Appendices

Table 1: Comparison of hybrid rice yield between districts

District	Mean	SD	Mean difference	Std.Error Difference	t computed	Inference
Quoc oai	5101.9615	497.99				
Phuxuyen	5529.3750	414.89				
			-427.41	92.07	-4.64	Reject H_o

Source: *Calculation*
Note: t(0.90, 98)= 1.66 t (0.95, 98)=1.96 t(0.99, 98)=2.58

Table 2: Comparison of conventional rice yield between districts

District	Mean	SD	Mean difference	Std.Error Difference	t computed	Inference
Quoc oai	4578.06	451.93				
Phuxuyen	4795.91	451.58				
			-217.85	62.30	-3.49	Reject H_o

Source: Calculation
Note: t(0.90, 192)= 1.66 t (0.95, 192)=1.96 t(0.99, 192)=2.58

Table 3: Comparison of spring and summer conventional rice yields

Season	Mean	SD	Mean difference	Std.Error Difference	t computed	Inference
Spring	4976.24	366.42				
Summer	4413.82	326.84				
			562.42	49.81	11.29	Reject H_o

Source: Calculation

Note: t (0.90, 192)= 1.66 t (0.95, 192)=1.96 t (0.99, 192) =2.58

Table 4: Technical efficiency for individual observation of hybrid rice production

Obs.	TE	Obs.	TE	Obs.	TE	Obs.	TE
1	0.95	26	0.86	51	0.87	76	0.99
2	0.86	27	0.85	52	0.93	77	0.89
3	0.88	28	0.85	53	0.91	78	0.88
4	0.74	29	0.9	54	0.87	79	0.97
5	0.82	30	0.86	55	0.89	80	0.75
6	0.74	31	0.88	56	0.93	81	0.98
7	0.85	32	0.88	57	0.87	82	0.84
8	0.91	33	0.75	58	0.89	83	0.89
9	0.73	34	0.86	59	0.93	84	0.96
10	0.75	35	0.86	60	0.96	85	0.76
11	0.88	36	0.86	61	0.93	86	0.76
12	0.93	37	0.89	62	0.83	87	0.83
13	0.9	38	0.89	63	0.83	88	0.84
14	0.92	39	0.84	64	0.84	89	0.87
15	0.92	40	0.82	65	0.87	90	0.88
16	0.91	41	0.88	66	0.94	91	0.86
17	0.85	42	0.89	67	0.94	92	0.87
18	0.91	43	0.82	68	0.87	93	0.84
19	0.86	44	0.92	69	0.99	94	0.89
20	0.88	45	0.9	70	0.97	95	0.84
21	0.92	46	0.84	71	0.9	96	0.87
22	0.76	47	0.81	72	0.95	97	0.87
23	0.81	48	0.84	73	0.96	98	0.89
24	0.97	49	0.85	74	0.87	99	0.86
25	0.93	50	0.82	75	0.85	100	0.89

Source: Calculated by using Frontier 4.1
Note: TE (Technical efficiency), Obs (Observation)

Table 5.a: TE for individual observation of conventional rice production (cont.)

Obs.	TE	Obs.	TE	Obs.	TE	Obs.	TE
1	0.91	26	0.84	51	0.84	76	0.84
2	0.84	27	0.85	52	0.83	77	0.85
3	0.84	28	0.86	53	0.82	78	0.74
4	0.75	29	0.72	54	0.87	79	0.85
5	0.75	30	0.8	55	0.87	80	0.86
6	0.93	31	0.86	56	0.9	81	0.82
7	0.76	32	0.93	57	0.89	82	0.9
8	0.87	33	0.89	58	0.81	83	0.75
9	0.81	34	0.86	59	0.78	84	0.87
10	0.93	35	0.83	60	0.84	85	0.79
11	0.8	36	0.83	61	0.89	86	0.85
12	0.81	37	0.83	62	0.88	87	0.83
13	0.83	38	0.85	63	0.87	88	0.81
14	0.84	39	0.83	64	0.86	89	0.75
15	0.84	40	0.83	65	0.9	90	0.81
16	0.78	41	0.84	66	0.9	91	0.76
17	0.87	42	0.84	67	0.89	92	0.76
18	0.78	43	0.85	68	0.87	93	0.88
19	0.91	44	0.82	69	0.94	94	0.85
20	0.96	45	0.89	70	0.87	95	0.82
21	0.91	46	0.91	71	0.89	96	0.9
22	0.81	47	0.84	72	0.9	97	0.77
23	0.82	48	0.83	73	0.92	98	0.85
24	0.88	49	0.86	74	0.9	99	0.75
25	0.84	50	0.83	75	0.73	100	0.75

