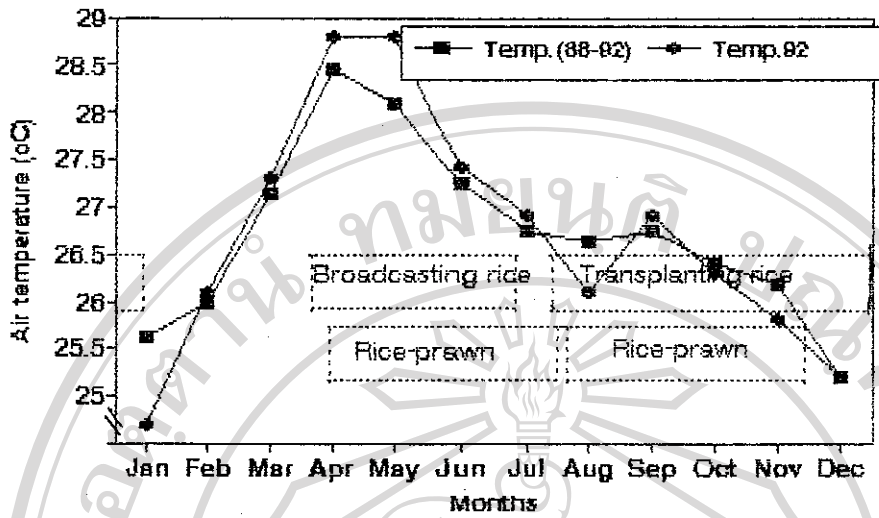
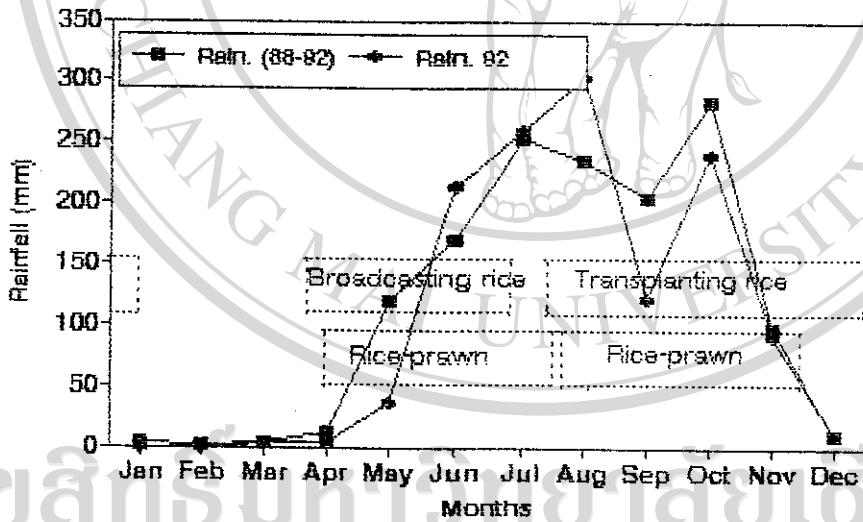


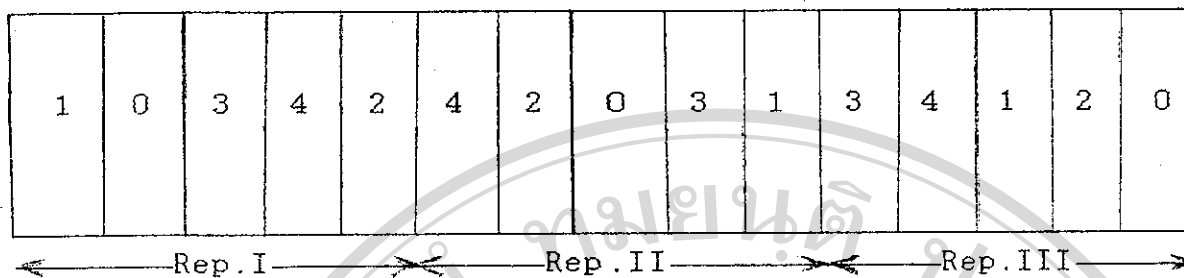
APPENDIX



Appendix Figure 1. Rice freshwater prawn pattern and average air temperature in Hau Giang during 1988 - 1992 and 1992



Appendix Figure 2. Rice freshwater prawn pattern and average rainfall in Hau Giang during 1988 - 1992 and 1992



Appendix Figure 3. Lay out of experiment

Note: 0=To, 1=T1, 2=T2, 3=T3, 4=T4 Plot size: 325 m²

Appendix Table 1. Average air temperature & rainfall in Hau Giang province during 1988 - 1992 and 1992

