

Supplementary Figures and Tables

Supplementary Figures

Figure S1(a). The 2006 experimental design in a study of rice and mungbean cropping systems in rubber plantation intercropping.

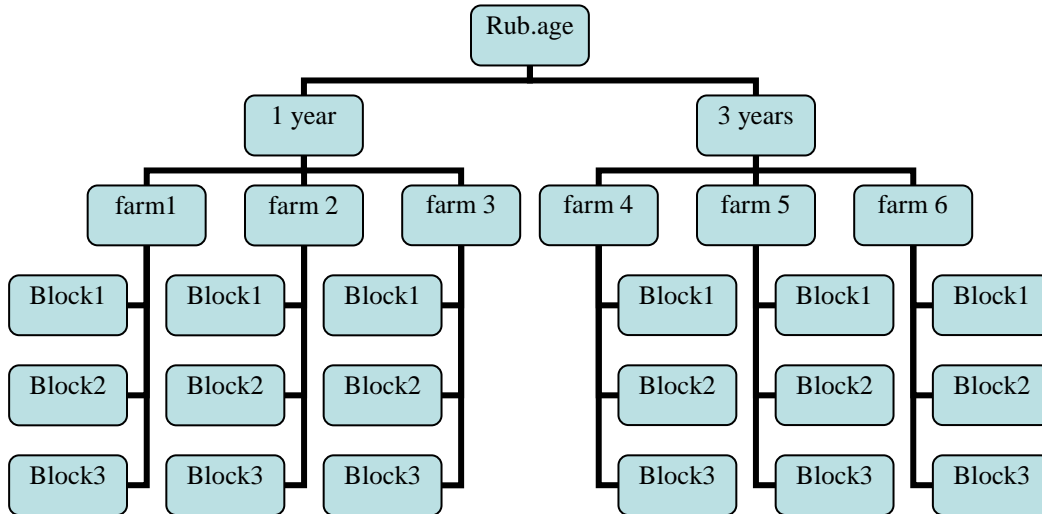


Figure S1(b). The schematic drawing of treatment arrangements in each block. The intercropping treatments 1 to 8 which were shown in Table 2 were randomized into each subplot in the blocks.

Block 1	Block 2	Block 3
2	8	5
1	6	6
3	5	8
4	7	7
6	1	3
8	2	1
5	4	4
7	3	2

Figure S2. The 2007-2008 experimental design in a study of rice and mungbean cropping systems in rubber plantation intercropping. The rubber tree age was different at each farm: 1, 1.5, 2, 2, 2.5 and 3 years. Since there was no replication of age group, age and farm do not appear in this design at the same time. The intercropping treatment arrangements in each block are similar with that in S1(b).

