IV. ANNUAL REVIEW OF THE TECHNICAL COOPERATION

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1. Dispatch of Japanese Experts

Item/Activity	Year					
	1997	1998	1999	2000	2001	2002
1. Long-term Experts						
(1) Team Leader	XXXX					
(2) Coordinator	XXXX					
(3) Varietal Improvement	XXXX					
(4) Farm Mechanization	XXX					
(5) Agronomy						
2. Short-term Expert(s) in the field of						
(1) Farm Mechanization (Reaper)	X					
(2) Farm Mechanization (Paddy Seeder)		X				
(3) Agronomy		X				

2. Training of Philippine Personnel in Japan in FY 1997.

Field	Name/Position	Training Period	Affiliation/Destination
1) Farm Mechanization	Engr. Rizaldo E. ALOAS	1998.02.09 ~ 1998.10.23	Tsukuba International Center (TBIC)
2) Agricultural Extension Service	Engr. Leo C. JAVIER	1998.03.16 ~ 1998.04.25	JICA, MAFF, NARC, etc.
3) Food Processing	Ms. Juma Novie B. AYAP	1998.03.31 ~ 1998.11.22	National Food Research Institute (NFRI) Niigata Food Research Institute
4) Information Processing	Ms. Teodora L. BRIONES	1998.03.31 ~ 1998.05.31	National Agricultural Research Center (NARC)

3. Provision of Machinery and Equipment in FY 1997

Imported from Japan	₱ 7,468,000
Purchased in the Philippines	1,647,000
Brought by JICA Experts	949,000
TOTAL	10,064,000

4. Highlights of Accomplishments of the TSI In 1997

4-1. Varietal Improvement

4-1-1. Selection and evaluation of potential germplasm for high-yielding/mechanized farming

Selection of parentals were based on non-shatterability, earliness, good grain quality and resistance to bacterial diseases. The *indica/japonica* progenies identified for shattering resistance were PR26946-6-1, PR26724-11-2-4, PR26681-2B-1-1, PR26681-2B-1-1-4 and PR26076-3B-5-2. Similarly, PR26700-10, PR26956-3-3, and PR26076-3B-5-2 were resistant to bacterial leaf blight under field conditions; and PR26703- PJ7-B3-18 to bacterial leaf streak. Early maturity with good grain quality was noted on two entries, PR26844-B-4 and PR26673-Bt.

(1) Materials and Methods

During the 1997 WS, a pool of parentals was evaluated for use in hybridization. A total of 238 entries were planted: 198 in the crossing block and 40 from the source nursery. Growth performance was observed from seedling to maturity. Agronomic traits and reactions to prevalent biotic stresses were also noted. Shattering resistance was observed by hand-grasp on-plant using a three-point qualitative scale; NS for non-shattering, MS for moderate, and S for shattering. The biotic stresses were also based on visual inspection using the Standard Evaluation System (SES).

(2) Results

Twenty-four breeding lines with *indica/japonica* parents were selected based on important agronomic characteristics (Table 1). Traits such as shattering and lodging resistance, field reactions to bacterial diseases, earliness, and good grain quality were prioritized. Five entries (PR26946-6-1, PR26724-11-1-2-4, PR26681-2B-1-1, PR26681-2B-1-1-4, and PR26076-3B-5-2) were highly non-shattering. Three lines, namely: PR26700-10; PR26956-3-3; and PR26076-3B-5-2 were resistant to bacterial leaf blight; and PR26703-PJ7-B3-18 to bacterial leaf streak. Other important germplasm which are non-shattering were SR-1, SR-5, Nanjin 20, Nanjin 21, and Suweon 262. Early maturity with good grain quality was noted on two entries, PR26844-B-4, and PR26673-Bt. Further selection and evaluation will be done in the succeeding seasons.

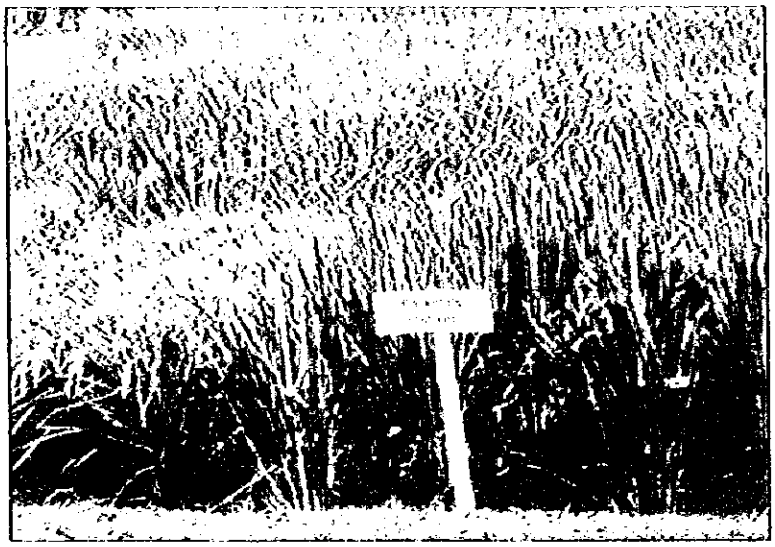


Photo 1. Germplasm diversity exhibited in the parental nursery, 1997 WS.

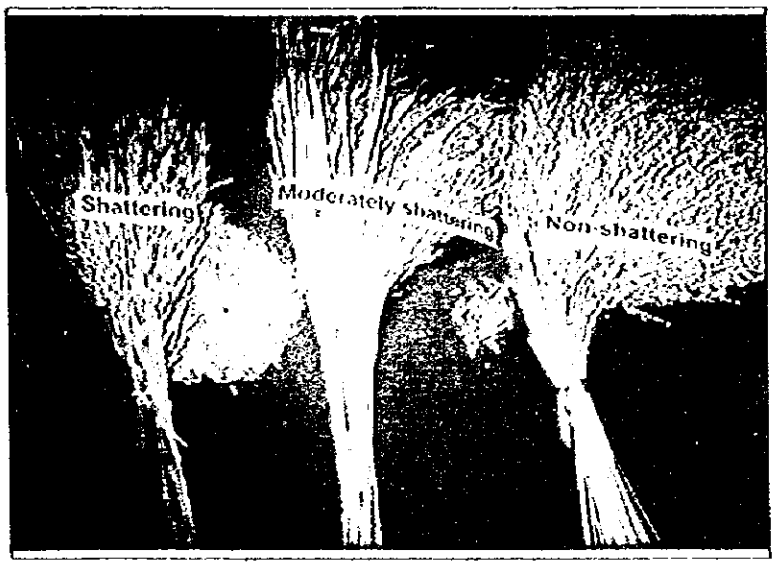


Photo 2. Differences of the shattering ability of one of the *indica/japonica* progenies evaluated in the JICA-PhilRice Technical Cooperation Project, 1997 WS.

Table 1. Selected breeding lines with non-to-moderate shattering ability and other agronomic traits utilized in the hybridization work at PhilRice Maligaya, 1997.

Field No.	Line/Variety	G [1]	Parentage	Remarks[2]
SN -1	PR27002-4	F_5	F_1 (Habataki/ARC11554//IR64)/ PSB Rc 4	Non-shattering but tall
-2	PR27002-9			Non-shattering but tall
-3	PR26946-6-1	F_5	(Akihikari/IR68)-13/IR64	Non-shattering, IR64-type, long panicle, less grain filling
-4	PR26700-10	F_6	Aichinokaori/BPI Ri10// Kiyonishiki/BPI Ri 10///IR66	Moderately shattering, resistant to BLB, long panicle, good plant type
-5	PR26956-3-3	F_7	Habataki/C4-63G//IR22(m)-3/ Taino 67	Moderately shattering, resistant to BLB, no field stress, good plant type
-6	PR26788-2b-2-3	F_7	Habataki/C4-63G//IR22(m)-3/ Taino 67	Segregating, non- to moderately shattering, susceptible to BLB
-7	PR26724-11-1-2-4	F_7	Koganebare/BPI Ri10*2	Non-shattering, long/sparse panicle, leafy, good ripe
-8	PR26681-2B-1-1-1	F_8	Koihime/PSB Rc 10	Non-shattering, tall, good plant type
-9	PR26681-2B-1-1-3	F_8		moderately shattering, good plant type
-10	PR26681-2B-1-1-4	F_8		Non-shattering, dwarf, short panicle, low yielding
-11	PR26844-B-4	F_7	Koshihikari/IR72*2	Good grain quality, shattering, early maturing
-12	SR-1		Mutant from Nanjin 11(Introduction)	Non-shattering
-13	SR-5 (Hokuriku 143)		-do-	Moderately shattering
-14	Nanjin20		Introduction	Non-shattering
-15	Nanjin 21		Introduction	Non-shattering
-16	Suweon 262		Introduction	Non-shattering
-17	PR26673-Bt	F_8	Sasanishiki/IR64	Shattering, early maturing, high yielding, good grain quality
-18	PR26076-3B-5-2	F_9	Akenohoshi/IR72	Non-shattering, medium height, resistant to stress, resistant to BLB
-19	PR26668-29-2-2-1	F_9	Habataki/BPI Ri10	Moderately shattering, high yielding
-20	PR26679-PJ3 ML	F_8	Hinohikari/IR64	Segregating
-21	PR26768-PJ(T)4	F_8	IR22(m)-1/PSB Rc4	resistant to RTV, stable uniformity, resistant to BLS
-22	PR26703-PJ7-B3-18	F_9	Nekken/BPI Ri10	resistant to BLS
-23	PR26850-B8-2	F_7	Suweon 325/BPI Ri10	Segregating
-24	PR26770-PJ2		Selection from IR61728-4B-2-1	Non-shattering

[1] Generation

[2] BLB- bacterial leaf blight; BLS- bacterial leaf streak; RTV-rice tungro virus
(Reactions to BLB were rated under induced method using Maligaya strain; for RTV, reactions were taken in the hot spot areas under late planting.)

4-1-2. Performance Tests of Advanced Irrigated Lowland Rice Lines in the Advanced Observational Nursery (AON) and Preliminary Yield Trial (PYT)

Two entries, PR26679-PJ3-4 and PR26687-8-1-1, were selected for further evaluation in the National Cooperative Tests (NCT) during the 1998 DS. PR26679-PJ3-4 matured in 123 days and gave an acceptable yield of 5088 kg/ha. It showed moderate field reaction to bacterial leaf diseases and susceptibility to narrow brown spot. It had higher milling recovery than IR64, the check variety. On the other hand, PR26687-8-1-1 had good phenotypic acceptability; matured in 126 days; and produced yield (4020 kg/ha) comparable to IR72 (4514 kg/ha), the highest-yielding check.

No lodging incidence was noted on 20 selections including the promising line in the PYT. In the AON, 22 entries exhibited the same reaction and were considered for further evaluation. For physical and milling potential, one entry, PR26841-B-5, was graded premium quality.

(1) Materials and Methods

Thirty-six entries were evaluated in two yield nurseries. In the AON, these entries were observed for yield and other traits in a systematic unreplicated plot arrangement, and compared with four maturity checks PSB Rc 28, IR72, PSB Rc18 and PSB Rc30. A grain quality check, IR64, was also included. In the PYT, rigid yield test was done with randomized complete block (RCB) experimental design using three replications. Similar traits were evaluated and the results became the bases for nomination to the multi-location NCT trials. Two seasons are required for each entry.

(2) Results

A total of 36 advanced lines were evaluated in the AON (15) and PYT (21). The test entries including the check varieties were affected by bacterial leaf diseases from moderate to severe reactions, hence, the yield performances were highly affected. In the AON (Table 2), yield levels ranged from 1686 to 4646 kg/ha while in the PYT (Table 3), yields were recorded from 2497 to 5088 kg/ha. Nine entries in the AON were subjected to re-selection on the basis of some specific merits while five entries were retained for further yield evaluation. Majority of the test entries were numerically comparable to IR64 but not with PSB Rc28, IR72, PSB Rc18 and PSB Rc30. Phenotypic acceptability was highly influenced by the disease reactions, hence, only seven gave fair rating which were comparable to the check varieties.

For the total milled rice recovery, only one entry, PR26841-B-5, recorded 70.2% and rated as premium.

In the PYT, only one entry, PR26697-PJ3-4, reached the 5-ton yield mark comparable with the highest-yielding check, IR72 (4.5 t/ha). Another entry, PR26687-8-1-1, which also gave comparable yield (4020 kg/ha) to IR72 showed good phenotypic acceptability. These entries were nominated to the 1998 DS in the NCT for further multi-location trials.

Four entries, which gave significantly lower yield than IR72 but exhibited fair phenotypic acceptability, including 10 other entries with comparable yield to IR72 were retained in the PYT. The remaining three entries, PR26697-PJ3-5, PR26703-PJ7-B3-18, and PR26685-PJ(G)6 were retained for further performance tests in the GYT.

Table 2. Yield and other agronomic characteristics of the advanced lines evaluated in the AON of the JICA-PhilRice Collaborative Project PhilRice Maligaya, 1997 wet season.

