APPENDIX

Appendix A. Gross margin of rice production (HH^{-1}) of each farm type

A1. Average gross margin of wet season rice of IFS-I (n=6)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Average land area	1.9	ha			
Gross return	2,819.7	kg	400	1,127,867	285.5
Variable cost:					
Seed	124.8	kg	400	49,933	12.6
Manure	8,683.0	kg	10	86,833	22.0
Urea	47.6	kg	900	42,833	10.8
DAP	19.6	kg	1,000	19,583	5.0
Insecticide				1,000	0.3
Hired labor	6.2	md	3,000	18,667	4.7
Family labor	110.7	md	3,000	332,000	84.1
Total variable cost				550,849	139.5
Gross margin				577,017	146.1
Return to variable cost				1.0	1.0
Return to family labor	1.0	md		5,214	1.3

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

A2. Average gross margin of wet season rice of IFS-II (n=9)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Average land area	1.8	ha			
Gross return	2,885.3	kg	400	1,154,133	292.2
Variable cost:					
Seed	115.4	kg	400	46,178	11.7
Manure	11,322.2	kg	10	113,222	28.7
Urea	19.4	kg	900	17,500	4.4
DAP	28.4	kg	1,000	28,389	7.2
Insecticide				333	0.1
Hired labor	16.5	md	3,000	49,389	12.5
Family labor	120.7	md	3,000	362,167	91.7
Total variable cost				617,177	156.2
Gross margin				536,956	136.0
Return to variable cost				0.9	0.9
Return to family labor	1.0	md		4,448	1.1

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

A3. Average gross margin of wet season rice of IFS-III (n=6)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Average land area	1.8	ha			
Gross return	1,802.4	kg	400	720,967	182.5
Variable cost:					
Seed	115.9	kg	400	46,367	11.7
Manure	3,000.0	kg	10	30,000	7.6
Urea	36.4	kg	900	32,750	8.3
DAP	3.3	kg	1,000	3,333	0.8
Insecticide				4,750	1.2
Hired labor	23.0	md	3,000	69,000	17.5
Family labor	90.2	md	3,000	270,500	68.5
Total variable cost				456,700	115.6
Gross margin				264,267	67.0
Return to variable cost				0.6	0.6
Return to family labor	1.0	md		2,931	0.7

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

A4. Average gross margin of wet season rice of IFS-IV (n=9)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Total land area	1.1	ha			
Gross return	1,067.8	kg	400	427,111	108.1
Variable cost:					
Seed	82.7	kg	400	33,067	8.4
Manure	2,666.7	kg	10	26,667	6.8
Urea	17.3	kg	900	15,539	3.9
DAP	6.4	kg	1,000	6411	1.6
Insecticide					0
Hired labor	5.4	md	3,000	16056	4.1
Family labor	66.7	md	3,000	200,000	50.6
Total variable cost				297,740	75.4
Gross margin				129,371	33.0
Return to variable cost				0.4	0.4
Return to family labor	1.0	md		1,941	0.5

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

Appendix B. Gross margin of vegetable productions (HH^{-1}) of each farm type

B1. Average gross margin of vegetables of IFS-I (n=6)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Average land area	1,388.0	m^2			
Gross return	1,491.0	kg		522,117	132.2
Variable cost:					
Seed				28,717	7.3
Manure	3,958.3	kg	10	39,583	10.0
Urea	44.7	kg	900	40,217	10.2
DAP	14.3	kg	1,000	14,250	3.6
Insecticide				10,583	2.7
Family labor	40.0	md	3,000	120,000	30.4
Total variable cost				253,350	64.1
Gross margin				268,767	68.0
Return to variable cost				1.1	1.1
Return to family labor	1.0	md		6,719	1.7

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

B2. Average gross margin of vegetables of IFS-II (n=9)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Average land area	1,125.0	m^2			
Gross return	836.0	kg		386,633	98.0
Variable cost:					
Seed				12,650	3.2
Manure	2,861.1	kg	10	28,611	7.2
Urea	25.2	kg	900	22,678	5.7
DAP	7.6	kg	1,000	7,644	1.9
Insecticide				4,500	1.1
Family labor	48.2	md	3,000	144,667	36.6
Total variable cost				220,750	56.0
Gross margin				165,883	42.0
Return to variable cost				0.8	0.8
Return to family labor	1.0	md		3,440	0.9