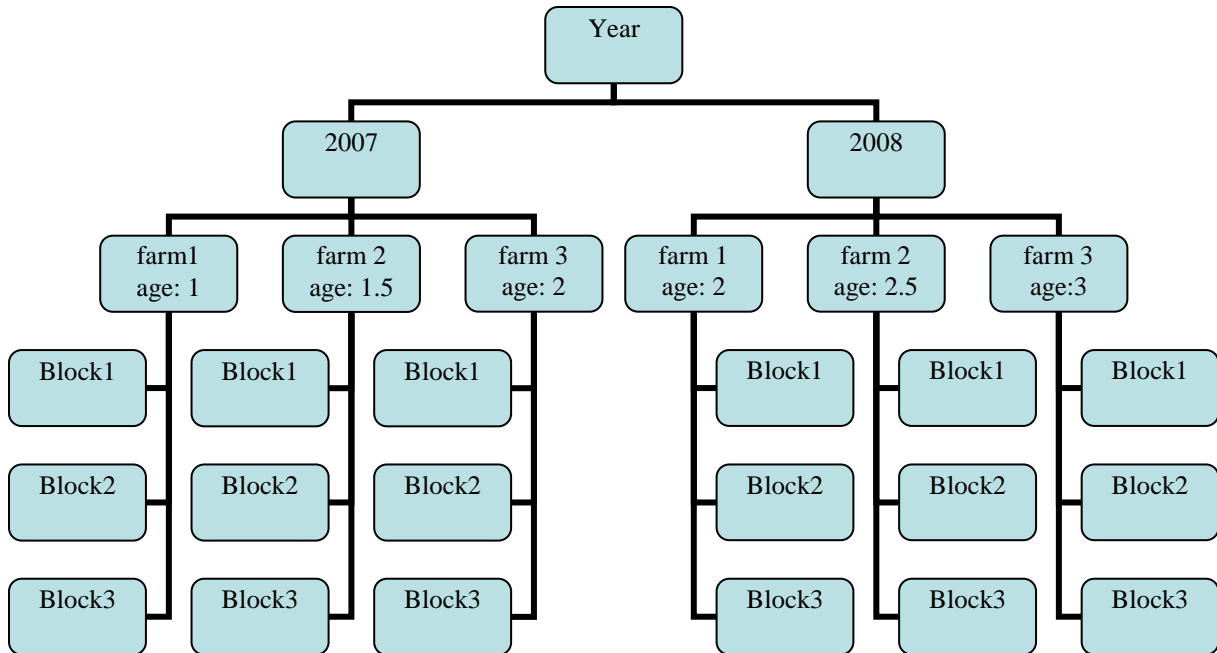


Figure S3. 95% confidence intervals for the mean yields of Dinorado, UPL Ri-5 and mungbean in 2006 - 2008. Treatment abbreviations are given in Table 2.