Month	Temperature (°C)		Rainfall-(mm)	
	1988 - 1992	1992	1988 - 1992	1992
January	25.6	24.7	3.4	0.0
February	26.0	26.1	2.0	0.0
March	27.1	27.3	5.8	3.9
April	28.5	28.3	13.8	3.9
May	28.1	28.3	121.0	36.4
June	27.3	27.4	169.1	213.4
July	26.7	26.9	252.6	258.9
August	26.6	26.1	236.1	303.7
September	26.7	26.9	206.1	121.3
October	26.4	26.3	284.8	239.9
November	26.2	25.8	97.7	90.9
December	25.2	25.2	10.3	10.2

Source: Meteorological Station of Hau Giang Province

Appendix Table 2. Analysis of soil on which the experiment was carried out in Phung Hiep District, Hau Giang Province during 1992-1993

Property	pH	N (%)	P ₂ O ₅ (ppm)	K ₂ O (ppm)	OM (%)
(a) Soil sample before setting the experiment					
Field plot	4.22	0.404	28.70	132.54	5.56
(b) Soil sample after harvesting rice & prawn					
Treatment To	4.94	0.320	39.82	122.51	7.09
Treatment T1	4.95	0.312	27.74	94.31	6.82
Treatment T2	4.81	0.326	49.67	110.92	7.01
Treatment T3	4.97	0.334	34.57	110.61	7.24
Mean	4.91	0.323	37.95	109.50	7.04
CV(%)	4.10	8.12	46.08	40.41	8.25
LSD .05	ns	ns	ns	ns	ns

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Appendix Table 13. ANOVA of prawn length (cm) over time during August-November 1992

Source of variation	df	0(*)		15		30		45		60	
		MS	P	MS	P	MS	P	MS	P	MS	P
Rep.	2	1.2E-01	0.19	8.8E-02	0.35	7.8E-02	0.18	1.1E-01	0.15	9.1E-02	0.26
Treatment	2	2.1E+00	0.00	2.6E+00	0.00	3.0E+00	0.00	3.4E+00	0.00	3.6E+00	0.00
Error	4	5.8E-02		5.4E-02		3.4E-02		4.0E-02		5.5E-02	

Note: (*) Day after resupplying of prawn

Appendix Table 13. ANOVA of prawn length (cm) over time during August-November 1992

Source of variation	df	75(*)		90		105		120	
		MS	P	MS	P	MS	P	MS	P
Replication	2	1.3E-01	0.24	1.5E-01	0.26	1.5E-01	0.33	1.2E-01	0.47
Treatment	2	4.0E+00	0.00	4.2E+00	0.00	4.3E+00	0.00	4.6E+00	0.00
Error	4	7.2E-02		9.0E-02		1.2E-01		1.4E-01	

Note: (*) Day after resupplying of prawn

Appendix Table 14. ANOVA of prawn weight (g) over time during August-November 1992

Source of variation	df	0(*)		15		30		45		60	
		MS	P	MS	P	MS	P	MS	P	MS	P
Rep.	2	2.9E+00	0.21	2.9E+00	0.20	2.4E+00	0.27	2.3E+00	0.25	2.0E+00	0.24
Treatment	2	1.4E+02	0.00	1.5E+02	0.00	1.6E+02	0.00	1.7E+02	0.00	1.8E+02	0.00
Error	4	1.4E+00		1.4E+00		1.5E+00		1.3E+00		1.1E+00	

Note: (*) Day after resupplying of prawn

Appendix Table 14. ANOVA of prawn weight (g) over time during August-November 1992

Source of variation	df	75(*)		90		105		120		Weight growth	
		MS	P	MS	P	MS	P	MS	P	MS	P
Rep.	2	1.8E+00	0.28	1.6E+00	0.34	1.1E+00	0.53	4.8E-01	0.82	8.1E-02	0.65
Treatment	2	1.9E+02	0.00	2.0E+02	0.00	2.1E+02	0.00	2.2E+02	0.00	5.9E-01	0.09
Error	4	1.2E+00		1.2E+00		1.5E+00		2.4E+00		1.8E-01	

Note: (*) Day after resupplying of prawn

Appendix Table 15. ANOVA of prawn production ($\text{kg}\cdot\text{ha}^{-1}$), survival (%), and number of prawn ($\text{no.}\cdot\text{ha}^{-1}$) during August-November 1992.