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

B3. Average gross margin of vegetables of IFS-III (n=6)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Average land area	126.0	m^2			
Gross return	113.0	kg		60,633	15.4
Variable cost:					
Seed				7,275	1.8
Manure	451.0	kg	10	4,510	1.1
Urea	1.1	kg	900	1,000	0.3
DAP	0.5	kg	1,000	500	0.1
Insecticide				417	0.1
Family labor	7.5	md	3,000	22,500	5.7
Total variable cost				36,202	9.2
Gross margin				24,431	6.2
Return to variable cost				0.7	0.7
Return to family labor	1.0	md		3,257.5	0.8

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

B4. Average gross margin of vegetables of IFS-IV (n=9)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Average land area	1,045.0	m^2			
Gross return	636.0	kg		177,777	45.0
Variable cost:					
Seed				21,611	5.5
Manure	916.0	kg	10	9,160	2.3
Urea	21.6	kg	900	19,478	4.9
DAP	3.8	kg	1,000	3,811	1.0
Insecticide				833	0.2
Family labor	22.3	md	3,000	67,000	17.0
Total variable cost				121,893	31.0
Gross margin				55,884	14.0
Return to variable cost				0.5	0.5
Return to family labor	1.0	md		2,502	0.6

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

Appendix C. Gross margin of chicken production (HH^{-1}) of each farm type

C1. Average gross margin of chicken of IFS-I (n=6)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Average frequency	29.0	heads			
Gross return:					
Weight	40.0	kg		197,723	50.1
Variable cost:					
Chicken cost				35,700	9.0
Feed				4,450	1.1
Vaccinated				367	0.1
Family labor	4.7	md	3,000	14,000	3.5
Total variable cost				54,517	13.8
Gross margin				143,206	36.3
Return to variable cost				2.6	2.6
Return to family labor	1.0	md		30,687	7.8

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

C2. Average gross margin of chicken of IFS-II (n=9)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Average frequency	33.0	heads			
Gross return:					
Weight	43.7	kg		156,939	39.7
Variable cost:					
Chicken cost				31,678	8.0
Feed				3,400	0.9
Vaccinated				222	0.1
Family labor	5.0	md	3,000	15,000	3.8
Total variable cost				50,300	12.7
Gross margin				106,639	27.0
Return to variable cost				2.1	2.1
Return to family labor	1.0	md		21,328	5.4

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

C3. Average gross margin of chicken of IFS-III (n=6)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Average frequency	21.7	heads			
Gross return:					
Weight	27.5	kg		104,183	26.4
Variable cost:					
Chicken cost				22,000	5.6
Feed				3,317	0.8
Vaccinated				0	0
Family labor	3.2	md	3,000	9,500	2.4
Total variable cost				34,817	8.8
Gross margin				69,366	17.6
Return to variable cost				2.0	2.0
Return to family labor	1.0	md		21,905.1	5.5

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

C4. Average gross margin of chicken of IFS-IV (n=9)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Average frequency	11.0	heads			
Gross return:					
Weight	14.0	kg		51,600	13.1
Variable cost:					
Chicken cost				14,667	3.7
Feed				1,078	0.3
Vaccinated					0.0
Family labor	1.6	md	3,000	4,667	1.2
Total variable cost				20,411	5.2
Gross margin				31,189	7.9
Return to variable cost				1.5	1.5
Return to family labor	1.0	md		20,050	5.1

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

Appendix D. Gross margin of duck productions (HH^{-1}) of each farm type

D1. Average gross margin of ducks of IFS-I (n=6)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Average frequency	9.7	heads			
Gross return:					
Weight	20.0	kg	4,000	80,000	20.2
Variable cost:					
Duck cost				5,800	1.5
Feed				4,868	1.2
Family labor	9.0	md	3,000	27,000	6.8
Total variable cost				37,668	9.5
Gross margin				41,998	10.6
Return to variable cost				1.1	1.1
Return to family labor	1.0	md		4,667	1.2

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

D2. Average gross margin of ducks of IFS-II (n=9)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Average frequency	11.7	heads			
Gross return:					
Weight	23.5	kg	4,000	94,044	23.8
Variable cost:					
Duck cost				7,000	1.8
Feed				6,207	1.6
Family labor	9.2	md	3,000	27,667	7.0
Total variable cost				40,874	10.3
Gross margin				53,170	13.5
Return to variable cost				1.3	1.3
Return to family labor	1.0	md		5,765	1.5