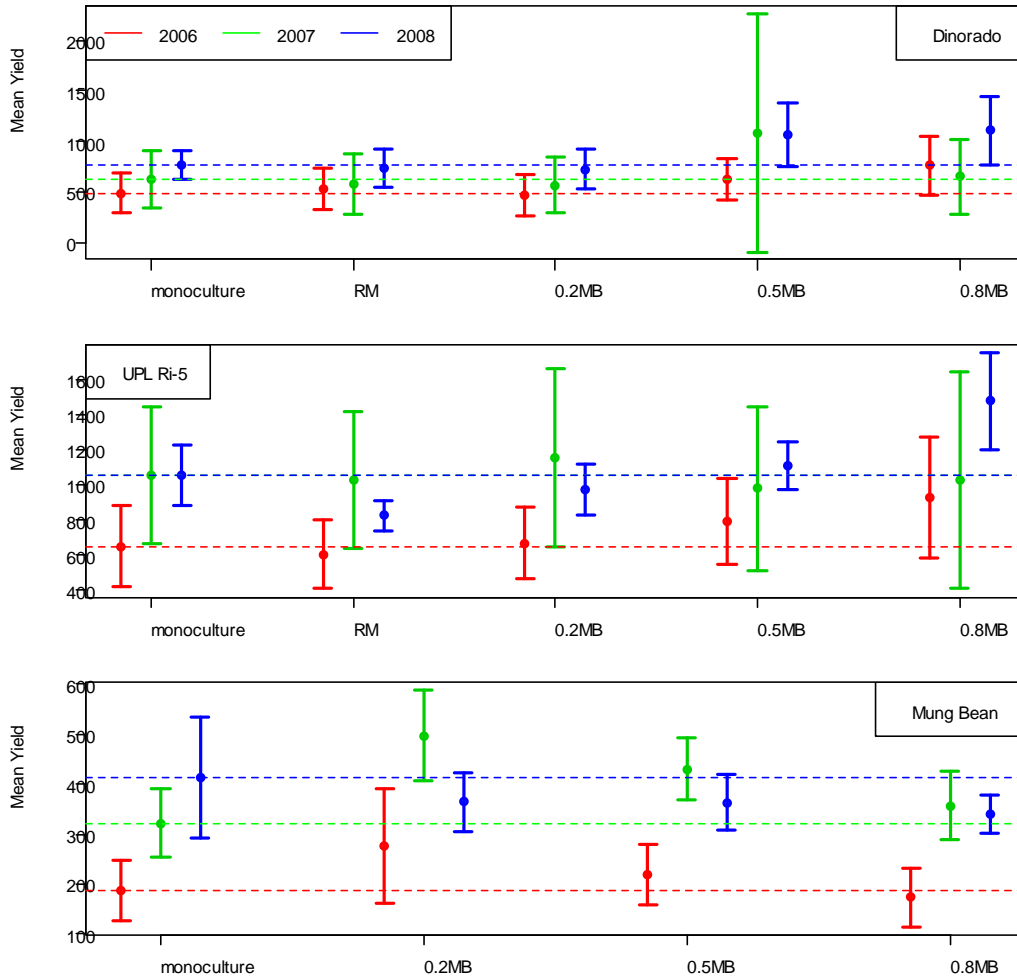


Figure S4. 95% confidence interval for the land equivalent ration (LER). Treatment abbreviations are given in Table 2.

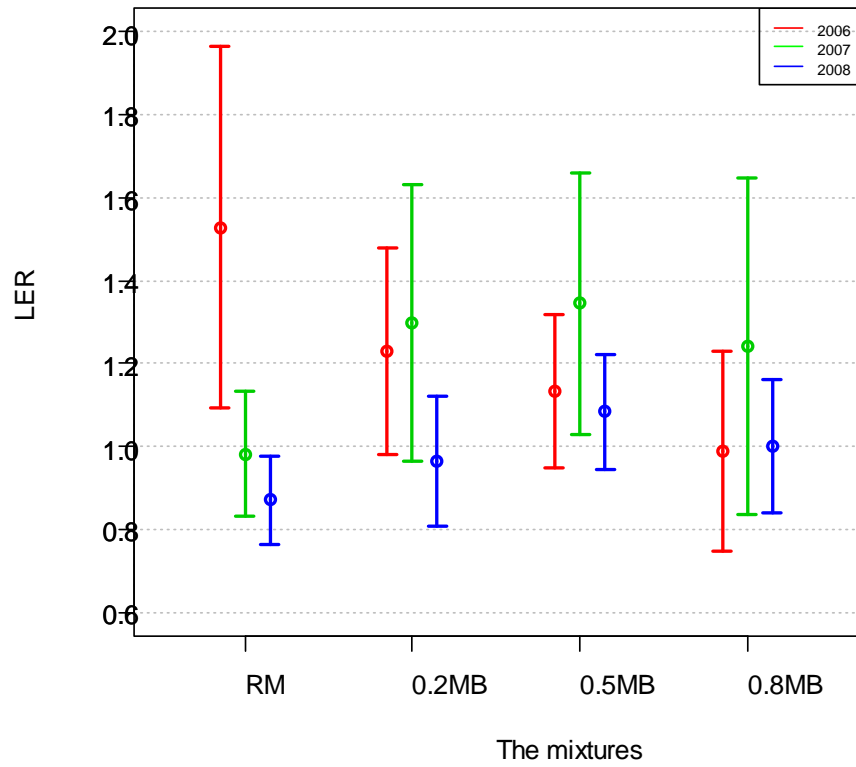
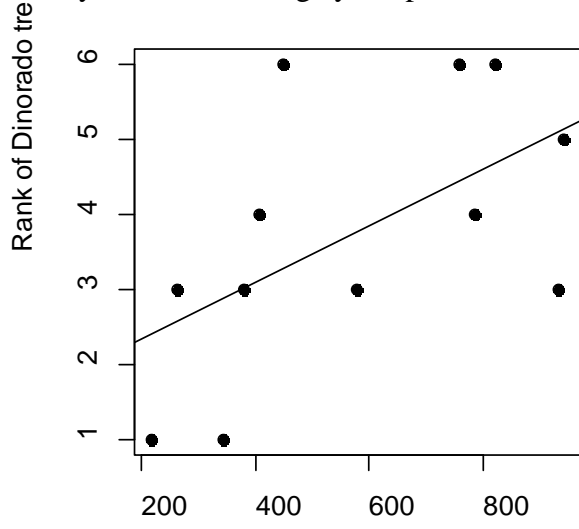
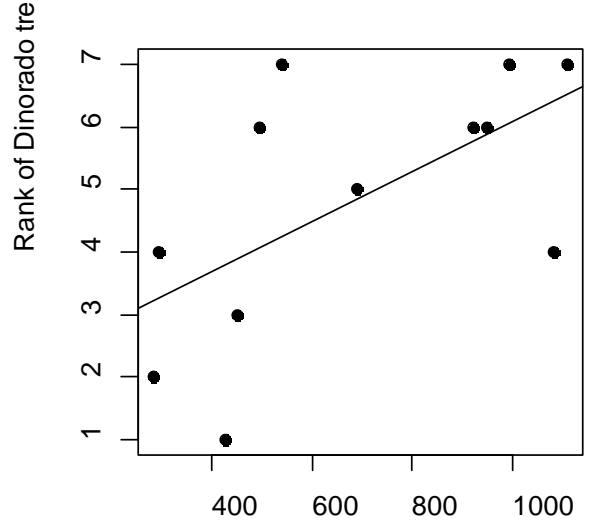