Source of variation	df	Production		Survival		Size1 no.		Size2 no.		Total no.	
		MS	P	MS	P	MS	P	MS	P	MS	P
Rep.	2	5.1E+02	0.24	1.0E+02	0.01	2.6E+04	0.31	7.0E+04	0.25	1.6E+05	0.28
Treatment	2	3.3E+03	0.00	3.1E+01	0.12	4.9E+04	0.14	4.0E+06	0.00	3.4E+08	0.00
Error	4	2.9E+02		1.1E+01		1.9E+04		4.1E+04		1.1E+05	

Appendix Table 18. Economic analysis of prawn culture during April-July 1992.
(VN dong.ha⁻¹)

A. Input factor	Unit	Quantity/treatment			Price (VN dong)	Value (1000 VN dong)		
		T1	T2	T3		T1	T2	T3
1. Variable cost								
Prawn seed	kg	145	145	145	10000	1448	1448	1448
Feed	kg	474	474	474	1500	711	711	711
Derris roots	kg	4	4	4	10000	41	41	41
Total						2198	2198	2198
2. Labor		(.....manday.....)						
Feeding		28	28	28	10000	258	258	258
Crop caring		41	41	41	10000	410	410	410
Harvesting		3	3	3	10000	28	28	28
Total		69	69	69		692	692	692
3. Fixed costs								
Depreciation(1): -Gate						12	12	12
-Fence						21	21	21
-Canal						9	9	9
Total						42	42	42
B. Gross return		(.....kg.....)						
Size 1 prawn				2	70000			151
Size 2 prawn			46	44	50000	0	2292	2185
Size 3 prawn			10	13	35000	0	345	442
Silver barb fish			2	1	8000	0	16	8
Snake head fish			10	8	12000	0	124	74
Total			68	68		0	2777	2860
C. Gross margin						-2198	579	862
D. Net return						-2932	-155	-72
E. Rate of return to cash expenditure						0	1.3	1.3
F. Rate of return						0	0.9	1.0
G. Return to labor per season						-2240	538	620
H. Return to labor per day						-32	8	9

Note: (1) Depreciation per hectare per season

$$C = B - A.1.$$

$$D = C - A.2. - A.3.$$

$$E = B/A.1.$$

$$F = B/A$$

$$G = B - A.1. - A.3$$

$$H = G/A.2. (\text{manday})$$

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Appendix Table 17. Economic analysis of prawn culture during August–November 1982
(VN dong.ha⁻¹)

A. Input factor	Quantity/treatment			Price (VN dong)	Value (1000 VN dong)			
	Unit	T1	T2		T3	T1	T2	T3
1. Variable cost								
Prawn seed	kg	21	78	94	25000	523	1892	2338
Feed	kg	282	310	384	1500	423	468	576
Total						2146	2358	2914
2. Labor		(.....manday.....)						
Hired labor		8	8	8	10000	82	82	82
Feeding		33	33	33	10000	328	328	328
Crop caring		25	25	25	10000	248	248	248
Harvesting		8	8	8	10000	82	82	82
Total		74	74	74		738	738	738
3. Fixed costs								
Depreciation(1):								
-Gate						12	12	12
-Fence						21	21	21
-Canal						9	9	9
Total						42	42	42
B. Gross return		(.....kg.....)						
Size 1 prawn		41	48	24	70000	2888	3188	1658
Size 2 prawn		47	48	115	45000	2105	2174	5178
Silver barb fish		3	6	3	6000	18	37	18
Snake head fish		18	31	18	10000	185	308	185
Total		110	131	160		5194	5706	7040
C. Gross margin						4248	3348	4128
D. Net return						3488	2568	3348
E. Rate of return to cash expenditure						5.5	2.4	2.4
F. Rate of return						3.0	1.8	1.9
G. Return to labor per season						4208	3307	4084
H. Return to labor per day						57	45	55

Note: (1) Depreciation per hectare per season

C = B-A.1.

D = C-A.2.-A.3.

E = B/A.1.

F = B/A

G = B-A.1.-A.3

H = G/A.2.(manday)

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Appendix Table 18. Economic analysis of rice early wet season during April-July 1992. (VN dong.ha⁻¹)