Index Number	Designation	Yield (kg/ha)	Maturity (DAS)[a/]	Uni-formity [b/]	Phen. Accept.[c/]	Brown Rice(%)[d/]	Total Milled Rice (%)[e/]	Pests/ Diseases[f/]	Remarks
1	PSB Rc28 (check)	4,118	114	3	5	78.1 F	67.7 G1	BLB, BLS	-
2	PR26850-B-12-3-1	2,763	124	7	5	76.0 F	64.6 G2	blb,sb	For reselection
3	PR26921-3-3	3,907	127	5	5	77.8 F	66.3 G1	BLS,blb	AON
4	PR26844-B-8-2	3,778	119	7	7	76.4 F	65.0 G2	BLB	For reselection
5	PR26844-B-4	4,062	118	5	5	75.8 F	60.5 G2	blb,shb	AON
6	IR64(check)	3,843	123	3	5	76.8 F	65.8 G1	sb	-
7	PR26724-11-1-1	1,686	124	5	7	74.6 P	61.6 G2	BLB,BLS	For reselection
8	PR26871-58	4,022	118	5	7	75.8 F	66.6 G1	BLB	AON
9	PR26871-27-4	3,866	123	3	5	77.9 F	67.9 G1	BLB	AON
10	PR27002-B-9	3,464	116	9	7	77.2 F	61.5 G2	BLB	For reselection
11	PR26956-10	3,570	120	7	7	78.5 F	69.8 G1	BLB	For reselection
12	PR26956-3-3	2,704	121	5	9	77.5 F	64.6 G2	BLB	For reselection
13	PR26946-6-3	3,117	123	5	9	76.7 F	67.2 G1	BLB,bls	For reselection
14	PR26841-B-5	3,946	123	3	5	77.4 F	70.2 Pr	BLB	AON
15	PR26850-B-8	4,205	126	5	5	75.4 F	65.2 G1	BLB,bls	AON
16	IR72(check)	4,586	124	3	5	78.4 F	65.0 G2	bls, blb	-
17	PSB Rc18 (check)	3,570	134	5	5	65.2 P	54.1 ***	-	-
18	PR26850-B-12-3-2	3,669	128	5	5	77.9 F	67.1 G1	BLS	For reselection
19	PR26684-31-2-1-5	3,339	120	3	7	75.7 F	66.2 G1	BLB,BLS	For reselection
20	PSB Rc 30 (check)	4,646	122	3	5	76.1 F	65.7 G1	BLB,bls	-

[a/] DAS - Days after sowing
[b/] Uniformity: 3 - uniform, 5 - 5%mixtures, 7 - 20%mixtures, 9 - highly segregating
[c/] Phenotypic acceptability: 3 - good, 5 - fair, 7 - poor
[d/] Brown rice (%): Fair (F) - 75.0-79.9%, Poor (P) - below 75.0%
[e/] Total milled rice(%): Premium (Pr) - 70.1% and above, Grade 1 (G1) - 65.1%-70.0%, Grade 2 (G2) - 60.1-65.0%, Grade 3 (G3) - 55.1%-60.0%, *** - below Grade 3
[f/] BLB (blb) - Bacterial leaf blight, BLS (bls) - Bacterial leaf streak, CLS (cls) - Cercospora leaf spot, SB (sb) - Stemborer. Capital letters mean severe infection; small letters, moderate; - = no incidence

Table 3. Yield and other agronomic characteristics of the advanced lines evaluated in the PYT of the JICA-PhilRice Collaborative Project PhilRice Maligaya, 1997 wet season.

Index No	Designation	Yield (kg/ha)[a]		Maturity (DAS)[b]	PAC[c]	LD[d]	Brown Rice (%)[e]	Total milled rice (%)[f]	Pests/ Diseases[g]	REMARKS
1	PSB Rc 28 (check)	3981		113	5	7	77.1 F	65.0 G1	BLB, BLS	-
2	PR26697-PJ3-2	4455		118	7	7	78.2 F	61.3 G2	BLS	PYT
3	PR26697-PJ3-5	4918		123	5	-	77.4 F	62.8 G2	BLB,bls	PYT/GYT
4	PR26668-29-2-1-2-1-4	3161	##	114	5	-	76.5 F	63.5 G2	BLB,BLS	FOR RESELECTION
5	IR 72 (check)	4514		120	5	-	78.0 F	64.6 G2	blb, bls	-
6	PR26697-PJ3-4	5088		123	5	-	77.7 F	67.7 G1	blb, bls, CLS	NCT
7	PR26687-8-1-1	4020		126	3	-	75.4 F	64.9 G2	BLB, bls	NCT
8	PR26871-27-3	4360		122	5	-	77.9 F	63.3 G2	BLB,BLS,CLS	PYT
9	PR26668-29-2-1-2-1-1	3756		114	5	-	75.0 F	63.2 G2	BLB,BLS	FOR RESELECTION
10	PR26703-PJ7-B3-18	4866		123	3	-	77.4 F	66.0 G1	blb,bls	PYT/GYT
11	PR26697-PJ3-6	4164		125	5	-	78.3 F	66.6 G1	BLB,BLS	PYT
12	IR64 (check)	4350		123	5	-	75.9 F	65.0 G1	BLB,BLS	-
13	PR26713-17-1-3	3690	#	126	5	-	72.8 P	64.9 G2	BLS, blb	PYT
14	PR26684-31-2-1	2497	##	119	7	-	75.0 F	66.0 G1	BLB,BLS	FOR RESELECTION
15	PR26767-PJ(T)5-1-5	3919		125	5	5	79.2 F	68.1 G1	BLS, blb	PYT
16	PSB Rc18 (check)	3359	##	136	3	-	63.4 P	54.3 G2	blb	-
17	PR26767-PJ(T)5A-1-5	3593	#	126	5	7	77.6 F	65.0 G1	BLS, blb	PYT
18	PR26768-PJ(T)4-18-8-B	3256	##	130	5	5	73.8 P	63.5 G2	sb, shb	PYT
19	PR26697-PJ3-1	3456	#	119	7	-	70.7 P	58.1 G2	BLB,BLS	FOR RESELECTION
20	PR26697-PJ3-3	4366		119	5	-	75.7 F	63.0 G1	blb	PYT
21	PR26768-PJ(T)4C-18-8-B	3930		132	3	-	73.5 P	60.8 G2	blb,bls	PYT
22	PR26685-P(G)6-3-1	4313		127	3	-	77.0 F	64.9 G2	BLS,sb	PYT/GYT
23	PR26684-91-1-1-1-4	3570	#	128	5	-	76.5 F	65.1 G1	bls, BLB	PYT
24	PR26946-6-1	3209	##	124	7	-	75.0 F	63.3 G2	BLB,BLS	FOR RESELECTION
25	PSB Rc30 (check)	4290		123	7	-	76.1 F	64.4 G2	BLB,BLS	-
26	PR26673-Bt	4039		126	5	5	76.8 F	66.2 G1	blb,bls	PYT

[a] C.V. = 9.7%. Control in LSD= IR72
and ## = rice selections significantly lower than the check at 0.05 and 0.01 probability levels, respectively.

[b] DAS=days after sowing

[c] Phenotypic acceptability: 3=good, 5=fair, 7=poor

[d] Lodging incidence: 5 = 21-40% lodging, 7 = >50% lodging, - = no lodging

[e] Brown rice (%): Fair(F) = 75.0-79.9%, Poor(P) = below 75.0%

[f] Total milled rice(%): Premium (Pr)=70.1% and above, Grade 1 (G1)=65.1%-70.0%, Grade 2 (G2)=60.1-65.0%

[g] BLB (blb)=Bacterial leaf blight, BLS (bls)=Bacterial leaf streak, CLS (cls)=Cercospora leaf spot
SB (sb)=Stemborer. Capital letters mean severe infection; small letters, moderate; - = no incidence

4-1-3. PR26679-PJ3-1, elevated as a special purpose rice in the NCT

In the initial NCT results under the special rice category, PR26679-PJ3-1 faired well during the dry season. It performed almost equally with IR64, the Philippines' leading variety in terms of yield, other agronomic traits, grain qualities and field stresses. They exhibited almost the same disease and insect reactions especially on susceptibility to rice tungro virus, sheath blight and green leafhopper. On the grain quality traits, however, the line had higher protein content than IR64. Further evaluation of this line will focus on the sensory traits.

(1) Materials and Methods

The NCT field performance tests for special purpose rice selections were conducted in three locations, namely: PhilRice Maligaya, Western Visayas Integrated Agricultural Research Center (WESVIARC) in Iloilo, and Ilocos Norte Integrated Agricultural Research Center (ILIARC) in Ilocos Norte. Eight entries were evaluated: PR26679-PJ3-1 was one of the six non-glutinous entries and two glutinous selections. Yield and other agronomic traits, disease and insect pests reactions (field and induced screening), as well as grain qualities were determined.

(2) Results

Of the three locations evaluated, WESVIARC results were excluded due to a high coefficient of variation. Highly significant differences among entries were observed only at PhilRice Maligaya. IR64 exhibited superiority over all entries but not significantly different from the highest yielding test entry, PR26679-PJ3-1, with 5.9 t/ha. IR64 had 6.1 t/ha. Table 4 shows the comparison of PR26679-PJ3-1 with IR64 across two test locations.

Photo 3. PR26679-PJ3-1 shown in the vegetative and maturity growth stages at the NCT Field Performance Test for Special Purpose Rices, PhilRice Maligaya, 1997 WS.

Table 4. Performance of PR26679-PJ3-1 in comparison with IR64 in the NCT I for special purpose rice selections, 1997 DS.

CHARACTER	PR26679-PJ3-1	IR64
Agronomic		
Yield (t/ha)	5.9	6.1
Maturity (DAS)	113	115
Plant height (cm)	77	77
Productive tillers	10	10
Disease		
Blast	Intermediate	Intermediate
Bacterial leaf blight	Resistant	Intermediate
Sheath blight	Intermediate	Intermediate
Rice tungro virus		
Modified field	Susceptible	Susceptible
Induced	Susceptible	Susceptible
Insect Pests		
Stemborers		
DH	Moderately resistant	Resistant
WH	Moderately resistant	Intermediate
Hoppers		
BPH 1	Susceptible	Intermediate
BPH 2	Intermediate	Moderately resistant
BPH 3	Susceptible	Intermediate
Green leafhoppers	Moderately susceptible	Moderately susceptible
Yellow stemborers	Intermediate	Intermediate
Grain quality		
Total milled rice (%)	67.4	68.2
Head rice recovery (%)	55.4	56.8
Grain length/shape	Long/slender	Long/slender
Crude protein (%)	7.3	6.7
Amylose content (%)	23.3	25.4

Total milled rice (%)
Premium(P)=70.1% and above
Grade 1(G1)=65.1-70.0%
Grade 2 (G2)=60.1-65.0%
Grade 3(G3)-55.1-60.0%

Head rice recovery (%)
Premium(P)=57.0% and above
Grade 1(G1)=48.0-56-9%
Grade 2(G2)=39.0-47.9%
Grade 3(G3)=30.0-38.9%

Grain length(mm)
Long =6.6-7.4
Medium=5.5-6.5

Amylose content
Intermediate=20.1-25.0%
High=25.1% and above

Grain shape
Intermediate=2.0-3.0
Slender=more than 3

4-1-4. PR26670-PJ2, a potential pre-release variety for cool elevated areas

PR26670-PJ2, a highly cool temperature-tolerant entry which exhibited promising performance in the NCT for dry season environment, is a candidate for pre-release in the farmers' fields in the Cordilleras. Two seasons' data across four locations gave the following performance: yield of 4810 kg/ha, 31.1% yield advantage over PSB Rc44 (3668 kg/ha); 158 days maturity; plant height of 95 cm; and 16 productive tillers. It recorded intermediate resistance to blast, stemborers, brown planthoppers, and green leafhoppers . It has excellent milling quality with short and bold grains, and low amylose content. Initial evaluation in the WS environment was also undertaken to test its adaptability. However, only one season's data is available.

(1) Materials and Methods

Tolerance to low temperature in the seedling stage of nine entries was evaluated in four cool elevated areas in the performance tests. Yield and other agronomic traits were observed and consolidated. Their resistance to blast, bacterial leaf blight, sheath blight, and tungro virus was evaluated using the induced and modified field methods. Their resistance to stemborers, brown planthoppers and green leafhoppers was also determined, as well as the various components of grain quality.

(2) Results

Only two locations were valid in the last DS test (Table 5). Most of the entries yielded significantly higher than PSB Rc44, the resistant check, which gave a mean yield of 2.8 t/ha only. The best performer was PR27137-CR153 (5.2t/ha) followed by PR26670-PJ2 (4.5 t/ha). Highest mean yield was obtained from Banaue, Ifugao (4.6t/ha) while the lowest was from BSU, La Trinidad, Benguet (3.0 t/ha). The performance of PR26670-PJ2 across two seasons is shown in Table 6. It gave a significantly promising performance in 4 out of the 6 trials, with 31.1% yield advantage over PSB Rc44. It is intermediate to blast and sheath blight but susceptible to tungro virus. For insect pests, it recorded intermediate to stemborers and green leafhoppers, and moderately resistant to brown planthoppers. It has premium milling potentials with short grain length and bold shape. It has low amylose content with hard gel consistency.

Photo 4. PR26770-PJ2 in the maturity stage, NCT Field Performance Tests for Cool Elevated Areas, BSU, La Trinidad, Benguet, 1997 WS.

Table 5. Grain yield (kg/ha) of rice selections evaluated in cool elevated areas, 1997 dry season trials.

INDEX	SELECTION	TEST LOCATIONS [a]						GRAND MEAN [b]		RANK [c]
		BSU		Tublay		Banaue		A	B	
1	PSB Rc44 (CHECK)	1831		680		3767		2092	2799	7
2	PR27137-CR153	4940	**	1786	**	5450	**	4059	5195	1
3	PR26770-PJ2	3917	**	397		5112	**	3142	4515	2
4	IR60058-4B-4-1-1	1929		327		4569	**	2275	3249	6
5	IR61728-4B-2-1	3602	**	268		-		1935	3602	5
6	IR62443-2B-7-2-2-2-1	3799	**	-		4793	**	4296	4296	4
7	IR62443-2B-4-3-2-3	1870		521		-		1196	1870	10
8	IR61673-AC201-1-1-3-3	3651	**	496		5171	**	3106	4411	3
9	IR64629-5-3-2-2	1063	##	203		4336	**	1868	2700	8
10	IR65246-10-2-2	1378		387		3916		1894	2647	9
	MEAN	2956		639		4639		2745	3798	
	F-test	298.0	**	7.0	**	45.9	**			
	CV (%)	5.2		51.5		0.2				
	LSD (5%)	265.7		569.3		32.9				
	LSD (1%)	363.7		784.4		45.1				

[a] Grand Mean A is the average of all the test locations, B is the average of 2 test locations with coefficient of variation (CV) less than 30%

[b] BSU – Benguet State University, data from Kalinga was insufficient, hence not presented
** Rice selections significantly higher than the check at 0.01 probability level
= Rice selections significantly lower than the check at 0.01 probability level
- No germination

[c] Ranked according to yield performance: 1- highest, 10 - lowest

Table 6. Performance of PR26670-PJ2 in comparison with PSB Rc44 in the NCT I for cool elevated areas, 1997 DS.