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

D3. Average gross margin of ducks of IFS-III (n=6)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Average frequency	12.2	heads			
Gross return:					
Weight	21.3	kg	4,000	85,133	21.6
Variable cost:					
Duck cost				7,300	1.8
Feed				4,613	1.2
Family labor	9.8	md	3,000	29,500	7.5
Total variable cost				41,413	10.5
Gross margin				43,720	11.1
Return to variable cost				1.1	1.1
Return to family labor	1.0	md		4,446	1.1

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

D4. Average gross margin of ducks of IFS-IV (n=4)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Average frequency	9.3	heads			
Gross return:					
Weight	17.4	kg	4,000	69,600	17.6
Variable cost:					
Duck cost				7,050	1.8
Feed				4,150	1.1
Family labor	8.5	md	3,000	25,500	6.5
Total variable cost				36,700	9.3
Gross margin				32,900	8.3
Return to variable cost				0.9	0.9
Return to family labor	1.0	md		3,870.6	1.0

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

Appendix E. Gross margin of pig productions (HH^{-1}) of each farm type

E1. Average gross margin of pigs of IFS-I (n=6)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Average frequency	2.7	heads			
Gross return:					
Weight	173.5	kg	2,800	485,800	123.0
Variable cost:					
Piglet cost				92,833	23.5
Feed				207,833	52.6
Vaccinated				917	0.2
Family labor	28.8	md	3,000	86,490	21.9
Total variable cost				388,073	98.2
Gross margin				97,727	24.7
Return to variable cost				0.3	0.3
Return to family labor	1.0	md		3,390	0.9

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

E2. Average gross margin of pigs of IFS-II (n=9)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Average frequency	1.7	heads			
Gross return:					
Weight	121.1	kg	2,800	339,111	86.0
Variable cost:					
Piglet cost				53,556	13.6
Feed				121,278	30.7
Vaccinated				1611	0.4
Family labor	21.6	md	3,000	64,667	16.4
Total variable cost				241,111	61.0
Gross margin				98,000	25.0
Return to variable cost				0.4	0.4
Return to family labor	1.0	md		4,546	1.2

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

E3. Average gross margin of pigs of IFS-III (n=4)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Average frequency	1.75	heads			
Gross return:					
Weight	108.5	kg	2,800	303,800	77.0
Variable cost:					
Piglet cost				60,750	15.4
Feed				123,700	31.3
Vaccinated				1,500	0.4
Family labor	26.5	md	3,000	79,500	20.1
Total variable cost				265,450	67.0
Gross margin				38,350	10.0
Return to variable cost				0.1	0.1
Return to family labor	1.0	md		1,447	0.4

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

Appendix F. Gross margin of fish productions (HH^{-1}) of each farm type

F1. Average gross margin of cultured fish of IFS-I (n=6)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Gross return:					
Output	45.8	kg	3,000	137,490	34.8
Variable cost:					
Fingerling	275.0	heads	50	13,750	3.5
Urea	0.7	kg	900	667	0.2
DAP	0.7	kg	1,000	667	0.2
Calcareous	4.2	kg	500	2,100	0.5
Manure	93.3	kg	10	933	0.2
Rice bran	120.0	kg	150	18,000	4.6
Harvested cost				3,750	0.9
Family labor	5.7	md	3,000	17,010	4.3
Total variable cost				56,875	14.4
Gross margin				80,615	20.4
Return to variable cost				1.4	1.4
Return to family labor	1.0	md		14,218	3.6

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

F2. Average gross margin of natural fish of IFS-I (n=4)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Gross return:					
Output	45.8	kg	3,500	160,125	40.5
Variable cost:					
Harvested cost				3,875	1.0
Family labor	3.5	md	3,000	10,500	2.7
Total variable cost				14,375	3.6
Gross margin				145,750	37.0
Return to variable cost				10.14	10.1
Return to family labor	1.0	md		41,643	10.5

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

F3. Average gross margin of natural fish of IFS-II (n=5)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Gross return:					
Output	29	kg	3,500	101,500	25.7
Variable cost:					
Harvested cost				3,600	0.9
Family labor	3	md	3,000	9,000	2.3
Total variable cost				12,600	3.2
Gross margin				88,900	22.5
Return to variable cost				7.1	7.1
Return to family labor	1	md		29,633	7.5

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

F4. Average gross margin of natural fish of IFS-III (n=3)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Gross return:					
Output	24	kg	3,500	84,000	21.3
Variable cost:					
Harvested cost				3,500	0.9
Family labor	3	md	3,000	9,000	2.3
Total variable cost				12,500	3.2
Gross margin				71,500	18.1
Return to variable cost				5.7	5.7
Return to family labor	1	md		23,833	6.0