A. Input factor	Unit	Quantity/treatment				Price (VNdong)	Value (1000 VN dong)			
		To	T1	T2	T3		To	T1	T2	T3
1. Variable cost										
Seed	kg	150	134	134	134	1000	150	134	134	134
Urea	kg	152	138	138	138	2350	358	319	319	319
DAP(18-48-00)	kg	101	90	90	90	3500	352	313	313	313
NPK(16-16-08)	kg	52	46	46	46	2300	119	106	106	106
Insecticide	Bottle	2	2	2	2	15000	34	31	31	31
Herbicide	Bottle	2	2	2	2	15000	34	31	31	31
Hired threshing(*)	kg rice	277	245	258	258	1000	277	245	258	258
Total							1328	1178	1192	1192
2. Labor	(.....munday.....)									
Hired labor		84	57	57	57	10000	841	571	571	571
Land preparation		8	7	7	7	10000	80	72	72	72
Sowing & transplanting		22	19	19	19	10000	218	194	194	194
Fertilizer broadcasting		5	4	4	4	10000	46	41	41	41
Weed control		5	4	4	4	10000	46	41	41	41
Pest management		2	2	2	2	10000	23	23	23	23
Harvesting & drying		16	14	14	14	10000	161	143	143	143
Total		122	108	108	108		1218	1085	1085	1085
3. Fixed costs										
Land tax (**)	kg rice	210	210	210	210	1000	210	210	210	210
Total							210	210	210	210
Gross return	kg	5548	4903	5185	5185	1000	5548	4903	5185	5185
C. Gross margin							4222	3725	3983	3983
D. Net return							2798	2430	2698	2698
E. Rate of return to cash expenditure							4.2	4.2	4.3	4.3
F. Rate of return							2.0	2.0	2.1	2.1
G. Return to labor per season							4198	3701	3989	3989
H. Return to labor per day							35	34	37	37

Note: (*) Hired threshing; paid 5% of harvested rice production

(**) Land tax; charged of 420 kg paddy/ha/year (2 seasons)

C = B-A.1.

D = C-A.2.-A.3.

E = B/A.1.

F = B/A

G = B-A.1.-A.3

H = G/A.2.(munday)

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Appendix Table 19. Economic analysis of rice wet season in August 1992 - January 1993. (VN dong.ha⁻¹)

A. Input factor	Unit	Quantity/treatment				Price (VNdong)	Value (1000 VN dong)			
		T0	T1	T2	T3		T0	T1	T2	T3
1. Variable cost										
Seed	kg	92	82	82	82	1000	92	82	82	82
Urea	kg	103	92	92	92	2300	238	212	212	212
DAP(18-46-00)	kg	172	153	153	153	3400	586	522	522	522
Insecticide	Bottle	5	4	4	4	12000	55	48	48	48
Hired threshing(*)	kg rice	139	142	131	144	1100	153	156	144	159
Total							1124	1020	1009	1023
2. Labor	(.....manday.....)									
Hired labor		51	45	45	45	10000	506	450	450	450
Land preparation		34	31	31	31	10000	345	307	307	307
Sowing & transplanting		34	31	31	31	10000	345	307	307	307
Fertilizer broadcasting		3	3	3	3	10000	34	31	31	31
Pest management		5	4	4	4	10000	48	41	41	41
Harvesting & drying		14	12	12	12	10000	138	123	123	123
Total		141	126	126	126		1414	1258	1258	1258
3. Fixed costs										
Land tax (**)	kg rice	210	210	210	210	1100	231	231	231	231
Total							231	231	231	231
Gross return	kg	2774	2837	2822	2883	1100	3051	3121	2884	3171
C. Gross margin							1928	2100	1876	2148
D. Net return							283	811	386	659
E. Rate of return to cash expenditure							2.7	3.1	2.9	3.1
F. Rate of return							1.1	1.2	1.2	2.3
G. Return to labor per season							1897	1869	1845	1917
H. Return to labor per day							12	15	13	15

Note: (*) Hired threshing; paid 5% of harvested rice production
 (**) Land tax; charged of 420 kg paddy/ha/year (2 seasons)

$$C = B - A.1.$$

$$D = C - A.2. - A.3.$$

$$E = B/A.1.$$

$$F = B/A$$

$$G = B - A.1. - A.3$$

$$H = G/A.2. (\text{manday})$$

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Appendix Table 20. Cash flow analysis of prawn culture in Treatment T1 during April-November 1992 (Thousand VN dong.ha⁻¹)

Month	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.
Transfer	0	-2908	-3102	-3350	-3571	-3833	-3934	-4044
Expense	2908	194	248	222	282	101	110	140
Revenue	0	0	0	0	0	0	0	5194
Cash balance	-2908	-3102	-3350	-3571	-3833	-3934	-4044	1010

Appendix Table 21. Cash flow analysis of prawn culture in Treatment T2 during April-November 1992 (Thousand VN dong.ha⁻¹)

Month	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.
Transfer	0	-2908	-3102	-3350	-1279	-3089	-3199	-3320
Expense	2908	194	248	222	1810	111	121	152
Revenue	0	0	0	2292	0	0	0	5706
Cash balance	-2908	-3102	-3350	-1279	-3089	-3199	-3320	2234