CHARACTER	PR26670-PJ2	PSB Rc44
Agronomic		
Yield (t/ha)	4.8	3.7
Maturity (DAS)	158	158
Plant height (cm)	95	90
Productive tillers	16	16
Disease		
Blast	Intermediate	Susceptible
Bacterial leaf blight	Resistant	Intermediate
Sheath blight	Intermediate	Intermediate
Rice tungro virus		
Modified field	Susceptible	Susceptible
Induced	Susceptible	Susceptible
Insect Pests		
Stemborers		
WH	Intermediate	Resistant
Hoppers		
BPH	Moderately resistant	Resistant
Green leafhoppers	Intermediate	Intermediate
Grain quality		
Total milled rice (%)	67.9	68.5
Headrice Recovery(%)	62.9	42.8
Grain length/shape	Short/bold	Short/intermediate
Amylose content (%)	16.1 (L)	23.9 (I)

Total milled rice (%)
Premium (P)=70.1% and above
Grade 1(G1)=65.1-70.0%
Grade 2 (G2)=60.1-65.0%
Grade 3(G3)-55.1-60.0%

Head rice recovery (%)
Premium (P)=57.0% and above
Grade 1(G1)=48.0-56-9%
Grade 2(G2)=39.0-47.9%
Grade 3(G3)=30.0-38.9%

Grain length(mm)
Long =6.6-7.4
Medium=5.5-6.5

Amylose content
Intermediate (I)=20.1%-25.0%
Low (L)=10.1%-20.0%

Grain shape
Intermediate=2.0-3.0
Slender=more than 3

4-2. Farm Mechanization

4-2-1. Development of the PhilRice rotary reaper III-B

The refinement of the third prototype of PhilRice rotary reaper has been completed and put to field trials and demonstration at farmers' fields. The mobility improved by reducing the weight and installation of reversing device. With gasoline engine of 7.5 hp, it weighs 140 kg, lighter than the previous model by 30%, approaching the weight of the reference imported model (120 kg).

The operating capacity of the unit averaged 0.15 ha/hr at a travel speed of 0.6 m/sec (2.2 km/h). With neat windrows formed and a minimum level of crop loss, the unit has shown a satisfactory overall performance. The points of further refinement necessary preceding the release of blueprints have been identified and adopted to derive PRR III-C model for testing in the 1998 DS crop.

(1) Derivation of prototype III-B

The design of PhilRice rotary reaper has three distinct features as basic concepts: rotary cutter instead of reciprocating cutter-bar, windrowing by side delivery belt, and composition of easy-to-assemble standard parts.

Through the participation of JICA short-term expert continuing from the preceding phase of cooperation, further refinements were added to the third prototype PRR III-A by, among others:

(a) Installing separate clutches: one for locomotion train, and another for cutter disk drive. This enables operators to activate the cutting mechanism before starting to cut the crop, to finish cutting and discharging cut straws before turning in the headlands, and to disengage cutting mechanism during transport.

(b) Installing reversing mechanism, to facilitate adjustment at blockages while in operation and accurate steering at headlands or for moving about.

(c) Reducing the total weight from 200 kg down to 140 kg by material selection and redesigning components configurations. The lighter weight enhances maneuverability of the entire unit while lessening the load on the engine and the stresses on moving parts.

(2) Field performance tests

Field tests on 1997 WS crop (Table 1) demonstrated that the operating capacity depended on the engine output. With the engine output of 7.5 hp and at a traveling speed of 0.6 m/s, the machine was able to cut and windrow 1 ha of crop in six hours. With the 5.0 hp engine, 7 to 9 hours were needed to harvest 1 hectare. Observation of the results showed that 6 hp was the most adequate engine capacity for driving the unit. The maximum cutting width was 80 cm. The straws were discharged in windrows at an angle of 80 to 90 degrees to the right of paths. Grain losses due to shattering were minimal at 1 to 1.5% of the standing crop yield. The losses due to uncut straws were seldom observed except for cases of lodged crop.

Table 1. Field test data on PhilRice rotary reaper

PARAMETERS	ENGINE				
	EY 28 (7.5 Hp Gasoline) with 4" diameter pulley		EY 20 (5 Hp Gasoline) with 4 ½" diameter pulley		
A. Variety	PSB Rc18	PSB Rc30	MS 6	IR74	IR74
Height (cm)	80	75	70	70	70
Estimated yield (t/ha)	4	5	3	5	5
Condition	good/ standing	good/ standing	standing with weed vines	partially lodged/ over ripe	partially lodged/over ripe
Size of the field, LxW (m)	244x10	34x15	28.5x15	27x12.2	34.2x14.8
B. Speed					
Engine RPM	1988	1980		2000	
Forward (m/s) w/ load		0.6	0.58	0.62	
Reverse (m/s) w/o load		0.58			0.63
C. Fuel Consumption (l/h)	2.6			1.9	
D. Cutting Width (cm)	80	80	80	80	80
E. Cutting Height (cm)					
Maximum	36		25		32
Average	25		20		23
Minimum	15		15		14
F. Angle of Straw	80-90	80-90	80-90	70-90	80-90
G. Capacity (ha/hr)	0.16	0.15	0.14	0.13	0.11
H. Field Efficiency (%)	88	80	74	73	
Total time (min)	93	20.15	17.96	17.26	
Harvesting time (min)	81.6	16.43	13.35	12.63	
Turning time (min)	11.16	4.08	4.62	4.63	
I. Grain Losses (%)	1.0	1.1	1.2	1.5	1.0

(3) Further improvement and perspectives

The reaper operation was demonstrated on the actual scale of farmers' fields in Nueva Ecija and Ilocos Norte. Farmers witnessed the performance with satisfaction and avid interests were shown to purchase the unit if it is made available commercially. Expected price for the final product from domestic manufacturers is around 50,000 pesos, sufficiently competitive as compared with imported models. However, technical

scrutinies have identified several points needing further refinement before commercialization. They are mostly concerned with the yet to be tested situation with soft soil paddies and, more basically, the durability aspects of the machine as a working component in the actual production systems.

Suggested modifications are incorporated in a newer version of the unit, PRR III-C which awaits further verification in the field and laboratory before the final blueprints release for manufacturers.

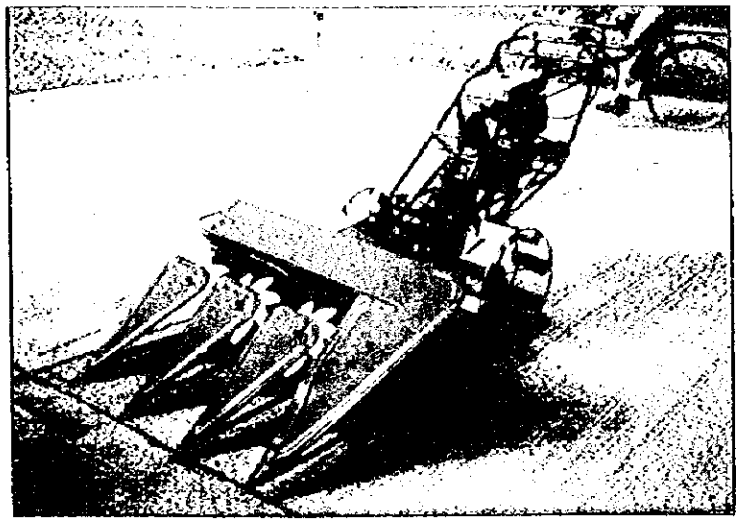


Photo 5. Overviewing PRR-III B's drive trains and windrowing header.

4-2-2. Development of the hand tractor mounted paddy seeder

Field tests were carried out for the improved prototype of seeder mounted on hand tractor. Further modification has resulted in a model which can assure reliable and stable operation under a wide range of field conditions.

Paddy soil consistency as determined by free-fall cone penetrometer proved to be a reliable measure to evaluate the adequacy of particular soil conditions for machine operation.

Derived machine model is deemed to be ready for release for farmers' adoption.

(1) Improvement of preceding prototypes

Through the collaboration activities in the preceding phase of the project, the machine function was improved in the following aspects:

(a) Installation of spring suspension on the leveler-furrower bar to negotiate for varying soil resistance profile and to minimize bulldozing effects;

(b) Configuration of lugs on the ground wheel to assure traction as well as to minimize soil and trash accumulation;

(c) Redesign and relocation of the depth regulator skid to increase machine maneuverability; and

(d) Addition of sliding shutters on the drum openings to regulate seeding rate.

(2) Results of field tests

Field tests were conducted in a farmer's field in Talavera, Nueva Ecija. The total area covered was 11500 m^2 (359 m x 32 m). Results are shown in Table 2. With the prevailing field conditions, one hectare of paddy field could be seeded in 1.7 ~ 2.4 hours. The locking of drive wheel due to soil and trash accumulation constituted the principal cause for the interrupted operation, necessitating the time for remedying and adjustment.

(3) Machine capability to varying degrees of soil consistency

The paddy soil (Maligaya clay loam) changes its consistency or hardness with the lapse of time after initial puddling, particularly when the field is drained. The seeder performance is known to depend greatly on the soil consistency. To determine the extent of workable soil consistency level for the seeder, an experiment was conducted by seeding at the field with successively different dates after puddling. The consistency was measured by the penetration of a steel cone which was dropped and allowed to fall freely from a fixed height. Plant establishment rates were compared for the operation at different levels of soil consistency. The results are shown in Figure 1.

The seedling establishments rate was considerably reduced for the operation in the field with average cone penetration of 8.1 cm, which coincided on the fifth and third day after puddling and draining, respectively. The lower establishment rate for machine

operation on soft soil (penetration depth of 13 cm) as compared to manual broadcasting arose as a result of deep coverage of seeds due to mud flow created by passing of leveling or furrowing device mounted on the seeder. The best results were obtained for the operation on fourth day after puddling or second day after draining.

Table 2. Operational data of seeder

Parameters	Test 1	Test 2	Test 3
Area (ha)	0.39 (159x32m)	0.51(121x32m)	0.25(79x32m)
Total Operating time (h,m,s)	39'00"	1° 10' 08"	35' 21"
Net operating time (h,m,s)	29' 59"	43' 38"	24' 47"
Turning time (h,m,s)	1' 47"	1' 31"	1' 27"
Seed loading time (h,m,s)	4' 05"(once)	7' 58"(2)	5' 54"(1)
Adjustment time (h,m,s)	3' 09"	17' 01"	3' 13"
Capacity (ha/h)	0.60	0.44	0.42
Rate of operation width (%)	99.4	92.3	92.3
Field efficiency	76.4	57.4	64.7

Traveling speed: 0.99 m/s
Fuel consumption (gasoline): 3.3 l/ha

(4) Improvement of seeder construction

The instability of performance was found to be caused by the locking of ground wheel which drives the seeding drum. Hence, efforts were made to improve the traction and drive train efficiency, and simultaneously to reduce the sticking of mud and trash. A ground wheel of a larger diameter with thicker pipe construction attached to an adjustable chain-sprocket train was newly fabricated. Field tests demonstrated that the problem of the locking ground wheel has been completely solved. The modification has stabilized the operation even on such soft soil conditions as encountered on the first day of puddling.

(5) Development perspective

As a key technology to mechanize the seeding operation, the tractor mounted seeder can be considered as an established technology. The diffusion to production sites is expected to follow. For that aspect of development, a certain amount of public efforts are needed to heighten the awareness on the part of potential manufacturers and rice growers.

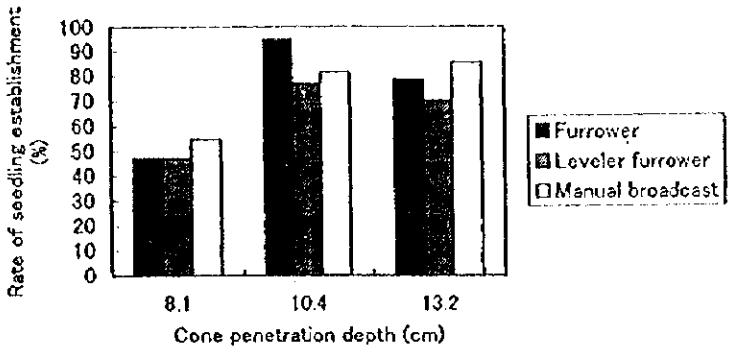


Figure 1. Rate of seedling establishment

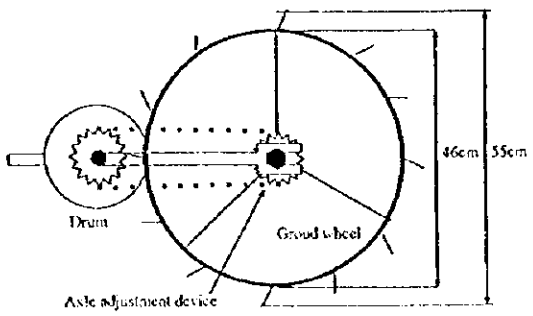


Figure 2. Improved ground wheel and axle adjustment mechanism

V. ANNUAL PLAN OF THE TECHNICAL COOPERATION FOR 1998

V. ANNUAL PLAN OF THE TECHNICAL COOPERATION FOR 1998

1. Technical Cooperation Activities

Tentative Schedule of Implementation (Itemized)

Item	1998 A	M	J	J	A	S	O	N	D	1999 J	F	M	Plans for FY 1998
1. Development of high-yielding and better quality rice varieties which are suitable for mechanization													
(1) Development of high-yielding and better quality promising lines for mechanized farming in irrigated lowland													
a. Development of high-yielding and better quality lines with less shattering and lodging resistance													Select from the 231 hybrid populations and 388 breeding lines and evaluate 14 elite lines in both dry (DS) and wet seasons (WS) for less shattering and lodging resistance.
b. Development of high-yielding and better quality lines for direct seeding cultivation													Further identify lines for direct seeding by screening to anaerobic conditions of all materials from the preceding project in both DS and WS. Incorporate important direct seeding traits from the identified donor parents to the Philippine leading varieties (20 crosses/ year)and evaluate succeeding generations in both DS and WS.
(2) Development of cool-temperature tolerant and high-yielding promising lines with good grain quality suitable for cool-elevated areas													
a. Development of high-yielding lines with strong cool-temperature tolerance													Generate 15 crosses per year to increase cool temperature tolerance and evaluate succeeding generations in both DS and WS.