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

F5. Average gross margin of natural fish of IFS-IV (n=4)

Items	Quantity	Unit	Price/unit (R)	Value (R)	Value (US$)
Gross return:					
Output	21.5	kg	3,500	75,250	19.1
Variable cost:					
Harvested cost				2,625	0.7
Family labor	2.8	md	3,000	8,250	2.1
Total variable cost				10,875	2.8
Gross margin				64,375	16.3
Return to variable cost				5.9	5.9
Return to family labor	1.0	md		23,409	5.9

R: Riel(s) (Cambodian currency: US$ 1 = 3,950 R in 2001), n: number of households, md: man-day

Appendix G. Related average monthly income (US$ HH^{-1}), related time-concentration (RTC) and related time-dispersion (RTD) of each enterprise in each farm type

G1. Average monthly income (US$ HH^{-1}), RTC and RTD of IFS-I

Month and statistic	Rice	Vegetables	Fruits	Livestock	Fish[*]	Total
January	0	0	0	8.9	15.8	24.7
February	0	4.8	0	9.7	16.7	31.1
March	0	22.5	1.3	8.0	0	31.7
April	0	12.2	2.4	2.9	0	17.5
May	0	0	0	3.6	0	3.6
June	0	2.7	0	7.3	0	10.0
July	0	16.3	0	6.5	0	22.9
August	0	9.5	2.9	0	0	12.4
September	0	0	0	0	0	0
October	0	0	0	8.7	8.1	16.8
November	68.7	0	0	9.9	4.5	83.1
December	77.4	0	0	6.2	0	83.6
Mean	12.2	5.7	0.5	6.0	3.8	28.1
SD	28.5	7.7	1.0	3.5	6.3	27.6
CV (%)	234.1	136.2	191.4	59.2	169.1	98.1
RTC = CV$_i$/CV$_{rice}$	1.0	0.6	0.8	0.3	0.7	0.4
RTD = 1-RTC	0	0.4	0.2	0.7	0.3	0.6

[*] = Cultured and natural fish, CV$_i$ is the CV of each enterprise

G2. Average monthly income (US$ HH^{-1}), RTC and RTD of IFS-II

Month and statistic	Rice	Vegetables	Fruits	Livestock	Fish	Total
January	0	0	0	7.8	0	7.8
February	0	4.6	0	11.7	0	16.3
March	0	12.2	0	7.8	0	20.0
April	0	8.0	2.8	4.9	0	15.7
May	0	0	0	11.7	0	11.7
June	0	3.8	0	10.1	0	13.9
July	0	8.0	0	3.6	0	11.6
August	0	5.5	0.3	0	0	5.8
September	0	0	0	0	0	0
October	0	0	0	8.6	2.8	11.3
November	93.8	0	0	3.9	9.8	107.5
December	42.1	0	0	7.8	0	49.9
Mean	11.3	3.5	0.3	6.5	1.0	22.6
SD	28.7	4.2	0.8	4.0	2.9	29.4
CV (%)	253.0	120.0	310.5	62.0	274.0	130.0
RTC = CV_i/CV_{fruits}	0.8	0.4	1.0	0.2	0.9	0.4
RTD=1-RTC	0.2	0.6	0	0.8	0.1	0.6

CV_i is the CV of each enterprise

G3. Average monthly income (US$ HH^{-1}), RTC and RTD of IFS-III

Month and statistic	Rice	Vegetables	Fruits	Livestock	Fish	Total
January	0	0	0	2.8	0	2.8
February	0	2.4	0	0	0	2.4
March	0	2.5	0	0	0	2.5
April	0	0	0	0	0	0
May	0	0	0	0	0	0
June	0	0.6	0	5.3	0	5.9
July	0	0.7	0	12.3	0	13.0
August	0	0	0	0	0	0
September	0	0	0	0	0	0
October	0	0	0	0	0	0
November	6.7	0	0	3.2	7.2	17.2
December	60.2	0	0	11.5	1.8	73.6
Mean	5.6	0.5	0	2.9	0.8	9.8
SD	17.3	0.9	-	4.5	2.1	20.9
CV (%)	310.5	181.2	-	155.4	279.5	213.4
RTC = CV_i/CV_{rice}	1.0	0.6	-	0.5	0.9	0.7
RTD=1-RTC	0	0.4	-	0.5	0.1	0.3