Figure S5. The relation between mean yields and ranks of yield in Dinorado treatment. The mean yield is the average yield per row for each site over seven treatments.



(a). Mean yield



(b). Mean economic

Supplementary Tables

Table S1. Planting and harvest dates for mungbean and rice cultivars UPL Ri-5 and Dinorado in experiments evaluating food crop production in young rubber plantations in Mindanao.

Year	Rubber tree age	Planting Dates and sites		Crops and Harvest Dates		
2006	1-year	May 27	Antipas	UPL Ri-5 Dinorado Mungbean	Oct.10 Oct.2 Aug.15 – Sept.15	
		June 1	Arakan	UPL Ri-5 Dinorado Mungbean	Oct.15 Oct.6 Aug.19 – Sept.19	
		May 25	President Roxas	UPL Ri-5 Dinorado Mungbean	Oct.7 Sept.30 Aug.12 – Sept.12	
	3-year	May 29	Antipas	UPL Ri-5 Dinorado Mungbean	Oct 12 Oct 4 Aug 17 – Sept 17	
		June 2	Arakan	UPL Ri-5 Dinorado Mungbean	Ovt 16 Oct 7 Aug 20 – Sept 20	
		May 26	President Roxas	UPL Ri-5 Dinorado Mungbean	Oct 8 Oct 1 Aug 14 – Sept 14	
	2007	>1 - 2 years	May 16	Naje, Arakan	UPL Ri-5 Dinorado Mungbean	Sept.30 Sept.23 Aug.4 – Sept.4
			June 12	Poblacion, Arakan	UPL Ri-5 Dinorado Mungbean	Oct.24 Oct.15 Aug.30 – Sept.30
			July 17	Doroluman, Arakan	UPL Ri-5 Dinorado Mungbean	Nov.28 Nov.20 Oct.1 – Oct.30

2008	>2- 3 year	April 21	Naje, Arakan	UPL Ri-5 Dinorado Mungbean	Sept.5 Aug.29 Jul.10 – Aug.10
		April 19	Sitio Sabang, Poblacion, Arakan	UPL Ri-5 Dinorado Mungbean	Sept.1 Aug.24 Jul.8 – Aug.8
		April 22	Doroluman, Arakan	UPL Ri-5 Dinorado Mungbean	Sept 6 Aug 30 July 12 – Aug 12

Table S2: Analysis of variance table for 2006 studies of the effects of rubber tree age and cropping treatments. The source column includes all the treatments in this design. The second column indicates whether the treatments are random effects or fixed effects. The mixed effect linear models were applied to the 2006 experiment since the Farms and the Blocks are random effects and rubber tree age is a fixed effect. Each crop (Dinorado, UPL Ri-5 and mungbean) did not appear in each of the eight intercropping treatments (Table 2). Therefore, the analyses were performed for the three crops separately (Columns: Dinorado model, UPL model and mungbean model).