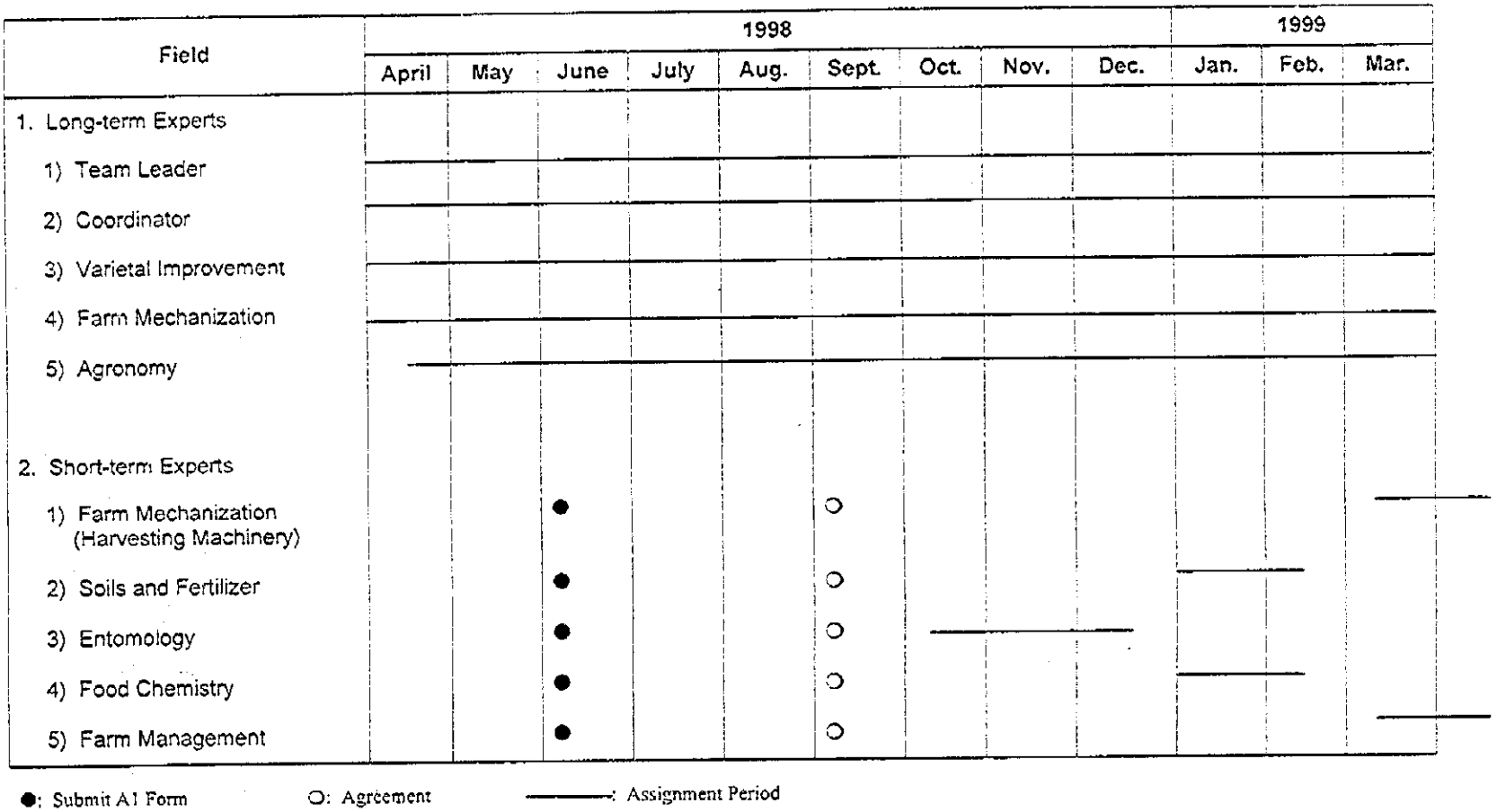
Item	1998 A	M	J	J	A	S	O	N	D	1999 J	F	M	Plans for FY 1998
b. Development of high-yielding lines with cool-temperature tolerance and good grain quality													Continue selection and evaluation of 345 breeding lines for cool temperature tolerance and grain quality. Generate 15 crosses per year to increase cool temperature tolerance, and evaluate succeeding generations in both DS and WS.
(3) Evaluation of local adaptability of promising lines													Select medium elevation sites.
a. Evaluation of promising lines in the NCT and other local adaptability tests													Monitor performance of the nominated NCT entries across seasons and locations: PJ2 for possible pre-release in the farmers' fields and PJ3 for registration as special rice. Identify a minimum of two entries from the PYT and GYT.
2. Development of farm machinery for small scale rice farmers													
(1) Development of machinery for plowing, leveling, and seeding for direct-seeding rice cultivation under irrigated lowland paddy condition													
a. Development of land preparation equipment for direct-seeding													Problems identification, analysis, and inventorying key technologies.
b. Improvement of performance of hand tractor mounted seeder													Giving guidance to manufacturers in fabrication of the equipment and advising farmers for practical application. Evaluating technology acceptance by farmers.
c. Development of direct-seeding equipment													Field evaluation of existing manual broadcasting equipment, and feasibility assessment of motorizing the operation.
(2) Development of rice harvesting machinery for small-scale farmers													
a. Improvement of reaper models													Performance evaluation of modifications in laboratory and field.

Item	1998 A	M	J	J	A	S	O	N	D	1999 J	F	M	Plans for FY 1998
b. Development of crop gathering equipment													Work load assessment of gathering operation, Inventorying for potential seed technology.
c. Development of small combine harvesters for rice													Evaluation and improvement of stripper combine performance.
3. Improvement of cultivation techniques for labor-saving and high-yielding rice production													
(1) Development of techniques for direct-seeding cultivation													
a. Search for the ideal plant type for direct seeding													Determine varietal response in terms of germinability, nutrient uptake, growth rate, lodging resistance, grain yield quantity and quality.
b. Improvement of land preparation for better crop establishment													Determine water, tillage, and weed management practices for optimum yield.
c. Development of direct-seeding cultivation for increased yield													Determine the appropriate combination of variety, seeding method, seeding and fertilizer rates for increased yield.
(2) Improvement of fertilizer application techniques for higher yielding and better quality rice													
a. Improvement of nutrient use efficiency													Use the leaf color chart and the chlorophyll meter to determine the need for nitrogen fertilizer. Incorporate rice straw to improve the soil nutrient status.
(3) Improvement of techniques for disease and insect pest management													
a. Synthesis and utilization of nationwide historical data on insect pest incidence in the development of location-specific insect pest profiles													Compilation, tabulation and synthesis of nationwide historical data on insect pests (data source: Technology Demonstration Project under the Gintong Ani Program of the Department of Agriculture). Development of location-specific profiles of insect pests in the Philippines.

Field/Item	1998									1999			Plans for FY 1998
	A	M	J	J	A	S	O	N	D	J	F	M	
b. Development of standard techniques to determine the mechanisms of resistance of rice cultivars to rice blast disease					.....	.....	.....	.....	.....	.....	.....	.....	Literature review on techniques to determine the mechanisms of resistance (physiological, morphological and cytological mechanisms) of rice cultivars to major diseases, with emphasis on the rice blast disease. Preliminary evaluation/modification of existing techniques.
4. Improvement of rice quality evaluation techniques													
(1) Improvement of techniques for rice grain quality evaluation													
a. Highly efficient measurement of moisture and nutrient contents of rice grain by Near-Infrared Reflectance (NIR)						.....	.....	.....	.....	.....	.....	.....	Verification of established estimation formula for moisture and protein content using randomly selected NCT rice samples. Calibration of NIR for amylose and lipid content determination; validation and verification of established estimation formula.
b. Establishment of criteria for predicting processing qualities of rice	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Training on theory and practice of rice product processing, particulary on (a) physicochemical properties of rice suitable for specific food products, and (b) food processing and storage technology of selected Japanese rice food products.
5. Development of mechanized rice-based farm management systems													
(1) Development of models of mechanized rice-based farm management													
a. Development of farm management models for evaluating mechanized rice-based farming systems						.....	.....	.....	.....	.....	.....	.....	Preparation of detailed proposal and framework initially for intensive irrigated systems, preparation of required database.

Field/Item	1998									1999			Plans for FY 1998
	A	M	J	J	A	S	O	N	D	J	F	M	
b. Development of techniques for monitoring and evaluation of rice-based farming systems using Geographic Information System (GIS) technology													Preparation of database requirements and detailed framework, engagement of first short term expert to develop first prototype village-level GIS-based model.
(2) Development of an information system for rice and rice-based farming technologies													
a. Development of database for better transfer of rice technology information													Pool of existing mature rice technologies. Development of rice technology database framework/design. Development of staff capability on information/database management.

2. Dispatch of Japanese Experts



3. Training of Philippine Personnel in Japan

Field	Name/Position	Training Period	Affiliation/Destination
1) Agronomy	Mrs. Evelyn F. JAVIER Science Res. Specialist II	1998.05 ~ 1998.11	National Agriculture Research Center (NARC)
2) Entomology	Dr. Hilario D. JUSTO, Jr. Chief Sci. Res. Specialist.	1998.08 ~ 1998.09	Kyushu National Agricultural Experiment Station
3) Agricultural Extension	Mr. Paterno I. REBUELTA Senior Sci. Res. Spec.	1998.05 ~ 1998.07	Tokyo International Center (TIC)
4) Biotechnology	Mrs. Victoria C. LAPITAN Science Res. Specialist I	1998.07 ~ 1998.10	Osaka International Center (OIC)
5) Plant Breeding	Mr. Hilario C. DELA CRUZ, Jr. Chief Sci. Res. Specialist	1998.09 ~ 1998.10	Tohoku National Agricultural Experiment Station and NARC

4. Provision of Machinery and Equipment in FY 1998

Field/Item	1998									1999		
	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1) Purchased in Japan			○					◎	X			
2) Purchased in the Philippines					○				X	○	X	○ X
3) Brought by Short-term Expert							○	X		○	X	○ X

●: Purchased Order ○: Shipping ◎: Arrival in the Philippines X: Arrival at PhilRice

APPENDICES

1. Record of Discussions

RECORD OF DISCUSSIONS
BETWEEN JAPANESE IMPLEMENTATION STUDY TEAM
AND AUTHORITIES CONCERNED OF THE GOVERNMENT OF
THE REPUBLIC OF THE PHILIPPINES
ON JAPANESE TECHNICAL COOPERATION
FOR THE RESEARCH AND DEVELOPMENT PROJECT
ON HIGH PRODUCTIVITY RICE TECHNOLOGY

The Japanese Implementation Study Team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency, headed by Mr. Shoji Furuya, visited the Republic of the Philippines from May 20 to 29, 1997 for the purpose of working out the details of the technical cooperation program concerning the Research and Development Project on High Productivity Rice Technology in the Republic of the Philippines.

During its stay in the Republic of the Philippines, the Team exchanged views and had a series of discussions with the Philippine authorities concerned with respect to desirable measures to be taken by both Governments for the successful implementation of the above-mentioned Project.

As a result of the discussions, the Team and the concerned Philippine authorities agreed to recommend to their respective Governments the matters referred to in the document attached hereto.

Manila, 28 May, 1997

Shoji Furuya
Leader
Implementation Study Team
Japan International Cooperation Agency

Santiago R. Obien
Director
Philippine Rice Research Institute
Republic of the Philippines

Confirmed:

Rodolfo C. Undan
Assistant Secretary
Department of Agriculture
Republic of the Philippines

ATTACHED DOCUMENT

I. COOPERATION BETWEEN BOTH GOVERNMENTS

1. The Government of the Republic of the Philippines will implement the Research and Development Project on High Productivity Rice Technology (hereinafter referred to as "the Project") in cooperation with the Government of Japan.

2. The Project will be implemented in accordance with the Master Plan which is given in Annex I.

II. MEASURES TO BE TAKEN BY THE GOVERNMENT OF JAPAN

In accordance with the laws and regulations in force in Japan, the Government of Japan will take, at its own expense, the following measures through the Japan International Cooperation Agency (hereinafter referred to as "JICA") according to the normal procedures under the Colombo Plan Technical Cooperation Scheme.

1. DISPATCH OF JAPANESE EXPERTS
   The Government of Japan will provide the services of the Japanese experts as listed in Annex II.

2. PROVISION OF MACHINERY AND EQUIPMENT
   The Government of Japan will provide such machinery, equipment, and other materials (hereinafter referred to as "the Equipment") necessary for the implementation of the Project as listed in Annex III. The Equipment will become the property of the Government of the Republic of the Philippines upon being delivered C.I.F. to the concerned Philippine authorities at the port(s) and/or airport(s) of disembarkation.

3. TRAINING OF PHILIPPINE PERSONNEL IN JAPAN
   The Government of Japan will receive Philippine personnel connected with the Project for technical training in Japan.

III. MEASURES TO BE TAKEN BY THE GOVERNMENT OF THE REPUBLIC OF THE PHILIPPINES

1. The Government of the Republic of the Philippines will take necessary measures to ensure a self-reliant operation of the Project during and after the period of Japanese technical cooperation, through the full and active involvement in the Project of all related authorities, beneficiary groups, and institutions.

2. The Government of the Republic of the Philippines will ensure that the technologies and knowledge acquired by the Philippine nationals as a result of Japanese technical cooperation will contribute to the economic and social development of the Republic of the Philippines.