CV_i is the CV of each enterprise

G4. Average monthly income (US$ HH^{-1}), RTC and RTD of IFS-IV

Month and statistic	Rice	Vegetables	Fruits	Livestock	Fish	Total
January	0	0	0	1.9	0	1.9
February	0	3.5	0	1.9	0	5.4
March	0	5.7	0.6	0	0	6.3
April	0	1.4	1.5	0	0	2.9
May	0	0	0	0	0	0
June	0	0.7	0	3.9	0	4.7
July	0	2.8	0	3.9	0	6.8
August	0	0	0	0	0	0
September	0	0	0	0	0	0
October	0	0	0	0	0	0
November	3.3	0	0	0	5.8	9.1
December	29.5	0	0	0	1.4	30.9
Mean	2.7	1.2	0.2	1.0	0.6	5.7
SD	8.5	1.9	0.4	1.6	1.7	8.5
CV (%)	310.5	158.4	255.0	161.5	279.5	151.1
RTC = CV_i/CV_{rice}	1.0	0.5	0.8	0.5	0.9	0.5
RTD=1-RTC	0	0.5	0.2	0.5	0.1	0.5

CV_i is the CV of each enterprise

Appendix H. The calculation of Simpson's Diversity index (DI) for farm households of every farm type in terms of species and incomes

H1. Diversity index (DI) of IFS-I

Farm structure	Species or physical diversity		Economic or value diversity	
Species/activities	# of individual (n_i)	$(n_i/N)^2$ (s = 7)	Annual income (n_i) (US$)	$(n_i/N)^2$ (s =9)
Rice	-	-	146.1	0.1876
Vegetables	-	-	68.0	0.0407
Fruits	78	0.3600	6.6	0.0004
Chicken	29	0.0498	36.3	0.0116
Ducks	10	0.0059	10.6	0.0010
Pigs	3	0.0005	24.7	0.0054
Cows	7	0.0029	0	0
Buffalo	1	0.0001	0	0
Fishpond	2	0.0002	45.0	0.0178
Sum	130	0.4194	337.3	0.2644
DI		0.5806		0.7356

DI = Diversity index ($DI = 1 - \sum_{i=1}^{s} (n_i / N)^2$), n_i (for i = 1 to S) is the number of individuals in the i-th species or incomes, and N (=Σn_i) is the total population of all individuals
(Source: McConnell and Dillon, 1997)

H2. Diversity index (DI) of IFS-II

Farm structure	Species or physical diversity		Economic or value diversity	
Species/activities	# of individual (n_i)	$(n_i/N)^2$ $(s = 7)$	Annual income (n_i) (US$)	$(n_i/N)^2$ $(s = 9)$
Rice			135.9	0.2507
Vegetables			42.0	0.0239
Fruits	45	0.2108	3.1	0.0001
Chicken	33	0.1134	39.7	0.0214
Ducks	12	0.0150	13.5	0.0025
Pigs	1	0.0001	24.8	0.0084
Cows	5	0.0026	0	0
Buffalo	1	0.0001	0	0
Fishpond	1	0.0001	12.5	0.0021
Sum	98	0.3421	271.5	0.3091
DI		0.6579		0.6909

DI = Diversity index ($DI = 1 - \sum_{i=1}^{s} (n_i / N)^2$), n_i (for i = 1 to S) is the number of individuals in the

i-th species or incomes, and N (=Σn_i) is the total population of all individuals
(Source: McConnell and Dillon, 1997)

H3. Diversity index (DI) of IFS-III

Farm structure	Species or physical diversity		Economic or value diversity	
Species/activities	# of individual (n_i)	$(n_i/N)^2$ $(s = 7)$	Annual income (n_i) (US$)	$(n_i/N)^2$ $(s = 9)$
Rice			66.9	0.3259
Vegetables			6.2	0.0028
Fruits	26	0.1477	0.0	0
Chicken	22	0.1046	17.6	0.0225
Ducks	12	0.0330	11.1	0.0089
Pigs	2	0.0007	6.5	0.0031
Cows	4	0.0027	0	0
Buffalo	1	0.0002	0	0
Fishpond	1	0.0002	9.1	0.0060
Sum	67	0.2891	117.2	0.3690
DI		0.7109		0.6310

DI = Diversity index ($DI = 1 - \sum_{i=1}^{s} (n_i / N)^2$), n_i (for i = 1 to S) is the number of individuals in the

i-th species or incomes, and N (=Σn_i) is the total population of all individuals,
(Source: McConnell and Dillon, 1997)