Source: Calculated by using Frontier 4.1

Note: TE (Technical efficiency), Obs (Observation)

Table 5.b: (Next) TE for individual observation of conventional rice production

Obs.	TE	Obs.	TE	Obs.	TE	Obs.	TE
101	0.75	126	0.85	151	0.82	175	0.84
102	0.83	127	0.78	152	0.88	176	0.78
103	0.76	128	0.79	153	0.9	177	0.84
104	0.79	129	0.86	154	0.9	178	0.88
105	0.79	130	0.93	155	0.97	179	0.84
106	0.85	131	0.9	156	0.84	180	0.9
107	0.86	132	0.85	157	0.81	181	0.79
108	0.8	133	0.84	158	0.84	182	0.8
109	0.79	134	0.83	159	0.87	183	0.85
110	0.82	135	0.84	160	0.91	184	0.82
111	0.82	136	0.86	161	0.89	185	0.85
112	0.77	137	0.85	162	0.9	186	0.83
113	0.83	138	0.86	163	0.92	187	0.83
114	0.8	139	0.85	164	0.89	188	0.79
115	0.81	140	0.83	165	0.89	189	0.79
116	0.8	141	0.87	166	0.88	190	0.78
117	0.8	142	0.83	167	0.92	191	0.8
118	0.91	143	0.88	168	0.85	192	0.85
119	0.85	144	0.89	169	0.9	193	0.85
120	0.83	145	0.89	170	0.89	194	0.84
121	0.8	146	0.87	171	0.88		
122	0.83	147	0.86	172	0.86		
123	0.82	148	0.87	173	0.78		
124	0.84	149	0.84	174	0.84		
125	0.83	150	0.85	175	0.84		

Source: Calculated by using Frontier 4.1

Note: TE (Technical efficiency), Obs (Observation)

Table 6: Estimates of stochastic Cobb-Douglas production frontier and inefficiency equation for hybrid rice

Variable	Coefficient	t-ratio
Stochastic Production Frontier		
Constant	9.40	18.57***
ln (Manure)	-0.0001	-0.34
ln(Nitrogent)	-0.01	-2.01*
ln(Phophorus)	0.034	2.26***
ln(Potasium)	0.061	2.6***
ln(Pesticide)	-0.023	-0.12
ln(Labor)	-0.082	-0.87
ln(Seed)	0.016	0.52
ln(District)	-0.046	-3.42***
Inefficiency equation		
Constant	0.15	1.73***
Gender	0.01	0.97
Experience	-0.03	-3.83***
Age	0.0017	1.67**
Education	0.0012	-0.35
Information	-0.045	-2.46**
Land per head	1.1	0.14
Variance parameters		
σ^2_ε	0.002	4.03***
γ	0.99	12.8***
Log likelihood function	174.38	

Source: Calculated by using Frontier 4.1

Note: Land-size variable is substituted by land area per head variable

Mean of TE = 0.88

Table 7: Estimates of stochastic Cobb-Douglas production frontier and inefficiency equation for conventional rice

Variable	Coefficient	t-ratio
Stochastic Production Frontier		
Constant	8.65	27.63***
ln (Manure)	0.021	1.44
ln(Nitrogent)	-0.056	-2.8***
ln(Phophorus)	0.048	4.11***
ln(Potasium)	-0.002	-0.20
ln(Pesticide)	-0.061	-2.92***
ln(Labor)	0.017	0.40
ln(Seed)	0.011	0.46
District	-0.027	-3.73***
Season	0.128	18.12**
Inefficiency equation		
Constant	0.436	4.16***
Gender	-0.0043	-0.74
Experience	-0.039	-8.87***
Age	-0.00014	-0.27
Education	-0.0005	-0.28
Information	-0.044	-5.32***
Land area per head	0.023	1.39
Variance parameters		
σ^2_ε	0.0011	9.01***
γ	0.999	1.75**
Log likelihood function	380.19	