3. The Government of the Republic of the Philippines will grant privileges, exemptions, and benefits to the Japanese experts referred to in II-1 above and their families, which are no less favorable than those accorded to experts of third countries working in the Republic of the Philippines under the Colombo Plan Technical Cooperation Scheme.

4. The Government of the Republic of the Philippines will ensure that the Equipment referred to in II-2 above will be utilized effectively for the implementation of the Project in consultation with the Japanese experts referred to in Annex II.

5. The Government of the Republic of the Philippines will take necessary measures to ensure that the knowledge and experience acquired by the Philippine personnel from technical training in Japan will be utilized effectively in the implementation of the Project.

6. In accordance with the laws and regulations in force in the Republic of the Philippines, the Government of the Republic of the Philippines will take necessary measures to provide, at its own expense, for the project:

   (1) Services of the Philippine counterpart personnel and administrative personnel as listed in Annex IV;

   (2) Land, buildings, and facilities as listed in Annex V;

   (3) Supply or replacement of machinery, equipment, instruments, vehicles, tools, spare parts and any other materials necessary for the implementation of the Project other than the Equipment provided through JICA under II-2 above;

   (4) Means of transport and travel allowances for the Japanese experts for their official travels within the Republic of the Philippines; and

   (5) Suitably furnished accommodations for the Japanese experts and their families.

7. In accordance with the laws and regulations in force in the Republic of the Philippines, the Government of the Republic of the Philippines will take necessary measures to meet the following:

   (1) Expenses necessary for transportation within the Republic of the Philippines of the Equipment referred to in II-2 above as well as for the installation, operation, and

maintenance thereof;

(2) Customs, duties, internal taxes, and any other charges imposed in the Republic of the Philippines on the Equipment referred to in II-2 above; and

(3) Running expenses necessary for the implementation of the Project.

IV. ADMINISTRATION OF THE PROJECT

1. The Secretary of the Department of Agriculture, as the Project Director, will bear overall responsibility for the implementation of the Project.

2. The Director of the Philippine Rice Research Institute, as the Project Manager, will be responsible for the administrative, managerial, and technical matters of the Project.

3. The Japanese Team Leader will provide the necessary recommendations and advice to the Project Manager on technical and administrative matters pertaining to the implementation of the Project.

4. The Japanese experts will give the necessary technical guidance and advice to the Philippine counterpart personnel on technical matters pertaining to the implementation of the Project.

5. For the effective and successful implementation of technical cooperation for the Project, a Joint Coordination Committee will be established whose functions and composition are described in Annex VI.

V. JOINT EVALUATION

Evaluation of the Project will be conducted jointly by the two Governments through JICA and the Philippine authorities concerned, at the middle and during the last six months of the cooperation term in order to examine the level of achievement.

VI. CLAIMS AGAINST JAPANESE EXPERTS

The Government of the Republic of the Philippines shall bear claims, if any arises, against the Japanese experts engaged in technical cooperation for the Project resulting from, occurring in the course of, or otherwise connected with, the discharge of their official functions in the Philippines except for those arising from the willful misconduct or gross negligence of the Japanese experts.

VII. MUTUAL CONSULTATION

There will be mutual consultation between the two Governments on any major issues arising from, or in connection with this Attached Document.

VIII. MEASURES TO PROMOTE UNDERSTANDING OF AND SUPPORT FOR THE PROJECT

For the purpose of promoting support for the Project among the people of the Philippines, the Government of the Republic of the Philippines will take appropriate measures to make the Project widely known.

IX. TERM OF COOPERATION

The duration of technical cooperation for the Project under this Attached Document will be for five (5) years from August 1, 1997.

ANNEX I MASTER PLAN

1. OBJECTIVES OF THE PROJECT

(1) Overall goal

High quality rice is supplied in sufficient quantity and farm management is stabilized through high productivity rice technologies which are sustainable for the conditions in rice growing areas.

(2) Project purpose

High productivity rice technologies for small-scale rice farmers are developed through the Project implementation by the Philippine Rice Research Institute.

2. OUTPUTS OF THE PROJECT

(1) High-yielding and better quality rice varieties which are suitable for mechanization are developed.

(2) Farm machinery for small-scale rice farmers are developed.

(3) Cultivation techniques for labor-saving and high-yielding rice production are improved.

(4) Rice quality evaluation techniques are improved.

(5) Mechanized rice-based farm management systems are developed.

3. ACTIVITIES OF THE PROJECT

1-1) To develop high-yielding and better quality promising lines for mechanized farming in irrigated lowlands.

1-2) To develop cool-temperature tolerant and high-yielding promising lines with good grain quality suitable for cool-elevated areas.

1-3) To evaluate local adaptability of promising lines.

2-1) To develop machinery for plowing, leveling, and seeding for direct-seeding rice cultivation under irrigated lowland paddy condition.

2-2) To develop rice harvesting machinery for small-scale farmers.

3-1) To develop techniques for direct-seeding cultivation.

3-2) To improve fertilizer application techniques for higher yielding and better quality rice.

3-3) To improve techniques for disease and insect pest management.

4-1) To improve techniques for rice grain quality evaluation.

5-1) To develop models of mechanized rice-based farm management.

5-2) To develop an information system for rice and rice-based farming technologies.

ANNEX II LIST OF JAPANESE EXPERTS

1. Long-term experts

(1) Team Leader

(2) Coordinator

(3) Experts in the fields of:

1) Varietal Improvement

2) Farm Mechanization

3) Agronomy

Note: The Team Leader may serve concurrently as an expert in one of the fields mentioned above.

2. Short -term expert(s)

Short-term expert(s) will be dispatched when necessity arises for the smooth implementation of the Project.

ANNEX III LIST OF MACHINERY AND EQUIPMENT

1. Machinery and equipment for activities of varietal improvement
2. Machinery and equipment for activities of farm mechanization
3. Machinery and equipment for activities of agronomy
4. Vehicles and their spare parts
5. Other necessary equipment and materials for the technical cooperation

ANNEX IV LIST OF PHILIPPINE COUNTERPARTS AND OTHER PERSONNEL

1. Project Director
2. Project Manager
3. Necessary number of Counterpart Personnel for long- and short-term experts
4. Administrative Personnel
    (1) Administrative Officers
    (2) Accounting and Budget Officers
    (3) Secretaries
    (4) Drivers

ANNEX V LIST OF LAND, BUILDINGS, AND FACILITIES

1. Buildings, facilities, and office space for the Project
2. Space for the machinery and equipment provided
3. Electricity and communication facilities
4. Other land, buildings, and facilities necessary for the implementation of the Project

ANNEX VI JOINT COORDINATION COMMITTEE

1. Function

The Joint Coordination Committee will meet at least once a year and whenever necessity arises, to:

(1) Formulate the Annual Work Plan of the Project in line with the Tentative Schedule of Implementation to be formulated under the framework of the Record of Discussions;

(2) Review the overall progress of the technical cooperation program as well as the achievements of the above-mentioned Annual Work Plan; and

(3) Review and exchange views on major issues arising from or in connection with the Project.

2. Composition

(1) Chairman: Secretary, Department of Agriculture (DA)

(2) Vice Chairman: Undersecretary for Research, Training and Regional Operations, DA

(3) Members:

a) Director, PhilRice

b) Deputy Director, PhilRice

c) Director, Bureau of Agricultural Research, DA

d) Chief, Project Assistance Division, Special Concerns Office, DA

e) Director, Agriculture Staff, National Economic and Development Authority (NEDA)

f) Director, Project Monitoring Staff, NEDA

g) Deputy Executive Director for Research, Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD)

h) Dean, College of Agriculture, University of the Philippines Los Banos

i) Team Leader, JICA

j) Coordinator, JICA

k) Experts, JICA

l) Personnel concerned to be dispatched by JICA, if necessary

m) Resident Representative of JICA Philippine Office

n) Official(s) of the Embassy of Japan, as observer(s)

TENTATIVE SCHEDULE OF IMPLEMENTATION OF JAPANESE TECHNICAL COOPERATION FOR THE RESEARCH AND DEVELOPMENT PROJECT ON HIGH PRODUCTIVITY RICE TECHNOLOGY

The Japanese Implementation Study Team (hereinafter referred to as "the Team") and the authorities concerned of the Republic of the Philippines have jointly formulated the herein Tentative Schedule of Implementation (TSI) of the Research and Development Project on High Productivity Rice Technology (hereinafter referred to as "the Project") as annexed hereto.

This TSI has been formulated in accordance with the Attached Document of the Record of Discussions signed between the Team and the Philippine authorities concerned with the Project on condition that the necessary budget will be allocated by both Governments, and that the schedule is subject to change within the framework of Record of Discussions.

Manila, 28 May, 1997

Shoji Furuya
Leader
Implementation Study Team
Japan International Cooperation Agency

Santiago R. Obien
Director
Philippine Rice Research Institute
Republic of the Philippines

Confirmed:

Rodolfo C. Undan
Assistant Secretary
Department of Agriculture
Republic of the Philippines

1. Activities of the Project

Item / Activity \ Year	Schedule					
	1997	1998	1999	2000	2001	2002
1. High-yielding and better quality rice varieties which are suitable for mechanization are developed.						
(1) To develop high-yielding and better quality promising lines for mechanized farming in irrigated lowland.						
(2) To develop cool-temperature tolerant and high-yielding promising lines with good grain quality suitable for cool-elevated areas.						
(3) To evaluate local adaptability of promising lines.						
2. Farm machinery for small-scale rice farmers are developed.						
(1) To develop machinery for plowing, leveling, and seeding for direct-seeding rice cultivation under irrigated lowland paddy condition.						
(2) To develop rice harvesting machinery for small-scale farmers.						
3. Cultivation techniques for labor-saving and high-yielding rice production are improved.						
(1) To develop techniques for direct-seeding cultivation.						
(2) To improve fertilizer application techniques for higher yielding and better quality rice.						
(3) To improve techniques for disease and insect pest management.						
4. Rice quality evaluation techniques are improved.						
(1) To improve techniques for rice grain quality evaluation.						
5. Mechanized rice-based farm management systems are developed.						
(1) To develop models of mechanized rice-based farm management.						
(2) To develop an information system for rice and rice-based farming technologies.						

when necessity arises

1

2. Technical Cooperation Program (Japanese Side)

Item/Activity \ Year	Schedule					
	1997	1998	1999	2000	2001	2002
1. Dispatch of Long-term Experts						
(1) Team Leader*						
(2) Coordinator						
(3) Varietal Improvement						
(4) Farm Mechanization						
(5) Agronomy						
2. Dispatch of Short-term Expert(s) (When necessity arises)						
3. Provision of Machinery and Equipment						
4. Acceptance of Philippine Counterpart Personnel for training in Japan (A few personnel or meembers per year)						
5. Dispatch of Missions (When necessity arises)						

* Team Leader may serve concurrently as an expert in one of the fields mentioned above.

3. Technical Cooperation Program (Philippine Side)

Item/Activity \ Year	Schedule					
	1997	1998	1999	2000	2001	2002
1. Counterpart						
(1) Project Director						
(2) Project Manager						
(3) Counterpart personnel for long-term experts						
(4) Counterpart personnel for short-term experts (When necessity arises)						
(5) Administrative personnel members						
2. Allocation of running cost of the Project						
3. Land, Buildings, Facilities, and Equipment						

MINUTES OF UNDERSTANDING ON
THE RECORD OF DISCUSSIONS
BETWEEN JAPANESE IMPLEMENTATION STUDY TEAM
AND AUTHORITIES CONCERNED OF THE GOVERNMENT OF
THE REPUBLIC OF THE PHILIPPINES
ON JAPANESE TECHNICAL COOPERATION
FOR THE RESEARCH AND DEVELOPMENT PROJECT
ON HIGH PRODUCTIVITY RICE TECHNOLOGY

The Japanese Implementation Study Team (hereinafter referred to as "the Team") and the authorities concerned of the Republic of the Philippines had a series of discussions and signed the Record of Discussions (hereinafter referred to as "R/D") on the Technical Cooperation for the Research and Development Project on high Productivity Rice Technology in the Republic of the Philippines.

The minutes of understanding attached hereto documents the details of the R/D.

Manila, May 28, 1997

Shoji Furuya
Leader
Implementation Study Team
Japan International Cooperation Agency

Santiago R. Obien
Director
Philippine Rice Research Institute
Republic of the Philippines

Confirmed:

Rodolfo C. Undan
Assistant Secretary
Department of Agriculture
Republic of the Philippines

Attached Document

1. List of Philippine Counterparts

Both sides confirmed that the Government of the Republic of the Philippines would assign counterparts (Annex I) for the Japanese experts.

2. Project Preparation

The Government of the Republic of the Philippines will submit the application forms (A1 Form) for five (5) long-term Japanese experts to the Embassy of Japan by the end of June 1997, the form for the provision of machinery and equipment (A4 Form), and the form for technical training of Philippine staff (A2 ,3 Form) as soon as possible after consultation with the Japanese side through the JICA Philippines Office.

3. Project Design Matrix

The Team and the concerned authorities of the Republic of the Philippines agreed that the Project would be implemented in accordance with Project Design Matrix (hereinafter referred to as the "PDM") in Annex II of this minutes and the Master Plan in the Record of Discussions. The PDM describes and summarizes the necessary activities to be implemented. The Government of Japan will assist within the scope of the Master Plan.

4. Farm Mechanization in the Republic of the Philippines

(1) In the Philippines at present, small-sized machines, such as power tiller for land preparation, are mainly used. In the future, labor shortage in the rural areas is forecast owing to migration to urban areas as a result of industrialization. The mechanization of harvesting is also expected for release from heavy labor.

(2) In farm mechanization, the development of both harvesting and post-harvesting machines for high yielding and high quality varieties, and machines for direct-seeding to address labor shortage are desired.

(3) The gradual progress of mechanization does not give serious effect on landless farmers. In the progress of mechanization, it is possible for landless farmer to find a job.

5 Workshop Equipment and Laboratory Test Instruments

The workshop equipment and laboratory test instruments for the development of machinery were requested by the Philippine side.