H4. Diversity index (DI) of IFS-IV

Farm structure	Species or physical diversity		Economic or value diversity	
Species/activities	# of individual (n_i)	$(n_i/N)^2$ $(s = 7)$	Annual income (n_i) (US$)	$(n_i/N)^2$ $(s = 9)$
Rice			32.8	0.2320
Vegetables			14.1	0.0433
Fruits	45	0.4017	2.1	0.0010
Chicken	11	0.0240	7.9	0.0135
Ducks	9	0.0170	3.7	0.0030
Pigs	0	0	0	0
Cows	3	0.0021	0	0
Buffalo	1	0.0003	0	0
Fishpond	1	0.0002	7.2	0.0113
Sum	71	0.4452	68.0	0.3040
DI		0.5600		0.6960

DI = Diversity index ($DI = 1 - \sum_{i=1}^{s}(n_i / N)^2$), n_i (for i = 1 to S) is the number of individuals in the i-th species or incomes, and N (=Σn_i) is the total population of all individuals
(Source: McConnell and Dillon, 1997)

Appendix I. Whole farm related time-dispersion values for each farm type

I1. Whole farm related time-dispersion values for IFS-I and IFS-II

Enterprise	IFS-I				IFS-II			
	Incomes (n_i) (US$)	n_i/N	Individual RTD_i	$RTD_i \times (n_i/N)$	Incomes (n_i) (US$)	n_i/N	Individual RTD_i	$RTD_i \times (n_i/N)$
Rice	146.1	0.4335	0	0	135.9	0.5007	0.19	0.0951
Vegetables	68.0	0.2019	0.42	0.0848	42.0	0.1547	0.61	0.0944
Fruits	6.6	0.0195	0.18	0.0035	3.1	0.0114	0	0
Livestock	71.6	0.2125	0.75	0.1594	78.0	0.2873	0.80	0.2298
Fishpond	45.0	0.1336	0.28	0.0374	12.5	0.0461	0.12	0.0055
Total [$N=\sum_{i=1}^{s}(ni)$]	337.3				271.5			
$RTD'=\sum_{i=1}^{s}RTDi(ni/N)$				0.3000				0.4200

RTD' is the related time-dispersion values of whole farm systems, n_i is the income of each enterprise,
RTD_i is the related time-dispersion of each enterprise
(Source: McConnell and Dillon, 1997)

12. Whole farm related time-dispersion values for IFS-III and IFS-IV

Enterprise	IFS-III				IFS-IV			
	Incomes (n$_i$)		Individual		Incomes (n$_i$)		Individual	
	(US$)	n$_i$/N	RTD$_i$	RTD$_i$ x (n$_i$/N)	(US$)	n$_i$/N	RTD$_i$	RTD$_i$ x (n$_i$/N)
Rice	66.9	0.5708	0	0	32.8	0.4824	0	0
Vegetables	6.2	0.0528	0.4	0.0222	14.1	0.2084	0.49	0.1021
Fruits	0	0	-	-	2.1	0.0311	0.18	0.0056
Livestock	35.1	0.2995	0.5	0.1498	11.6	0.1708	0.48	0.0820
Fishpond	9.1	0.0772	0.1	0.0077	7.2	0.1067	0.10	0.0107
Total [N= $\sum\limits_{i=1}^{s}(ni)$]	117.2				67.9			
RTD'= $\sum\limits_{i=1}^{s} RTDi(ni/N)$				0.1800				0.2000

RTD' is the related time-dispersion values of whole farm systems, n$_i$ is the income from each enterprise,
RTD$_i$ is the related time-dispersion of each enterprise
(Source: McConnell and Dillon, 1997)

Appendix J. Income diversity ratio (R) for each farm type

Enterprise	IFS-I		IFS-II		IFS-III		IFS-IV	
	Income of individual enterprise (R_i) (US$)	R_i^2	Income of individual enterprise (R_i) (US$)	R_i^2	Income of individual enterprise (R_i) (US$)	R_i^2	Income of individual enterprise (R_i) (US$)	R_i^2
Rice	146.1	21339.4	135.9	18479.2	66.9	4476.0	32.8	1072.7
Vegetables	68.0	4629.8	42.0	1763.6	6.2	38.3	14.1	200.2
Fruits	6.6	43.3	3.1	9.6	0	0	2.1	4.5
Chicken	36.3	1314.4	39.7	1578.6	17.6	308.4	7.9	62.3
Ducks	10.6	113.0	13.5	181.2	11.1	122.5	3.7	13.7
Pigs	24.7	612.0	24.8	615.5	6.5	41.9	0	0
Cows	0	0	0	0	0	0	0	0
Buffaloes	0	0	0	0	0	0	0	0
Fishponds	45.0	2026.1	12.5	156.3	9.1	81.9	7.2	52.5
Total	337.3	30,078.1	271.5	22,784.1	117.2	5,069.0	67.9	1,405.8
$\left(\sum_{i=1}^{s} R_i\right)^2$	113,800.0		73,731.0		13,746.0		4,604.0	
$R=\left[\sum_{i=1}^{n} R_i\right]^2 / \sum_{i=1}^{n} R_i^2$	4.00		3.24		2.71		3.27	