Source	Random Effect	df (All CT)	df (Dinorado model)	df (UPL model)	df(Mungbean model)
RA		1	1	1	1
F(RA)	Random	2(3-1) = 4	2(3-1) = 4	2(3-1) = 4	2(3-1) = 4
B(F RA)	Random	2(3)(3-1)=12	2(3)(3-1)=12	2(3)(3-1)=12	2(3)(3-1)=12
CT		8-1 = 7	5-1=4	5-1=4	4-1=3
CT*RA		7 = 7	1(4)=4	1(4)=4	3
CT*F(RA)	Random	4(7)=28	4(4)=16	4(4)=16	12
CT*B(F RA)	Random	84	4(12)=48	4(12)=48	36
Total		144	90	90	72

Where RA stands for the 2 rubber tree age. F(RA) stands for the 3 farms per RA. B(F RA) stands for 3 blocks per farm. CT is the 8 intercropping treatments.

Table S3. Analysis of Variance Table for 2007-2008.

Source	Random Effect	df (All CT)	df (Dinorado model)	df (UPL model)	df(MungBean model)
F	Random	3-1 = 2	3-1 = 2	3-1 = 2	3-1 = 2
B(F)	Random	3(3-1)=6	3(3-1)=6	3(3-1)=6	3(3-1)=6
CT		8-1 = 7	5-1 = 4	5-1 = 4	4-1 = 3
CT*F	Random	14	8	8	6
CT*B(F)	Random	42	24	24	18
Y		2-1 = 1	2-1 = 1	2-1 = 1	2-1 = 1
Y*F	Random	2	2	2	2
Y*B(F)	Random	3(3-1)=6	6	6	6
Y*CT		8-1 = 7	4	4	3
Y*CT*F	Random	14	8	8	6
Y*CT*B(F)	Random	42	24	24	18
Total		144	90	90	72

Where F stands for the 3 farms. B(F) stands for 3 blocks per farm. CT is the 8 intercropping treatments. Y stands for the year effect.

Table S4. 95% confidence intervals for Figure S1. Treatment abbreviations are given in Table 2.