6. Necessity of GIS for the Development of the Models for the Rice-Based Farm Management

In the development of models for mechanized rice-based farm management, farm level and regional aspects are important. To visualize the results of monitoring and evaluation of land use and effects of mechanization at the village levels, a simple PC-based GIS (Geographic Information System) or mapping system will be useful.

7. Acquisition of Hardware for the Development of the Rice Technology Database

The upgrading and acquisition of computers and computer accessories for the development of the rice technology database shall be provided by PhilRice starting in 1997. Because of insufficient communication infrastructure, CD-R (compact disk rewritable) is considered as one of the most suitable media for the delivery of technology information in the Rice R&D Network.

ANNEX I List of Philippine Counterparts

Management	
Santiago R. Obien	Director
Ronilo A. Beronio	Deputy Director
Coordination	
Eulito U. Bautista	Scientist I
Nestor C. Martin	Division Chief for Finance
Teodora L. Briones	Science Research Specialist II
Varietal Improvement	
Hilario C. dela Cruz	Chief Science Research Specialist
Leocadio S. Sebastian	Supervising Science Research Specialist
Rodante E. Tabien	Senior Science Research Specialist
Thelma F. Padolina	Senior Science Research Specialist
Emily R. Corpuz	Science Research Specialist II
Farm Mechanization	
Eulito U. Bautista	Scientist I
Manuel Jose C. Regalado	Senior Science Research Specialist
Ricardo F. Orge	Senior Science Research Specialist
Eden C. Gagelonia	Senior Science Research Specialist
Rizaldo E. Aldas	Senior Science Research Specialist
Joselito A. Damian	Science Research Specialist II
Agronomy	
Rolando T. Cruz	Chief Science Research Specialist
Teodula M. Corton	Supervising Science Research Specialist
Edna Marie S. Punzalan	Supervising Science Research Specialist
Evelyn F. Javier	Senior Science Research Specialist
Madonna C. Casimero	Senior Science Research Specialist
Fernando D. Garcia	Science Research Specialist II
Hilario D. Justo Jr.	Chief Science Research Specialist
Leandro M. Sanchez	Supervising Science Research Specialist
Alejandra B. Estoy	Supervising Science Research Specialist
Gerardo F. Estoy Jr.	Senior Science Research Specialist
Rice Chemistry & Food Science	
James A. Patindol	Senior Science Research Specialist
Juma Novie B. Ayap	Senior Science Research Specialist
Marissa V. Romero	Senior Science Research Specialist
Nanette V. Zulueta	Science Research Specialist II
Evelyn M. Herrera	Science Research Specialist I
Farm Management	
Segfredo R. Serrano	Chief Science Research Specialist
Sergio R. Francisco	Supervising Science Research Specialist
Rogelio D. Cosio	Senior Science Research Specialist
Irene R. Tanzo	Science Research Specialist II
Cheryll B. Casiwan	Science Research Specialist I
Alice M. Briones	Science Research Specialist I

Technology Promotion	
Leo C. Javier	Chief Science Research Specialist
Roger F. Barroga	Supervising Science Research Specialist
Ruben C. Miranda	Senior Science Research Specialist
Paterno I. Rebuelta	Senior Science Research Specialist
Olive Rose O. Matchoc	Science Research Specialist II

Annex II Project Design Matrix (Tentative)

The Research and Development Project on High Productivity Rice Technology

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS*	MEANS OF VERIFICATION*	IMPORTANT ASSUMPTIONS*
Overall goal High quality rice is supplied in sufficient quantity and farm management is stabilized through high-productivity rice technologies which are sustainable for the conditions in rice growing areas	• Stabilization of self-sufficiency in rice production • Improvement of farm management	Survey and other means	Agricultural policy will not be drastically changed
Specific Objective High productivity rice technologies for small-scale rice farmers are developed at the Philippine Rice Research Institute	• Improvement of productivity through high and better grain quality	Survey and other means	Small-scale farmer adopted the technology developed at PhilRice
Output of the Project) High-yielding and better quality rice lines which are sustainable for mechanization are developed) Farm machinery for small-scale rice farmers is developed) Cultivation techniques for labor-saving and high-yielding rice production are improved) Rice quality evaluation techniques are improved) mechanized rice-based farm management systems are developed	1) Several promising lines are developed 2) A few prototype machinery are developed 3) Labor-saving of 25% in transplanted, 40% in direct seeded rice, 10% yield increase 4) Faster and more accurate rice quality evaluation techniques are mastered 5) Faster evaluation and delivery of developed technology	1) Commercial release of varieties 2) Prototypes 3) Publication of cultivation techniques 4) Techniques for evaluation 5) Survey for adoption	Research activity and management of PhilRice will be maintained
Activities -1) To develop high-yielding and better-quality promising lines for mechanized farming in irrigated lowlands -2) To develop cool-temperature tolerant and high-yielding promising lines with good grain quality suitable for cool-elevated areas -3) To evaluate local adaptability of promising lines -1) To develop machinery for plowing, leveling, and seeding for direct-seeding rice cultivation under irrigated lowland paddy condition -2) To develop rice harvesting machinery for small-scale farmers -1) To develop techniques for direct seeding cultivation -2) To improve fertilizer application techniques for higher-yielding and better quality rice -3) To improve techniques for disease and insect pest management -1) To improve techniques for rice grain quality evaluation -1) To develop models for mechanized rice-based farm management -2) To develop an information system for rice and rice-based farming technologies	Inputs (Japanese side) 1. Dispatch of Experts (1) Long-term 1. Team Leader 2. Coordinator 3. Varietal Improvement 4. Farm Mechanization 5. Agronomy (2) Short-term (as needed) 2. Provision of machinery and equipment 3. Acceptance of Philippine counterpart personnel members for training in Japan (a few personnel members per year)	(Philippine side) 1. Counterpart and administrative personnel 2. Land, buildings and facilities 3. Repair or replacement of machinery 4. Maintenance and operating expenses	PhilRice staff will continue high quality research **PRECONDITION** PhilRice is a established rice research center in the Philippines

* INDICATORS, MEANS OF VERIFICATION and ASSUMPTIONS are to be further discussed upon commencement of the Project

Annex III List of the Team Members

(1) Mr. Shoji FURUYA (Leader)
Deputy Director General,
Tohoku National Agricultural Experiment Station (N.A.E.S),
Ministry of Agriculture, Forestry and Fisheries (MAFF)

(2) Dr. Koichiro OKAZAKI (Farm Mechanization)
Team Leader, Research Project Team 1,
Department of Integrated Research for Agriculture,
Chugoku N.A.E.S, MAFF

(3) Dr. Teruaki NANSEKI (Agricultural Management)
Chief, Division of Socio-Economic Analysis,
Department of Integrated Research,
Tohoku N.A.E.S, MAFF

(4) Mr. Takanobu NAWASHIRO (Technical Cooperation)
Special Technical Advisor,
Japan International Cooperation Center

2. Tentative Schedule of Implementation (Itemized)

MINUTES OF UNDERSTANDING BETWEEN THE JAPANESE CONSULTATION TEAM AND THE AUTHORITIES CONCERNED OF THE GOVERNMENT OF THE REPUBLIC OF THE PHILIPPINES ON JAPANESE TECHNICAL COOPERATION FOR THE RESEARCH AND DEVELOPMENT PROJECT ON HIGH PRODUCTIVITY RICE TECHNOLOGY

The Japanese Consultation Team (hereinafter referred to as "the Team") organized by Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Dr. Tsugufumi Ogawa visited the Republic of the Philippines from March 17 to 27, 1998 for the purpose of formulating the detailed Tentative Schedule of Implementation for the Research and Development Project on High Productivity Rice Technology (hereinafter referred to as "the Project") as well as discussing the major issues related to the implementation of the Project.

During its stay in the Republic of the Philippines, the Team exchanged views and had a series of discussions with the authorities concerned of the Government of the Philippines in respect of various issues for sharing common understanding on the Project.

Understanding between the Team and the authorities concerned of the Government of the Philippines is recorded as shown in the document attached hereto.

Manila, March 25, 1998

Tsugufumi Ogawa	Santiago R. Obien
Leader	Exective Director
Consultation Team	Philippine Rice Research Institute
Japan International Cooperation Agency	Department of Agriculture

Confirmed:_____

SALVADOR H. ESCUDERO III
Secretary
Department of Agriculture
The Republic of the Philippines

ATTACHED DOCUMENT

1. Purpose of the Project

The Team and the Philippine side confirmed the purpose of the Project that was mentioned in the master plan of the Record of Discussions signed in Manila on May 28, 1997.

2. Inputs of the technical cooperation program

2-1. Japanese inputs

2-1-1. Long-term experts

Four long-term experts have been dispatched as Team leader, Coordinator, and Experts in the fields of Varietal Improvement and Farm Mechanization. The expert in the field of Agronomy will be dispatched on April 16, 1998.

2-1-2. Short-term experts

Three short-term experts have been dispatched in the fields of farm mechanization (one expert each for rice reaper and rice seeder), and agronomy during the FY 1997.

2-1-3. Acceptance of the Philippine counterpart personnel for training in Japan

Two counterparts are being trained in Japan on farm mechanization and agricultural extension; and two others are scheduled in the fields of food science and information processing within the FY 1997.

2-1-4. Provision of equipment, machinery, and materials

Vehicles and equipment for the implementation of the project activities will be provided.

2-2. Philippine inputs

2-2-1. Assignment of counterpart personnel and administrative staff

A project director, a project manager, five counterparts in varietal improvement, four each in farm mechanization and agronomy have been assigned to work with Japanese experts.

Sixteen staff members in rice chemistry and food science, farm management, and technology transfer have been assigned as counterparts, and are ready to work with Japanese experts.

2-2-2. Provision of land, buildings, and other necessary facilities

Facilities and equipment for this project were provided under the Japanese grant-aid program in 1991. Office space for Japanese experts, laboratories, experiment fields, and other necessary buildings and facilities have been provided.

2-2-3. Allocation of current budget for the Project

Budget for office equipment, consumables, telephone, fax, and electricity have been allocated.

3. Outputs and progress of project activities

3-1. Varietal Improvement

3-1-1. To develop high-yielding and better quality promising lines for mechanized farming in irrigated lowlands.

To determine genetic potential, 174 parents were assembled and will be used for hybridization.

Materials selected from previous 1997 wet season were presently planted for evaluation of traits relevant to direct seeding cultivation.

3-1-2. To develop cool-temperature tolerant and high-yielding promising lines with good grain quality suitable for cool elevated areas.

Eight highly cool-temperature tolerant germplasm were selected under the natural condition in Benguet based on fertility, maturity, and shattering. On-site selection generated 43 breeding lines from Benguet, and 166 in Banaue for the reproductive cool-temperature tolerance while 36 were re-evaluated for tolerance at the seedling stage.

3-1-3. To evaluate local adaptability of promising lines.

Three promising lines were tested in the National Cooperative Test (NCT); PJ2 was evaluated as tolerant to cool-temperature and is a candidate for pre-release.

3-2. Farm Mechanization

3-2-1. To develop machinery for plowing, leveling, and seeding for direct-seeding rice cultivation under irrigated lowland paddy condition.

Leveling equipment and hand tractor mounted seeder were already developed, but plowing machine would be developed for tilling non-tilled portion along levees.

3-2-2. To develop rice harvesting machinery for small-scale farmers.

The PhilRice rotary reaper was already developed and field trial demonstrated its satisfactory performance. However, durability studies for the equipment will be conducted.

3-3. Agronomy, Soils and Fertilizers, and Crop Protection

3-3-1. To develop techniques for direct-seeding cultivation.

The problems in wet direct seeding rice cultivation were identified, and the research and development strategies for improving its productivity were formulated.

3-3-2. To improve fertilizer application techniques for higher yielding and better quality rice.

This was not implemented during the FY 1997. It will be started during the FY 1998.

3-3-3. To improve techniques for disease and insect pest management.

There was no plan for carrying out this item within the first implementation year. It will be started in the second implementation year.

3-4. Rice Chemistry and Food Science

3-4-1. To improve techniques for rice grain quality evaluation.

There was no plan for carrying out this item within the first implementation year. It will be started in the second implementation year.

3-5. Farm Management and Technology Transfer

3-5-1. To develop models of mechanized rice-based farm management.

There was no plan for carrying out this item within the first implementation year. It will be started in the second implementation year.

3-5-2. To develop an information system for rice and rice-based farming technologies.

There was no plan for carrying out this item within the first implementation year. It will be started in the second implementation year.

4. Tentative Schedule of Implementation (TSI)

The Team and the Philippine side refined the tentative schedule of implementation signed in Manila on May 28, 1997 as shown in the Annex I.

This schedule shows detailed project activities based on the TSI. There is no substantial difference between the two schedules.

4-1. Varietal Improvement

4-1-1. To develop high-yielding and better quality promising lines for mechanized farming in irrigated lowlands.

A. Development of high-yielding and better quality lines with less shattering and lodging resistance.

Further improvement of the less shattering, lodging resistant, and excellent grain quality of the indica/japonica lines developed for transplanting during the preceding project.

B. Development of high-yielding and better quality lines for direct seeding cultivation.

Establishment of screening methods for germplasm tolerant to anaerobic conditions. Introduction of the direct seeding suitable traits such as root lodging resistance and seedling vigor by backcrossing into the leading varieties and promising lines.

4-1-2. To develop cool-temperature tolerant and high-yielding promising lines with good grain quality suitable for cool-elevated areas.

A. Development of high-yielding lines with strong cool-temperature tolerance.

Development of artificial screening methods for cool-temperature tolerance. Screening of the cool-temperature tolerant germplasm as potential donor parents.

On-site breeding for the development of very early maturing, high-yielding lines with strong tolerance to cool-temperature and suitable for high elevation areas.

B. Development of high-yielding lines with cool-temperature tolerance and good grain quality.

Development of early maturing high-yielding lines with cool-temperature tolerance and good grain quality suitable for medium elevation areas.

4-1-3. To evaluate local adaptability of promising lines.

