

## Appendices

**Appendix 6.1 t-test for equality of means of the human resource indicators**

Indicators	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% Confidence interval of the difference	
						Lower	Upper
Member	1.167	116	<b>0.246<sup>NS</sup></b>	0.437	0.374	-0.305	1.179
Labor	0.045	116	<b>0.964<sup>NS</sup></b>	0.015	0.326	-0.631	0.660
Education	1.494	116	<b>0.138<sup>NS</sup></b>	-0.958	0.641	-0.312	2.229
Experience	0.027	116	<b>0.978<sup>NS</sup></b>	0.022	0.797	-1.557	1.600
Training	2.766	116	<b>0.007***</b>	0.199	0.072	0.056	0.342
Disease preparation	2.362	116	<b>0.020**</b>	-0.210	0.089	0.034	0.387

Source: Calculated by SPSSWIN 11.0.

Note: NS: not significant at 0.1 level. \*, \*\* and \*\*\*: significant at 0.1, 0.05 and 0.01 level, respectively.

### Appendix 6.2 t-test for equality of means of other inputs of the two shrimp systems

Indicators	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% Confidence interval of the difference	
						Lower	Upper
Density	17.493	116	<b>0.000***</b>	12.479	0.713	11.066	13.892
Time	1.845	116	<b>0.068*</b>	6.030	3.268	-0.444	12.505
Area	1.044	116	<b>0.299<sup>NS</sup></b>	1.688	1.617	-1.515	4.892
Distance	1.395	116	<b>0.166<sup>NS</sup></b>	32.311	23.170	-13.580	78.202
Reservoirs	3.495	116	<b>0.001***</b>	0.262	0.075	0.113	0.411
Feed	1.997	116	<b>0.048*</b>	19.248	9.638	0.159	38.338
Fuel	5.331	116	<b>0.000***</b>	24.097	4.520	15.144	33.050

Source: Calculated by SPSSWIN 11.0.

Note: NS: not significant at 0.1 level. \*, \*\* and \*\*\*: significant at 0.1, 0.05 and 0.01 level, respectively.

**Appendix 6.3 Testing for the significant difference between the cost means of the two shrimp aquacultural systems**

Indicators	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% confidence interval of the difference	
						Lower	Upper
Seed	5.240	116	<b>0.000***</b>	145.0	27.6	90.2	199.9
Feed	3.154	116	<b>0.002**</b>	407.2	129.2	151.4	662.9
Disease prevention	3.141	116	<b>0.002**</b>	67.0	21.3	24.7	109.3
Pond depreciation	4.301	116	<b>0.000***</b>	77.2	17.9	41.6	112.8
Pond preparation	7.460	116	<b>0.000***</b>	229.9	30.8	168.9	291.0
Machine depreciation	8.267	116	<b>0.000***</b>	160.6	19.4	122.1	199.0
Tools	4.134	116	<b>0.000***</b>	27.5	6.6	14.3	40.7
Maintenance	2.437	116	<b>0.016**</b>	18.7	7.7	3.5	34.0
Fuel	5.331	116	<b>0.000***</b>	101.2	18.9	63.	138.8
Interest	4.825	116	<b>0.000***</b>	58.9	12.2	34.7	83.1
Harvest	2.345	116	<b>0.021**</b>	10.8	4.6	1.6	20.0
Labor	3.065	116	<b>0.003**</b>	114.3	37.3	40.4	188.2
FC	9.125	116	<b>0.000***</b>	237.8	26.0	186.2	289.5
VC	6.186	116	<b>0.000***</b>	1,181.0	190.9	802.8	1,559.2
TC	6.992	116	<b>0.000***</b>	1,418.9	202.9	1,016.9	1,820.8

Source: Calculated by SPSSWIN 11.0.

Note: \*\*, \*\*\* show the significance of the variables at 0.05 and 0.01 level, respectively.