Source: Calculated by using Frontier 4.1

Note: Land-size variable is substituted by land area per head variable

Mean of TE =0.85

Table 8: Estimates of stochastic Cobb-Douglas production frontier (without pesticide variable) and inefficiency equation for conventional rice

Variable	Coefficient	t-ratio
Stochastic Production Frontier		
Constant	8.251	29.627***
ln (Manure)	0.025	1.44
ln(Nitrogent)	-0.058	-2.61***
ln(Phophorus)	0.052	5.82***
ln(Potasium)	0.002	0.15
ln(Labor)	0.001	0.22
ln(Seed)	0.011	0.45
District	-0.023	-3.30***
Season	0.128	15.46**
Inefficiency equation		
Constant	0.466	10.97***
Gender	-0.0036	-0.62
Experience	-0.04	-9.20***
Age	-0.00008	-0.18
Education	-0.0003	-0.18
Information	-0.044	-5.47***
Land size	-0.02	-0.40
Variance parameters		
σ^2_ε	0.0011	9.31***
γ	0.999	3.16**
Log likelihood function	374.77	

Source: Calculated by using Frontier 4.1

Note: Mean of TE = 0.87

Table 9: Test for economic return indicators

		Sum of Squares	df	Mean Square	F	Sig.
Net return	Between Groups	51458265.022	2	25729132.51	40.482	.000
	Within Groups	184951042.195	291	635570.592		
	Total	236409307.216	293			
Farm income	Between Groups	51739493.263	2	25869746.63	48.810	.000
	Within Groups	154232409.239	291	530008.279		
	Total	205971902.502	293			
Cost/kg	Between Groups	2.728	2	1.364	58.838	.000
	Within Groups	6.747	291	.023		
	Total	9.475	293			
Net return/kg	Between Groups	1.437	2	.719	31.001	.000
	Within Groups	6.747	291	.023		
	Total	8.184	293			
Return/labor	Between Groups	2.797	2	1.399	39.883	.000
	Within Groups	10.205	291	.035		
	Total	13.003	293			
Return /material cost	Between Groups	8.099	2	4.050	30.407	.000
	Within Groups	38.757	291	.133		
	Total	46.856	293			
Gross return /Total cost	Between Groups	.703	2	.352	37.723	.000
	Within Groups	2.713	291	.009		
	Total	3.416	293			
Net return /Total cost	Between Groups	.703	2	.352	37.723	.000
	Within Groups	2.713	291	.009		
	Total	3.416	293			

Source: Calculation

Table 10: Average price of some commodities in 2002

Commodity	Price (VND/kg)
Nitrogen	2,300
Phosphorus	800
Potassium	2,100

Source: Survey, 2002

Table 11: t calculation of r_{Xi} and test allocative efficiency hypothesis for hybrid rice

Input	t calculation of r_{Xi}	Hypothesis result
Nitrogen	-60.20	Reject H_o at 1%
Phosphorus	-5.12	Reject H_o at 1%
Potassium	26.54	Reject H_o at 1%
Pesticide	-94.20	Reject H_o at 1%

Source: Calculation

Note: Number of observation is 100 and t_{table} (100, α=1 %)= 2.58

Table 12: t calculation of r_{Xi} and test allocative efficiency hypothesis for conventional rice

Input	t calculation of r_{Xi}	Hypothesis
Nitrogen	-83.94	Reject H_o at 1%
Phosphorus	8.77	Reject H_o at 1%
Potassium	-115.58	Reject H_o at 1%
Pesticide	0.15	Reject H_o at 1%

Source: Calculation

Note: Number of observation is 194 and t_{table} (194, α=1 %)= 2.58

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