A. Evaluation of promising lines in the NCT and other local adaptability tests.

Identification of outstanding lines for general or location-specific recommendations. Further improvement of breeding through information obtained from local adaptability tests.

4-2. Farm Mechanization

4-2-1. To develop machinery for plowing, leveling, and seeding for direct-seeding rice cultivation under irrigated lowland paddy condition.

A. Development of land preparation equipment for direct seeding.

Improvement of performance of equipment for tillage.

B. Improvement of performance of hand tractor mounted seeder.

Refinement for commercial release.

C. Development of direct seeding equipment.

Development of broadcast seeders. Performance evaluation of developed models for extension.

4-2-2. To develop rice harvesting machinery for small-scale farmers.

A. Improvement of reaper models.

Refinement for commercial release.

B. Development of crop gathering equipment.

Development of a reaper model equipped with gathering function.

C. Development of small combine harvesters for rice.

Development of prototype combine harvesters.

4-3. Agronomy, Soils and Fertilizers, and Crop Protection

4-3-1. To develop techniques for direct-seeding cultivation.

A. Search for the ideal plant type for direct-seeding.

Analysis of seedling establishment, plant and crop growth characteristics, lodging resistance, and yield components.

B. Improvement of land preparation for better crop establishment.

Improvement of labor-saving land preparation and seeding methods for crop establishment and weed control.

C. Development of direct-seeding cultivation for increased yield.

Development of high-yielding and labor-saving wet direct seeding cultivation techniques considering land preparation, seeding rate, and fertilizer and water management.

4-3-2. To improve fertilizer application techniques for higher yielding and better quality rice.

A. Improvement of nutrient use efficiency.

Improvement of soil fertility condition and nutrient use efficiency through the combined use of organic and inorganic fertilizers.

4-3-3. To improve techniques for disease and insect pest management.

A. Synthesis and utilization of nationwide historical data on insect pest incidence in the development of location-specific insect pest profiles.

Generation of database on nationwide insect pest incidence and development of location-specific insect pest profiles.

B. Development of standard techniques to determine the mechanisms of resistance of rice cultivars to rice blast disease.

Determination of physiological, morphological, and cytological mechanisms of resistance of rice varieties to rice blast disease.

4-4. Rice Chemistry and Food Science

4-4-1. To improve techniques for rice grain quality evaluation.

A. Highly efficient measurement of moisture and nutrient contents of rice grain by Near-Infrared Reflectance (NIR).

Improvement of NIR techniques for fast and accurate measurement of moisture, amylose, protein, and lipid contents.

B. Establishment of criteria for predicting processing qualities of rice.

Establishment of criteria suitable for evaluating rice grain quality for product processing.

4-5. Farm Management and Technology Transfer

4-5-1. To develop models of mechanized rice-based farm management.

A. Development of farm management models for evaluating mechanized rice-based farming systems.

Development of farm models to evaluate mechanized rice-based farming systems in terms of management, economy, and technical efficiency.

B. Development of techniques for monitoring and evaluation of rice-based farming systems using Geographic Information System (GIS) technology.

Development of a PC-based GIS in monitoring and evaluation of rice-based farming systems at the village level.

4-5-2. To develop an information system for rice and rice-based farming technologies.

A. Development of database for better transfer of rice technology information.

Development of a multi-media database of rice technologies developed by PhilRice and the national rice research and development network for better transfer of information nationwide.

5. Project Design Matrix (PDM)

The Team and the Philippine side modified the PDM through their discussions as shown in the Annex II. Particularly, indicators and assumptions were well examined.

6. Project management

The Team and the Philippine side confirmed that to make the implementation of the project activities smooth, both sides will continuously exert their best efforts.

Annex I Tentative Schedule of Implementation

Item	Year of implementation				
	1	2	3	4	5
1.Development of high yielding and better quality rice varieties which are suitable for mechanization.					
1-1.Development of high-yielding varieties and better quality promising lines for mechanized farming in irrigated lowlands.					
a.Development of high-yielding and better quality lines with less shattering and lodging resistance.					
b.Development of high-yielding and better quality lines for direct seeding cultivation.					
1-2.Development of cool-temperature tolerant and high-yielding promising lines with good grain quality suitable for cool-elevated areas.					
a.Development of high-yielding lines with strong cool-temperature tolerance.					
b.Development of high-yielding lines with cool-temperature tolerance and good grain quality.					
1-3.Evaluation of local adaptability of promising lines.					
a.Evaluation of promising lines in the NCT and other local adaptability tests.					
2.Development of farm machinery for small-scale rice farmers.					
2-1.Development of machinery for plowing, leveling, and seeding for direct-seeding rice cultivation under irrigated lowland paddy condition.					
a.Development of land preparation equipment for direct seeding.					
b.Improvement of performance of hand tractor mounted seeder.					
c.Development of direct seeding equipment.					

Item	Year of implementation				
	1	2	3	4	5
2-2.Development of rice harvesting machinery for small-scale farmers.					
a.Improvement of reaper models.					
b.Development of crop gathering equipment.					
c.Development of small combine harvesters for rice.					
3.Improvement of cultivation techniques for labor-saving and high yielding rice production.					
3-1.Development of techniques for direct-seeding cultivation.					
a.Search for the ideal plant type for direct-seeding.					
b.Improvement of land preparation for better crop establishment.					
c.Development of direct-seeding cultivation for increased yield.					
3-2.Improvement of fertilizer application techniques for higher yielding and better quality rice.					
a.Improvement of nutrient use efficiency.					
3-3.Improvement of techniques for disease and insect pest management.					
a.Synthesis and utilization of nationwide historical data on insect pest incidence in the development of location-specific insect pest profiles.					
b.Development of standard techniques to determine the mechanisms of resistance of rice cultivars to rice blast disease.					

Item	Year of implementation				
	1	2	3	4	5
4.Improvement of rice quality evaluation techniques.					
4-1. Improvement of techniques for rice grain quality evaluation.					
a.Highly efficient measurement of moisture and nutrient contents of rice grain by Near-Infrared Reflectance(NIR).					
b.Establishment of criteria for predicting processing qualities of rice.					
5.Development of mechanized rice-based farm management system.					
5-1. Development of models of mechanized rice-based farm management.					
a.Development of farm management models for evaluating mechanized rice-based farming system.					
b.Development of techniques for monitoring and evaluation of rice-based farming systems using Geographic Information System (GIS) technology.					
5-2.Development of an information system for rice and rice-based farming technologies.					
a.Development of database for better transfer of rice technology information.					

----when necessity arises

ANNEX II PROJECT DESIGN MATRIX (PDM) FOR RESEARCH AND DEVELOPMENT PROJECT ON HIGH PRODUCTIVITY RICE TECHNOLOGY

Cooperation term:August 1,1997 - July 31, 2002 **Implementing organization: PhilRice, Department of Agriculture**
Drafted by the Consultation Team and PhilRice Team **Target group: Small-scale rice farmers**

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Overall goal High quality rice is supplied in sufficient quantity and farm management is stabilized through high productivity rice technologies which are sustainable for the conditions in rice growing areas.	· Stabilization of self-sufficiency in rice production · Improvement of farm management	Rice Statistics	Agricultural policies will not drastically change.
Specific Objective High productivity rice technologies for small-scale rice farmers are developed through the project implementation by the Philippine Rice Research Institute.	· Improvement of productivity through high yield and better grain quality	Farm management survey by PhilRice	Small-scale farmers adopt the technology developed by PhilRice.
Outputs of the Project 1) High-yielding and better quality rice varieties which are suitable for mechanization are developed. 2) Farm machinery for small-scale rice farmers are developed. 3) Cultivation techniques for labor-saving and high-yielding rice production are improved. 4) Rice quality evaluation techniques are improved. 5) Mechanized rice-based farm management systems are developed.	1) Twenty promising lines are developed 2) Four prototype machinery are developed 3) Labor-saving of 25% in transplanted and 40% in direct-seeded rice; 10% yield increase 4) Faster rice grain quality evaluation techniques (200 samples/day) are developed 5) Two times faster evaluation and delivery of developed technologies are achieved	1) Commercial varieties 2) Prototypes 3) Cultivation techniques 4) Evaluation techniques 5) Adoption survey	Research activities and PhilRice commitment to the project will be maintained.
Activities of the Project 1-1) To develop high-yielding and better quality promising lines for mechanized farming in irrigated lowlands. 1-2) To develop cool-temperature tolerant and high-yielding promising lines with good grain quality suitable for cool-elevated areas. 1-3) To evaluate local adaptability of promising lines. 2-1) To develop machinery for plowing, leveling, and seeding for direct-seeding rice cultivation under irrigated lowland paddy condition. 2-2) To develop rice harvesting machinery for small-scale farmers. 3-1) To develop techniques for direct-seeding cultivation. 3-2) To improve fertilizer application techniques for high-yielding and better quality rice. 3-3) To improve techniques for disease and insect pest management. 4-1) To improve techniques for rice grain quality evaluation. 5-1) To develop models of mechanized rice-based farm management. 5-2) To develop an information system for rice and rice-based farming technologies.	**Inputs** (Japanese side) 1. Dispatch of Experts (1)Long-term 1.Team Leader 2.Coordinator 3.Varietal Improvement 4.Farm Mechanization 5.Agronomy (2)Short-term (as needed) 2. Provision of machinery and equipment 3.Acceptance of Philippine counterpart personnel for training in Japan	(Philippine side) 1. Counterpart and administrative personnel 2. Land, buildings and facility 3. Repair or replacement of machinery 4. Maintenance and operating expenses	PhilRice will continue to conduct high quality research. PRE-CONDITION PhilRice will continue as an established rice research center in the Philippines.

3. Japanese Experts and their Filipino Counterparts in the Technical Cooperation Project

3. Japanese experts and their Filipino counterparts in the technical cooperation project.

FIELD OF EXPERTISE	JAPANESE EXPERT	FILIPINO COUNTERPARTS
A. Long-term		
Management	Dr. Hitoshi Takahashi	Santiago R. Obien Executive Director Leocadio S. Sebastian Deputy Executive Director for R&D Ronilo A. Beronio Deputy Executive Director for Administration
Coordination	Mr. Takanobu Nawashiro	Mr. Nestor C. Martin Head, Finance Division Teodora L. Briones Development Management Officer III
Varietal Improvement	Mr. Takehiko Sasaki	Mr. Hilario C. dela Cruz, Jr. Head, Plant Breeding and Biotechnology Division (PBBD) Dr. Rodante E. Tabien Supng. Science Research Specialist, PBBD Ms. Thelma F. Padolina Sr. Science Research Specialist, PBBD Ms. Emily R. Corpuz Science Research Specialist, PBBD
Farm Mechanization	Engr. Shuji Ishihara	Engr. Ricardo F. Orge Head, Rice Engineering and Mechanization Division (REM) Engr. Eulito U. Bautista Scientist I & Program Leader, REM
B. Short-term		
Agronomy	Mr. Shoji Furuya	Dr. Rolando T. Cruz Head, Agronomy, Soils and Plant Physiology Division (ASPPD) Dr. Teodula M. Corton Program Leader, Planting & Fertilizer Mgt. Mr. Fernando D. Garcia Science Research Specialist II, ASPPD Ms. Evelyn F. Javier Sr. Science Research Specialist, ASPPD

FIELD OF EXPERTISE	JAPANESE EXPERT	FILIPINO COUNTERPARTS
Agricultural Machinery (Rice Reaper)	Engr. Kunihiko Maeoka	Engr. Eulito U. Bautista Scientist I & Program Leader, REM Engr. Manuel Jose R. Regalado
Agricultural Machinery (Paddy Seeder)	Dr. Ryuji Otani	Engr. Ricardo F. Orge Head, REM Engr. Joselito A. Damian Science Research Specialist II, REM

4. Equipment and Supplies under the Technical Cooperation Project (FY 1997)

4. Equipment and Supplies under the Technical Cooperation, FY 1997.

ITEM/DESCRIPTION	QTY	UNIT COST (In Pesos)	TOTAL COST (in Pesos)	LOCATION
A. Purchased in the Philippines				
1. Microscope Lamp 6630-H09, Leica general purpose, valuable for stereomicroscopy, wide aperture with heat-reflecting coating, 3-link arm, ventilated housing includes 6V halogen-cycle lamp, 3-wire and plug for 120V, 50 or 60 Hz with Lamp Bulb, 6630-H24, 20W, Pk. 10	2 units 2 units	42,780 16,760	85,560 33,520	Plant Breeding and Biotechnology Division (PBBD)
2. CO_2 Injector System for LI-COR LI-6400 photosynthesis analyzer, LI-6400-01 with CO_2 source assembly, CO_2 controller; and 3 packs (25/packs) 12 g CO_2 cylinders	1 unit	268,290	268,290	Agronomy and Soils Division (ASD)
3. Leaf Area Meter, LI-COR LI-3100, laboratory model, includes both 0.1 and 1.0 mm^2 resolution, interface connection for 3000A-01 & dust cover with 3100 fluorescent lamps (2 pcs), and 3100 lower and upper transparent belts (1 pc each) - 3100 lower transparent belts - 3100 upper transparent belts	1 unit 4 pcs 4 pcs	534,398 2,904 2,904	534,398 11,616 11,616	ASD
4. Desktop Computer, Compaq Presario, Pentium 2 with 40 MB RAM; 2 GB harddisk; 12X CD-ROM w/ sound card and speaker; LAN card; 21" color monitor w/ 5MB video RAM; serial mouse	1 unit	155,000	159,000	Social Science & Policy Research (SSPR)
5. Printer/Plotter, HP DesignJet 750 C plus color Inkjet printer, 72 MB RAM (to be used for mapping of rice varieties, insect pests & diseases, soil fertility, production, technologies, etc)	1 unit	330,000	330,000	SSPR
6. Digitizer, CALCOMP drawing board III, 36"x48"	1 unit	122,000	122,000	SSPR
7. PC Based GIS Software, ARCView ver 3.0	1 unit	97,720	97,720	SSPR
Sub-total			1,649,720	
B. Imported from Japan				
1. Swing rotor RPS 27-2 for Himac SCP 85 H2 Ultracentrifuge Cat. # 106569, swing bucket rotor, 6x40 ml., 27,000 rpm with Centrifuge tube 40 PC, Part # 325754 A, PC tube, 2.6x9.0 cm	1 pc 1 bx of 50	560,857	560,857	PBBD
2. Gel documentation system, BIORAD, Gel Doc 1000 UV Macintosh, 220/240V	1 unit	1,037,143	1,037,143	PBBD