**Appendix 6.4 t-test for equality of means of criteria of profitability and productivity performance of the two shrimp systems**

Performance	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% Confidence interval of the difference	
						Lower	Upper
<b>1. Profitability performance</b>							
TGR	4.270	116	<b>0.000***</b>	1,882.420	440.847	1,009.26	2,755.57
GM	2.140	116	<b>0.034*</b>	702.244	328.077	52.44	1,352.04
NR	1.431	116	<b>0.155<sup>NS</sup></b>	464.366	324.457	-178.26	1,106.99
<b>2. Productivity performance</b>							
GTFP	-0.613	116	<b>0.541<sup>NS</sup></b>	-0.058	0.094	-0.245	0.12
NTPP	-0.613	116	<b>0.541<sup>NS</sup></b>	-0.058	0.094	-0.245	0.12
NR_PL	-3.287	116	<b>0.001**</b>	-0.199	0.060	-0.319	-0.07
NR_FEED	0.484	116	<b>0.629<sup>NS</sup></b>	1.333	2.753	-4.120	6.78
NR_LABOR	0.298	116	<b>0.766<sup>NS</sup></b>	7.136	23.969	-40.339	54.61
NR_FUEL	-1.134	116	<b>0.259<sup>NS</sup></b>	-16.875	14.884	-46.356	12.60
YIELD	4.722	116	<b>0.000***</b>	23.868	5.055	13.857	33.880
FCR	-3.513	116	<b>0.001***</b>	-0.545	0.155	-0.853	-0.238

Source: Calculated by SPSSWIN 11.0.

Note: NS: not significant at 0.1 level. \*, \*\* and \*\*\*: significant at 0.1, 0.05 and 0.01 level, respectively.

### Appendix 7.1 Technical efficiency estimates of the SSAS

Firm	Efficiency estimations		
		42	0.9713
		43	0.8923
1	0.9425	44	0.6078
2	0.4956	45	0.5349
3	0.9371	46	0.6128
4	0.9998	47	0.2265
5	0.2923	48	0.9705
6	0.9455	49	0.9033
7	0.5809	50	0.8101
8	0.8387	51	0.4191
9	0.8982	52	0.9172
10	0.9694	53	0.5863
11	0.7458	54	0.6992
12	0.9530	55	0.8047
13	0.7131	56	0.9918
14	0.5474	57	0.9070
15	0.8103	58	0.8744
16	0.7347	59	0.7809
17	0.5293	60	0.4506
18	0.5111	61	0.7419
19	0.6738	62	0.6505
20	0.5420	63	0.5086
21	0.5265	64	0.5172
22	0.6815	65	0.8450
23	0.7302	66	0.7248
24	0.6114	67	0.5050
25	0.7220	68	0.3427
26	0.6513		
27	0.3239		<b>Mean efficiency = 0.6967</b>
28	0.6252		
29	0.6118		(Source: Estimated by FFONTIER 4.1)
30	0.3955		
31	0.9191		
32	0.9879		
33	0.5153		
34	0.3495		
35	0.9857		
36	0.9650		
37	0.4473		
38	0.7183		
39	0.8759		
40	0.4189		
41	0.8579		

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### Appendix 7.2 Technical efficiency estimates of the ISAS

Firm	Efficiency estimations		
		28	0.6148
		29	0.8592
1	0.8835	30	0.9371
2	0.3311	31	0.9777
3	0.9293	32	0.9706
4	0.2495	33	0.8223
5	0.9767	34	0.9771
6	0.8348	35	0.8929
7	0.9999	36	0.5975
8	0.6238	37	0.9755
9	0.7716	38	0.8171
10	0.4446	39	0.8465
11	0.8151	40	0.9979
12	0.5719	41	0.4611
13	0.6232	42	0.9686
14	0.7192	43	0.8494
15	0.7893	44	0.9831
16	0.8692	45	0.9530
17	0.7646	46	0.9446
18	0.9847	47	0.8848
19	0.7663	48	0.9547
20	0.3393	49	0.8768
21	0.7933	50	0.7126
22	0.8453		
23	0.9371		
24	0.5479		
25	0.7360		
26	0.9929		
27	0.7256		