Note:

$$CB = T + R - E$$

$$R = \text{Price} \times \text{yield}$$

$$E = \text{TCVC} + \text{hired labor cost}$$

CB : Cash balance calculated for every month during season

T : Transfer of last month cash balance

R : Revenue or Gross return

E : Expenses or total cash variable cost (TCVC)

Appendix Table 22. Cash flow analysis of prawn culture in Treatment T3 during April-November 1992 (Thousand VN dong.ha⁻¹)

Month	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.
Transfer	0	-2908	-3102	-3350	-794	-3320	-3457	-3607
Expense	2908	194	248	222	2526	137	150	183
Revenue	0	0	0	2777	0	0	0	7040
Cash balance	-2908	-3102	-3350	-794	-3320	-3457	-3607	3250

Appendix Table 23. Cash flow analysis of rice culture in Treatment T0 during April 1992 - January 1993 (Thousand VN dong.ha⁻¹)

Month	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Transfer	0	-862	-1096	-1186	3578	2391	2391	2391	2101	2101
Expense	862	233	90	783	1187	0	0	290	0	153
Revenue	0	0	0	5548	0	0	0	0	0	3051
Cash balance	-862	-1096	-1186	3578	2391	2391	2391	2101	2101	5000

Appendix Table 24. Cash flow analysis of rice culture in Treatment T1 during April 1992 - January 1993 (Thousand VN dong.ha⁻¹)

Month	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Transfer	0	-768	-975	-1056	3152	2095	2095	2095	1837	1837
Expense	768	208	81	695	1057	0	0	258	0	156
Revenue	0	0	0	4903	0	0	0	0	0	3121
Cash balance	-768	-975	-1056	3152	2095	2095	2095	1837	1837	4602

Appendix Table 25. Cash flow analysis of rice culture in Treatment T2 during April 1992 - January 1993 (Thousand VN dong.ha⁻¹)

Month	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Transfer	0	-768	-975	-1058	3420	2363	2363	2363	2105	2105
Expense	768	208	81	708	1057	0	0	258	0	144
Revenue	0	0	0	5185	0	0	0	0	0	2884
Cash balance	-768	-975	-1058	3420	2363	2363	2363	2105	2105	4845

Appendix Table 26. Cash flow analysis of rice culture in Treatment T3 during April 1992 - January 1993 (Thousand VN dong.ha⁻¹)

Month	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Transfer	0	-768	-975	-1058	3420	2363	2363	2363	2105	2105
Expense	768	208	81	708	1057	0	0	258	0	158
Revenue	0	0	0	5185	0	0	0	0	0	3171
Cash balance	-768	-975	-1058	3420	2363	2363	2363	2105	2105	5118

Appendix Table 27. Cash flow analysis of rice monoculture in Treatment T0 during April 1992 - January 1993 (Thousand VN dong.ha⁻¹)

Month	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Transfer	0	-862	-1095	-1187	3578	2391	2391	2391	2101	2101
Expense	862	233	81	783	1187	0	0	290	0	152
Revenue	0	0	0	5548	0	0	0	0	0	3051
Cash balance	-862	-1095	-1187	3578	2391	2391	2391	2101	2101	5000

Appendix Table 28. Cash flow analysis of rice-prawn culture in Treatment T1 during April 1992 - January 1993 (Thousand VN dong.ha⁻¹)

Month	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Transfer	0	-3676	-4077	-4408	-420	-1738	-1839	-1949	2847	2847
Expense	3676	401	329	917	1318	101	110	398	0	156
Revenue	0	0	0	4803	0	0	0	5194	0	3121
Cash balance	-3676	-4077	-4408	-420	-1738	-1839	-1949	2847	2847	5812

Appendix Table 29. Cash flow analysis of rice-prawn culture in Treatment T2 during April 1992 - January 1993 (Thousand VN dong.ha⁻¹)

Month	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Transfer	0	-3676	-4077	-4408	2140	-726	-837	-957	4339	4339
Expense	3676	401	329	931	2868	111	120	410	0	144
Revenue	0	0	0	7477	0	0	0	5708	0	2884
Cash balance	-3676	-4077	-4408	2140	-726	-837	-957	4339	4339	7079

Appendix Table 30. Cash flow analysis of rice-prawn culture in Treatment T3 in April 1992 - January 1993 (Thousand VN dong.ha⁻¹)

Month	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Transfer	0	-3676	-4077	-4408	2625	-957	-1094	-1244	5355	5355
Expense	3676	401	329	931	3582	137	150	441	0	159
Revenue	0	0	0	7962	0	0	0	7040	0	3171
Cash balance	-3676	-4077	-4408	2625	-957	-1094	-1244	5355	5355	8367

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