R is the income diversity ratio; R_i is the income of each enterprise (i to n)
(Source: McConnell and Dillon, 1997)

Appendix K. Total income from on-farm and off-farm of the respondents

K1. Total income from each enterprise and total off-farm income (US$ HH^{-1}) of households in IFS-I

HH	Rice	Vegetables	Chicken	Ducks	Pigs	Management fish	Natural fish	Fruit crops	Total on-farm income	Off-farm income	Total HH income
1	121.6	28.2	85.2	12.0	33.2	32.2	23.4	13.7	349.4	15.2	364.6
2	144.8	28.8	10.4	6.8	23.5	11.6	0	0	225.9	0	225.9
3	118.8	76.1	89.1	3.7	29.9	20.4	14.4	0	352.4	3.8	356.2
4	186.2	22.1	10.9	24.7	3.3	39.2	25.9	9.4	321.8	0	321.8
5	132.6	14.1	10.1	4.5	31.0	8.7	0	0	201.1	46.8	248.0
6	172.4	238.9	11.8	12.1	27.6	10.4	83.8	16.5	573.4	0	573.4
Mean	146.1	68.0	36.3	10.6	24.7	20.4	24.6	6.6	337.3	11.0	348.3
SD	27.7	86.5	39.4	7.8	11.0	12.7	31.1	7.6	132.1	18.5	123.9
CV (%)	19.0	127.1	108.8	73.2	44.5	62.2	126.2	114.8	39.2	168.9	35.6
Min	118.8	14.1	10.1	3.7	3.3	8.7	0	0	201.1	0	225.9
Max	186.2	238.9	89.1	24.7	33.2	39.2	83.8	16.5	573.4	46.8	573.4

K2. Total income from each enterprise and total off-farm income (US$ HH⁻¹) of households in IFS-II

HH	Rice	Vegetables	Chicken	Ducks	Pigs	Natural fish	Fruit crops	Total on-farm income	Off-farm income	Total HH income
7	76.7	19.8	68.8	3.8	19.5	13.7	7.3	209.6	6.3	215.9
8	51.5	20.4	20.8	11.0	15.8	0	0	119.5	0	119.5
9	158.5	13.1	49.0	14.5	9.5	19.9	11.6	276.1	5.1	281.2
10	76.4	81.4	9.0	6.4	35.4	5.7	8.9	223.2	0	223.2
11	169.4	49.3	47.5	11.5	50.9	0	0	328.6	75.9	404.5
12	135.3	2.8	23.0	18.9	8.6	19.0	0	207.6	0	207.6
13	203.7	13.4	56.4	18.2	13.8	0	0	305.6	37.3	342.9
14	111.1	40.3	27.2	12.5	25.9	0	0	217.1	0	217.1
15	240.9	137.5	55.9	24.3	43.8	54.3	0	556.6	124.6	681.2
Mean	136.0	42.0	39.7	13.5	24.8	12.5	3.1	271.6	27.7	299.3
SD	63.3	43.1	20.2	6.4	15.3	17.7	4.8	123.5	44.5	165.6
CV (%)	46.6	102.7	50.9	47.3	61.8	141.9	154.1	45.5	160.7	55.3
Min	51.5	2.8	9.0	3.8	8.6	0	0	119.5	0	119.5
Max	240.9	137.5	68.8	24.3	50.9	54.3	11.6	556.6	124.6	681.2

K3. Total income from each enterprise and total off-farm income (US$ HH^{-1}) of households in IFS-III