Crops	Treatment	year	Mean	Standard error	Lower limit	Upper limit
Dinorado	Monoculture	2006	486.625	96.759	296.9776	676.2721
	Monoculture	2007	626.035	142.313	347.1011	904.9695
	Monoculture	2008	768.449	71.155	628.9851	907.9132
	RM	2006	524.034	103.183	321.7957	726.2717
	RM	2007	577.109	147.23	288.539	865.6793
	RM	2008	728.347	94.74	542.6575	914.0364
	0.2MB	2006	470.381	103.586	267.3521	673.4094
	0.2MB	2007	561.47	138.306	290.3897	832.5507
	0.2MB	2008	725.384	99.157	531.0365	919.7309
	0.5MB	2006	625.593	101.311	427.0228	824.1639
	0.5MB	2007	1082.905	592.883	-79.1463	2244.956
	0.5MB	2008	1066.368	157.119	758.415	1374.322
	0.8MB	2006	761.669	145.495	476.4983	1046.841
	0.8MB	2007	648.066	186.12	283.271	1012.862
0.8MB	2008	1108.191	167.801	779.3001	1437.081	
UPL Ri-5	Monoculture	2006	651.044	116.843	422.031	880.0568
	Monoculture	2007	1054.351	192.827	676.4104	1432.292
	Monoculture	2008	1052.034	86.346	882.7964	1221.272
	RM	2006	604.86	97.566	413.6304	796.0902
	RM	2007	1027.33	194.223	646.6534	1408.006
	RM	2008	827.741	43.035	743.3928	912.09
	0.2MB	2006	668.22	101.898	468.5001	867.94
	0.2MB	2007	1154.098	252.443	659.3098	1648.886
	0.2MB	2008	975.49	72.434	833.5182	1117.461
	0.5MB	2006	790.037	121.092	552.6969	1027.376
	0.5MB	2007	977.268	234.28	518.0803	1436.456
	0.5MB	2008	1111.432	67.378	979.3713	1243.493
	0.8MB	2006	928.471	171.119	593.0778	1263.864
	0.8MB	2007	1029.449	306.268	429.1628	1629.735
0.8MB	2008	1475.408	137.544	1205.822	1744.993	
Mung bean	Monoculture	2006	187	30.666	126.8945	247.1055
	Monoculture	2007	321.856	34.667	253.9075	389.8036
	Monoculture	2008	412.222	60.731	293.1892	531.2553
	0.2MB	2006	275.967	57.008	164.2307	387.7026
	0.2MB	2007	496	45.317	407.1792	584.8208
	0.2MB	2008	363.889	29.788	305.5037	422.2741
	0.5MB	2006	219.107	30.161	159.9902	278.2231
	0.5MB	2007	429.733	31.046	368.8827	490.584
	0.5MB	2008	363.333	27.386	309.6565	417.0101
	0.8MB	2006	173.192	28.785	116.7733	229.61
	0.8MB	2007	356.292	34.347	288.9725	423.6108
	0.8MB	2008	338.889	18.801	302.0382	375.7396

Table S5. 95% confidence intervals for land equivalent ratio (LER). Treatment abbreviations are given in Table 2.

Treatment	Year	Mean	SE	LL	UL
RM	2006	1.528	0.218	1.100407	1.955507
RM	2007	0.982	0.076	0.834135	1.130342
RM	2008	0.87	0.054	0.764536	0.974999
0.2MB	2006	1.23	0.125	0.886445	1.377868
0.2MB	2007	1.297	0.167	1.017491	1.670536
0.2MB	2008	0.965	0.078	0.930676	1.235386
0.5MB	2006	1.132	0.092	0.808567	1.169465
0.5MB	2007	1.344	0.158	0.932113	1.549883
0.5MB	2008	1.083	0.07	0.861242	1.137091
0.8MB	2006	0.989	0.121	0.993952	1.466434
0.8MB	2007	1.241	0.203	0.899472	1.695471
0.8MB	2008	0.999	0.08	0.807798	1.121289

Table S6. Mean yield per row for each treatment in each site in year 2006 and 2007-2008. Treatment abbreviations are given in Table 2.

	2006 site1	2006 site2	2006 site3	2006 site4	2006 site5	2006 site6	2007 site1	2007 site2	2007 site3	2008 site1	2008 site2	2008 site3
Dinorado	1237.66	640.80	118.87	216.20	412.72	293.50	817.86	868.29	191.96	974.55	526.51	804.28
UPL	1597.92	649.84	134.79	390.48	503.01	630.22	1705.01	1027.70	430.34	1191.54	827.27	1137.30
RM	1333.35	573.96	170.13	472.41	391.21	494.12	1219.73	1063.39	258.60	974.02	630.58	759.35
0.5 MB	799.00	547.37	255.36	236.13	487.66	395.02	1123.15	607.94	442.80	771.34	626.22	787.54
0.8 MB	456.23	195.62	313.88	155.81	335.07	250.24	439.42	558.56	360.37	590.33	493.63	504.46
0.2 MB	1096.43	460.28	198.23	372.05	447.95	433.68	966.77	1051.70	337.81	905.08	618.15	736.15
MB	76.67	85.00	330.00	0.00	280.00	163.33	266.67	321.67	377.23	340.00	323.33	573.33
Mean	942.47	450.41	217.32	263.30	408.23	380.02	934.09	785.61	342.73	820.98	577.96	757.49

Table S7. The ranks of the mean yield per row for each treatment in each site in year 2006 and 2007-2008. Treatment abbreviations are given in Table 2. The mean yield per row for each treatment in Table S5 are ranked for each site in each column.