**Mean efficiency = 0.7948**

*(Source: Estimated by FRONTIER 4.1)*

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**Appendix 7.3 MPs of variable inputs of the two systems**

Items	SSAS	ISAS
Labor (kg shrimp/man-day)	0.147	-0.151
Fuel (kg shrimp/litre of fuel)	0.213	0.231
Pond preparation (kg shrimp/VND1,000 for disease prevention)	0.011	0.033
Disease prevention (kg shrimp/VND1,000 for disease prevention)	0.031	-0.029
Feed (kg shrimp/kg of feed)	0.249	0.508
Seed (kg shrimp/post larva)	0.003	0.000005

*Source: Calculation from production frontiers and applying Formula (4.21).*

**Appendix 7.4 Descriptive statistics for MVPs of the SSAS**

MVPs	N	Minimum	Maximum	Mean	Std. Dev.
Labor (VND1,000/man-day)	68	7.336	15.839	12.326	1.535
Fuel (VND1,000/litre of fuel)	68	10.639	22.971	17.877	2.227
Pond preparation (VND/VND for disease prevention)		0.568	1.226	0.954	0.119
Disease prevention (VND/VND for disease prevention)		1.535	3.314	2.579	0.321
Feed (VND1,000/kg of feed)	68	12.447	26.874	20.914	2.605
Seed (VND1,000/post larva)	68	0.155	0.334	0.260	0.032

*Source: Calculation by applying Formula (4.20).*

**Appendix 7.5 Descriptive statistics for MVPs of the ISAS**

MVPs	N	Minimum	Maximum	Mean	Std. Dev.
Labor (VND1,000/man-day)	50	-15.974	-4.725	-12.181	2.480
Fuel (VND1,000/litre of fuel)	50	7.226	24.431	18.630	3.793
Pond preparation (VND/VND for disease prevention)	50	1.027	3.471	2.647	0.539
Disease prevention (VND/VND for disease prevention)	50	-3.061	-0.906	-2.335	0.475
Feed (VND1,000/kg of feed)	37	15.866	53.639	40.903	8.327
Seed (VND1,000/post larva)	50	0.002	0.005	0.004	0.001

*Source: Survey 2002.*



### Appendix 7.6 Testing for the statistical significance of the r ratios of the resources in the two shrimp aquacultural systems

The hypotheses are  $H_0 : r_{X_i} = 1$  and  $H_1 : r_{X_i} \neq 1$

To test the above hypothesis, the following formula is used:  $t = \frac{\bar{r} - r_0}{s} \cdot \sqrt{n}$

Where  $\bar{r}$  is the mean,  $r_0$  is equal to 1, s is the standard deviation, and n is the number of observation of the sample.

With given  $\alpha$  level, the critical value  $t_{n-1(\alpha/2)}$  with (n-1) degree of freedom is looked up from the Student distribution table and it is then compared with calculated-t. If:

$$\begin{aligned} |t| &\geq t_{n-1(\alpha/2)} && \text{reject } H_0 \\ |t| &< t_{n-1(\alpha/2)} && \text{accept } H_0 \end{aligned} \quad (\text{Ho, 1999})$$

The testing results of r ratios of the two shrimp aquacultural systems.

The SSAS			The ISAS		
Items	Calculated t	Accept or Reject $H_0$	Items	Calculated t	Accept or Reject $H_0$
Fuel	-80.7	Reject	Fuel	-112.2	Reject
Feed	50.3	Reject	Feed	26.6	Reject
Seed	-3.2	Reject	Seed	21.4	Reject
Labor	40.3	Reject	Labor	-49.2	Reject
Disease prevention	14.7	Reject	Disease prevention	20.7	Reject
Pond preparation	15.8	Reject	Pond preparation	-197.8	Reject

Source: Calculation. Note:  $t_{68-1(\alpha/2)} \approx 2.66$  and  $t_{50-1(\alpha/2)} \approx 2.70$ .

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