	ITEM/DESCRIPTION	QTY	UNIT COST (In Pesos)	TOTAL COST (in Pesos)	LOCATION
3.	Spot Welding Machine (Rocker Arm Type), bench mounted, rocker arm type; with electrical foot-pedal control, 3/8" diameter; air cool electrodes; 7.5 kVA output, capacity: 1/16" mild steel, 18" throat depth, McMaster No. 7970A13	1 unit	140,143	140,143	Rice Engineering & Mechanization Div. (REMD)
4.	Cone Penetrometer, DIK-5520 for measuring soil bearing pressure with pen and paper recorder	1 unit	103,543	103,543	REMD
5.	TMA-6 Fixed Angle Rotor and Motor Shaft for MRX-152 Centrifuge, MG 100-01, 2ml x 24, 15,000 rpm, Order# 4006	1 unit	322,286	322,286	Crop Protection Division (CPD)
6.	Sonic Sifter Separator, # 8324-825B, 240 VAC, operating temp. range: 0to 120 °F with stainless steel sieves: # 8324-B72, No. 100 (1 pc) # 8324-B80, No. 200 (1 pc) # 8324-B92, No. 500 (1 pc)	1 unit	911,429	911,428	CPD
7.	Vacuum pump, Air cadet E-07530-65; Max vacuum 20"Hg; 10 1/2"Lx4W"x51/2"H; Max PSI 18; Motor type: 1/45hp, TEFC; Welted parts; novyl pump head, nitrile diaphragm, values of teplon PTFE, polyethylene fittings; Max temp. 35°C; 220VAC; Port size: 3/8" hose barb with Tygon tubing, E-06408-12, Dimensions, in. (mm): ID: 3/8"(9.6), OD 1/2(12.8), Wall 1/16; Max. psi at 70°F:-18	1 unit 50ft/ pk	83,743	83,743	CPD
8.	Multi-media LCD Projector, EIKI, LC-6200, 220 VAC, 1000 ANSI lumen with input for videos and computers; autovolt; high resolution	1 unit	365,143	365,143	Technology Promotion Division (TPD)
9.	Cutting Plotters, Mimaki Pro Series Model CG-61; with SPB -0030 standard blade and SPB-0001 for vinyl sheet and paper; plus needed supporting tools and accessories for this model, 220 VAC	1 unit	220,000	220,000	TPD
	Vehicles:				
10.	Mini-elf , 4W drive, 4-wheeler, double-cab, 2 tons loading capacity with aircon and stereo	1 unit	1,150,286	1,150,286	
11.	Pajero, 8-seater capacity; 4-wheel drive	1 unit	823,429	823,429	
12.	Journals	1 lot	668,571	668,571	
	Sub-total			6,386,571	

5. Equipment and Supplies Brought by JICA Experts (FY 1997)

5. Equipment and Supplies Brought by JICA Experts (FY 1997).

ITEM/DESCRIPTION	TOTAL COST (₱)	LOCATION
Electronic balance, SB 800	32,000.00	
Electronic balance, PB 5001	26,857.14	Plant Breeding and
Auto balance, B-Type	15,885.70	Biotechnology Division
Moisture meter, PM-700	36,342.86	(Mr. Sasaki)
Rice grain petri dish, etc.	21,771.43	
Sub total	132,857.14	
Portable recorder	85,714.29	Rice Engineering and Mechanization Division
		(Engr. Maeoka)
Computer & printer, COMPAQ Presario 4190	81,914.29	JICA Office (Mr. Nawashiro)
MS Office 97 ST	13,857.14	
BJ 455J	16,428.57	
SVC-1000ND	7,000.00	
Accessories	30,780.86	
Sub total	149,980.86	
Computer, Power Macintosh 7600/200	102,342.86	
Printer, LaserJet 6L	14,857.14	Rice Engineering and
Scanner, JX-250 M3	10,800.00	Mechanization Division
SVC-1000ND	6,571.43	(Engr. Ishihara)
MS Office Ver. 4.2	14,228.57	
EXCEL	8,571.43	
Accessories	9,771.43	
Sub total	167,142.86	
Digital video, DCR-PC10 SONY	57,828.57	Rice Engineering and
Camera, DVBK-W2000 SONY	14,571.43	Mechanization Division
Accessories	11,142.86	(Dr. Otani)
Sub-total	83,542.86	
Auto temperature & humidity meter, 3-3121 ISUZU	14,571.43	Agronomy, Soils, and Plant Physiology Division
Auto temperature & humidity meter, 3-3121 ISUZU	14,571.43	(Mr. Furuya)
Auto temperature & humidity meter, 3-3121 ISUZU	14,571.43	
Auto temperature & humidity meter, 3-3121 ISUZU	14,571.43	
Accessories	14,857.14	
Sub-total	73,142.86	
TOTAL	692,380.87	

6. PhilRice Corporate Operating Budget (FY 1997-1998)

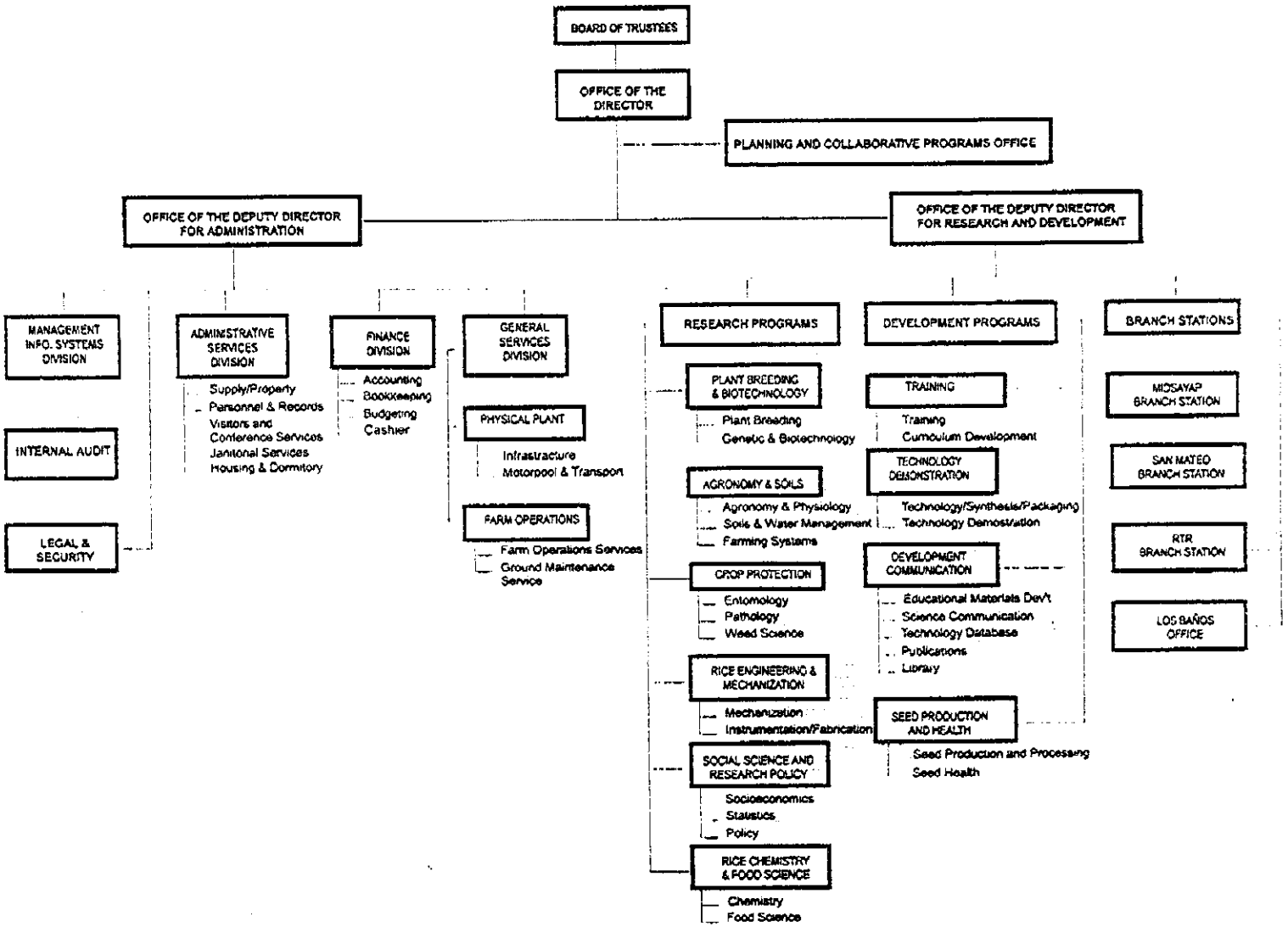
6. Philippine Rice Research Institute, Corporate Operating Budget, FY 1997-1998.

PARTICULAR	AMOUNT (P'000)	
	1997	1998
A. General Administrative & Support Services	54,535	46,713
B. Support to Operations		
1. Seed Production & Health	12,032	6,681
2. Farm Operations	2,021	1,868
Sub-total	14,053	8,549
C. Operations		
Research	58,986	68,225
Technology Transfer	18,359	14,770
Sub-total	77,345	82,995
Support to the Network	6,984	7,500
Mindanao Rice R&D Program	24,000 ✓	10,000
TOTAL	**176,917**	**155,757**

✓ Congressional initiative (net of 20% reserve)

7. PhilRice Organizational Structure

PHILIPPINE RICE RESEARCH INSTITUTE ORGANIZATIONAL STRUCTURE



Development of Wet Direct Seeded Rice Cultivation Technologies

Shoji Fumiya

Objectives

- Increase and stabilize yield of wet direct seeded rice through efficient and cost-saving soil and crop management practices.
- Increase yield through the combination of management and plant type appropriate for wet direct seeding.

Activities

1. **Land Preparation**
   a) Standard practices: saturate soil for 24 hours, plow once with moldboard plow, harrow with spike tooth harrow 1 week after plowing and 3 weeks after plowing, level land then broadcast pre-germinated seeds.
   b) New practices: Saturate and flood with 2-3 cm water, plow and harrow twice with rotovator, level land then broadcast pre-germinated seeds.

2. **Weed Control**
   a) Relate rice plant density to weed density.
   b) Assess time of herbicide application for effective weed control.
   c) Devise herbicide application and water management scheme to effectively and efficiently control weeds.

3. **Seed Establishment (in cooperation with Rice Engineering and Mechanization Division)**
   a) Assess germinability of seeds of many rice varieties under laboratory and field conditions.
   b) Utilize the anaerobic seeding method to improve seedling emergence and establishment. It has been observed that farmers broadcast pre-germinated seeds onto soil 1-3 days after the final land preparation. Under such condition, soil is drier and seeds settle on soil surface and become more exposed to water stress, bird, rat and snail damages. "Anaerobic seeding" is broadcasting pre-germinated seeds immediately after the final preparation onto a more saturated soil wherein condition is anaerobic or low in oxygen. This procedure allows seeds to sink to some depth thereby minimizing water stress, bird, rat and snail damages.
   c) Use low seeding rate. Farmers use as much as 200 kg seeds per hectare to compensate for losses due to birds, rats and snails. However, seeds could be costly. Forty, 80 and 160 kg seeds per hectare will be tested to assess seedling establishment, seedling vigor, crop-weed competition, grain yield and management cost.
   d) Compare broadcast and drum seeding and transplanting methods based on seeding rate, seedling establishment, lodging resistance, crop yield, ease and cost of operation.

4. **Water Management**
   a) Assess depth of irrigation water to improve seedling establishment, crop growth and development.
   b) Apply intermittent irrigation (for example, apply 5 cm floodwater every 2 weeks from mid-tillering to ripening growth stages) to save on irrigation water, enhance lodging resistance and ripening process.

5. **Fertilizer Management**
   a) Assess crop need for nitrogen (N) fertilizer based on leaf color chart (LCC) and chlorophyll meter (SPAD) readings. LCC and SPAD are non-destructive field methods for estimating the leaf greenness or leaf nitrogen status.
   b) Compare LCC, SPAD, researchers' basal N application methods, and farmers' method of N application at 10 days after sowing, based on increase and stability in yields and N use efficiency.
   c) Manage rice straw (form and time of incorporation) to increase and sustain rice yields.

6. **Pest and Disease Management (in cooperation with Crop Protection Division)**
   a) Assess prevalence of pest and disease in wet direct seeded rice.
   b) Relate crop management practices (for example, seeding and nitrogen fertilizer rates, water level and variety) to incidence of stem borer, sheath blight, bacterial leaf blight and others.
   c) Propose crop protection scheme for wet direct seeded rice culture.

7. **Plant Type for Wet Direct Seeding (in cooperation with Plant Breeding Division and Rice Chemistry Division)**
   a) Assess seed germinability, seedling emergence and seedling vigor of varieties or breeding lines grown under anaerobic condition.
   b) Relate tillering ability and leaf area development to seeding rate, nitrogen level and nitrogen uptake patterns.
   c) Assess lodging resistance in relation to depth of seeding, rate of seeding, water and nitrogen management practices.
   d) Assess productivity of tillers (number of panicles per number of tillers) of varieties or breeding lines in relation to depth of seeding, rate of seeding, nitrogen level and nitrogen uptake patterns, and improvement in soil nutrient status (for example, after incorporation of rice straw).
   e) Assess grain yield quantity (includes yield components) and quality (physical and chemical characteristics and eating quality)

8. **Publication**
   a) Prepare a manual on Wet Direct Seeded Rice Cultivation.
      1. For researchers/technicians
      2. For farmers


JICA