	2006 site1	2006 site2	2006 site3	2006 site4	2006 site5	2006 site6	2007 site1	2007 site2	2007 site3	2008 site1	2008 site2	2008 site3	Mean Rank
Dinorado	5	6	1	3	4	3	3	4	1	6	3	6	3.75
UPL	7	7	2	6	7	7	7	5	6	7	7	7	6.25
RM	6	5	3	7	3	6	6	7	2	5	6	4	5.00
0.5 MB	3	4	5	4	6	4	5	3	7	3	5	5	4.50
0.8 MB	2	2	6	2	2	2	2	2	4	2	2	1	2.42
0.2 MB	4	3	4	5	5	5	4	6	3	4	4	3	4.17
MB	1	1	7	1	1	1	1	1	5	1	1	2	1.92

Table S8. Economic value for each treatment in each site in year 2006 and 2007-2008. Treatment abbreviations are given in Table 2. The mean economic value for each treatment is based on the mean yield per row (Table S5) according to the economic value weight 1.4 : 1 (Dinorado : UPL Ri-5) and 1.4 : 1 (Mungbean : UPL Ri-5).

	2006 site1	2006 site2	2006 site3	2006 site4	2006 site5	2006 site6	2007 site1	2007 site2	2007 site3	2008 site1	2008 site2	2008 site3
Dinorado	1732.73	897.11	166.42	302.68	577.81	410.90	1145.00	1215.61	268.74	1364.37	737.12	1126.00
UPL	1597.92	649.84	134.79	390.48	503.01	630.22	1705.01	1027.70	430.34	1191.54	827.27	1137.30
RM	1553.68	646.31	218.00	518.65	431.26	570.36	1328.32	1205.43	284.99	1142.54	708.46	862.56
0.5 MB	907.73	674.01	333.02	254.90	586.75	483.52	1366.81	764.00	560.81	945.49	747.65	965.89
0.8 MB	549.88	247.19	426.91	178.59	440.07	324.12	568.11	717.19	492.87	754.57	629.42	662.74
0.2 MB	1304.49	553.74	252.35	406.82	540.94	512.22	1075.45	1259.09	410.28	1083.04	721.01	890.85
MB	107.33	119.00	462.00	0.00	392.00	228.67	373.33	450.33	528.13	476.00	452.67	802.67
Mean	1107.68	541.03	284.78	293.16	495.98	451.43	1080.29	948.48	425.17	993.94	689.08	921.14

Table S9. The ranks of the economic value in each treatment in each site in year 2006 and 2007-2008. Treatment abbreviations are given in Table 2. The treatment economic values are ranked according to Table S7 for each sites in each column.

	2006 site1	2006 site2	2006 site3	2006 site4	2006 site5	2006 site6	2007 site1	2007 site2	2007 site3	2008 site1	2008 site2	2008 site3	Mean Rank
Dinorado	7	7	2	4	6	3	4	6	1	7	5	6	4.83
UPL	6	5	1	5	4	7	7	4	4	6	7	7	5.25
RM	5	4	3	7	2	6	5	5	2	5	3	3	4.17
0.5 MB	3	6	5	3	7	4	6	3	7	3	6	5	4.83
0.8 MB	2	2	6	2	3	2	2	2	5	2	2	1	2.58
0.2 MB	4	3	4	6	5	5	3	7	3	4	4	4	4.33
MB	1	1	7	1	1	1	1	1	6	1	1	2	2.00