HH	Rice	Vegetables	Chicken	Ducks	Pigs	Natural fish	Fruit crops	Total on-farm income	Off-farm income	Total HH income
16	47.5	2.5	7.0	7.2	16.5	38.5	0	119.1	15.2	134.3
17	52.7	12.8	34.8	4.4	10.2	0	0	114.9	25.6	140.4
18	20.0	7.8	30.5	2.5	0	5.7	0	66.4	12.8	79.2
19	75.8	7.9	14.7	9.2	0	10.1	0	117.7	19.7	137.4
20	116.0	5.6	16.4	9.9	5.1	0	0	153.0	31.1	184.2
21	89.5	0.5	2.1	33.2	7.1	0	0	132.4	10.9	143.2
Mean	67.0	6.2	17.6	11.1	6.5	9.1	0	117.5	19.0	136.7
SD	34.0	4.4	12.9	11.2	6.3	15.0	-	28.6	7.9	33.5
CV (%)	51.0	70.8	73.3	101.2	97.5	165.7	-	24.4	41.0	24.6
Min	20.0	0.5	2.1	2.5	0	0	0	66.4	10.9	79.2
Max	116.0	12.8	34.8	33.2	16.5	38.5	0	153.0	31.1	184.2

K4. Total income from each enterprise and total off-farm income (US$ HH^{-1}) of households in IFS-IV

HH	Rice	Vegetables	Chicken	Ducks	Pigs	Natural fish	Fruit crops	Total on-farm income	Off-farm income	Total HH income
22	61.0	22.7	10.0	2.5	0	10.1	6.1	112.5	19.0	131.4
23	6.2	36.8	10.8	0	0	0	6.1	59.9	21.5	81.4
24	37.1	17.8	9.8	0	0	0	0	64.6	30.4	95.0
25	19.4	12.8	6.6	15.2	0	4.7	0	58.7	26.6	85.3
26	13.3	10.2	4.5	0	0	28.7	0	56.7	93.0	151.3
27	10.9	7.5	13.7	0	0	0	0	32.0	14.4	46.5
28	53.2	17.9	6.9	-0.8	0	0	0	77.2	57.0	134.2
29	46.4	0.2	1.8	16.3	0	0	0	64.8	7.6	72.4
30	47.2	1.5	7.0	0	0	21.6	6.8	84.2	80.0	166.5
Mean	33.0	14.1	8.0	3.7	0	7.2	2.1	68.0	38.8	107.4
SD	20.5	11.3	3.6	6.9	-	10.9	3.2	22.1	31.3	40.3
CV (%)	62.6	80.2	45.1	186.8	-	150.2	150.4	32.6	79.6	37.6
Min	6.2	0.2	1.8	-0.8	0	0	0	32.0	7.6	46.5
Max	61.0	36.8	13.7	16.3	0	28.7	6.8	112.5	94.7	166.5

Appendix L. Total present rice output of households in each farm type

Items	IIFS-I (n=6)	IFS-II (n=9)	IFS-III (n=6)	IFS-IV (n=9)
A Total land area of rice (ha)	11	16	11	10
B Rice yield (kg ha^{-1})	1,533	1,645	1,060	927
C Total present rice output (kg per whole farm) = (A x B)	16,863	26,320	11,660	9,270

n: number of households

Appendix M. Estimated food demands for households in each farm type in 2010

Items	IIFS-I (n=6)	IFS-II (n=9)	IFS-III (n=6)	IFS-IV (n=9)
D. Present population (heads)	35	60	36	54
E. Projected population in 2010 (persons) = (D x 0.028 x 10) + D	45	77	46	69
F. Future food demands (kg per whole farm) (in 2010) = E x 334 kg	15,030	25,718	15,364	23,046
G. Present available food (kg per whole farm) = C	16,863	26,320	11,660	9,270
H. Present food demands (kg per whole farm) = D x 334 kg	11,690	20,040	12,024	18,036
I. Food scenario (addition food supply) (kg per whole farm) = F - G	-	-	3,704	13,776
J. Food surplus (kg per whole farm) = G -F	1,833	602	-	-

n: number of households
Population growth rate is 2.8 percent and present per capita food consumption is 334 kg head^{-1} year^{-1} and 10 years from 2001 to 2010
(Sources: CIAP, 1993; EOKT, 2000; FAO, 2001; Koma, 1999; and Rashid and Cheng-Hopkins, 1999)

CURRICULUM VITAE

Name: **Pech Sithan**

Date of birth: August 09, 1972

Educational background:

1989-1993   B.S. Agricultural Science, Royal University of Agriculture, Phnom Penh, Cambodia

2001-2003   M.S. Agriculture (Agricultural Systems) Chiang Mai University, Chiang Mai, Thailand

Scholarships:

                                      Department of Technical and Economic Cooperation (DTEC), Thailand

Working experiences:

1993-present   Lecturer of Agronomy of National Agriculture School, Ministry of Agriculture, Forestry and Fishery