



Appendices

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่

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Appendix A

Highland population information

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Table A-1: The estimated of highland population in Thailand

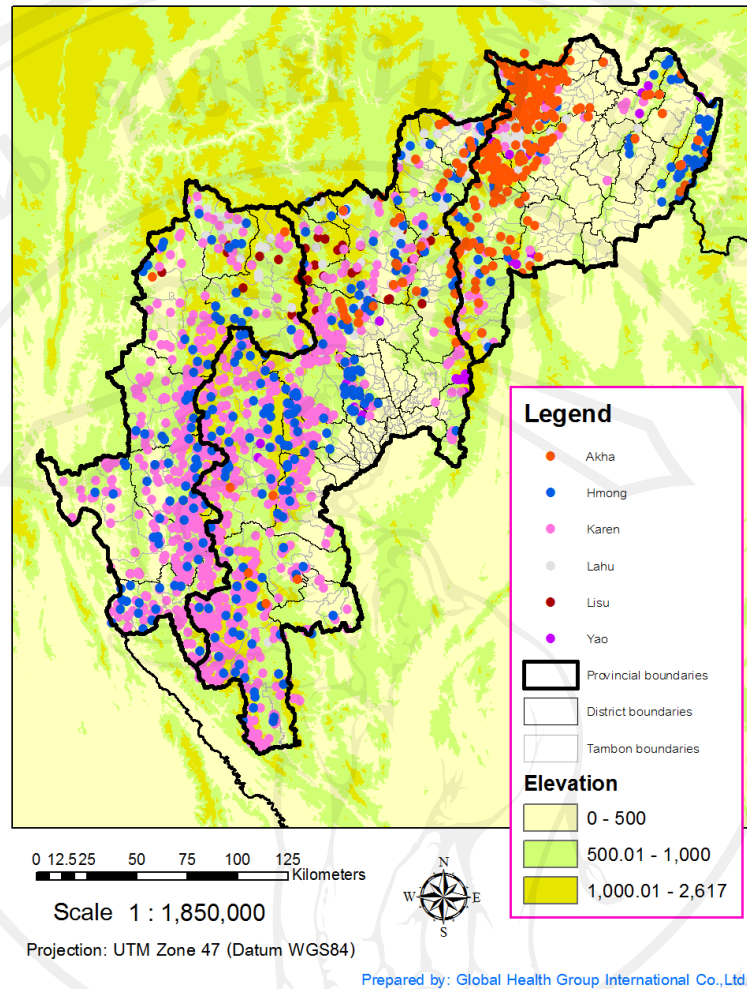
Provinces	Village (%)	Household (%)	Population (%)
Chiang Mai	571 (27.16)	58,245 (25.21)	244,291 (25.32)
Chiang Rai	290 (13.80)	28,160 (12.19)	130,054 (13.48)
Mae Hong Son	322 (15.32)	25,670 (11.11)	109,119 (11.31)
Tak	205 (9.75)	28,591 (12.38)	130,065 (13.48)
Nan	191 (9.08)	18,762 (8.12)	87,253 (9.04)
Kanchanaburi	113 (5.38)	17,820 (7.71)	61,816 (6.41)
Lamphun	63 (3.00)	8,057 (3.49)	30,825 (3.19)
Phitsanulok	61 (2.90)	6,298 (2.73)	25,872 (2.68)
Phrae	46 (2.19)	5,095 (2.21)	18,517 (1.92)
Lampang	46 (2.19)	4,511 (1.95)	18,432 (1.91)
Phayao	41 (1.95)	4,050 (1.75)	18,572 (1.92)
Rachburi	26 (1.24)	5,874 (2.54)	20,510 (2.13)
Phetchaboon	24 (1.14)	5,176 (2.24)	25,140 (2.61)
Phetburi	24 (1.14)	5,176 (2.24)	8,407 (0.87)
Kampangphet	23 (1.09)	1,820 (0.79)	8,729 (0.90)
Uthaitani	17 (0.81)	1,994 (0.86)	7,511 (0.78)
Prachuapkirikhan	14 (0.67)	2,945 (1.27)	9,131 (0.95)
Sukhothai	12 (0.57)	1,136 (0.49)	4,413 (0.46)
Supanburi	11 (0.52)	1,299 (0.56)	4,783 (0.50)
Loei	2 (0.10)	317 (0.14)	1,476 (0.15)
Total	2,102 (100)	230,996 (100)	964,916 (100)

Source: Highland Research and Development Institute (2007)

Table A-2: The estimated of highland population in Chiang Mai, Chiang Rai, and Mae Hong Son

Tribes	Household (%)	Population (%)
Akha	9,169 (10.65)	42,617 (11.28)
Hmong	7,377 (8.57)	42,791 (11.33)
Karen	47,212 (54.84)	199,843 (52.89)
Lahu	15,310 (17.79)	63,121 (16.71)
Lisu	5,084 (5.91)	21,319 (5.64)
Yao	1,931 (2.24)	8,124 (2.15)
Total	86,083 (100)	377,815 (100)

Source: Highland Research and Development Institute (2007)



Source: Highland Research and Development Institute, 2007

Figure A-1: Location of the highland villages in Chiang Mai, Chiang Rai, and Mae Hong Son

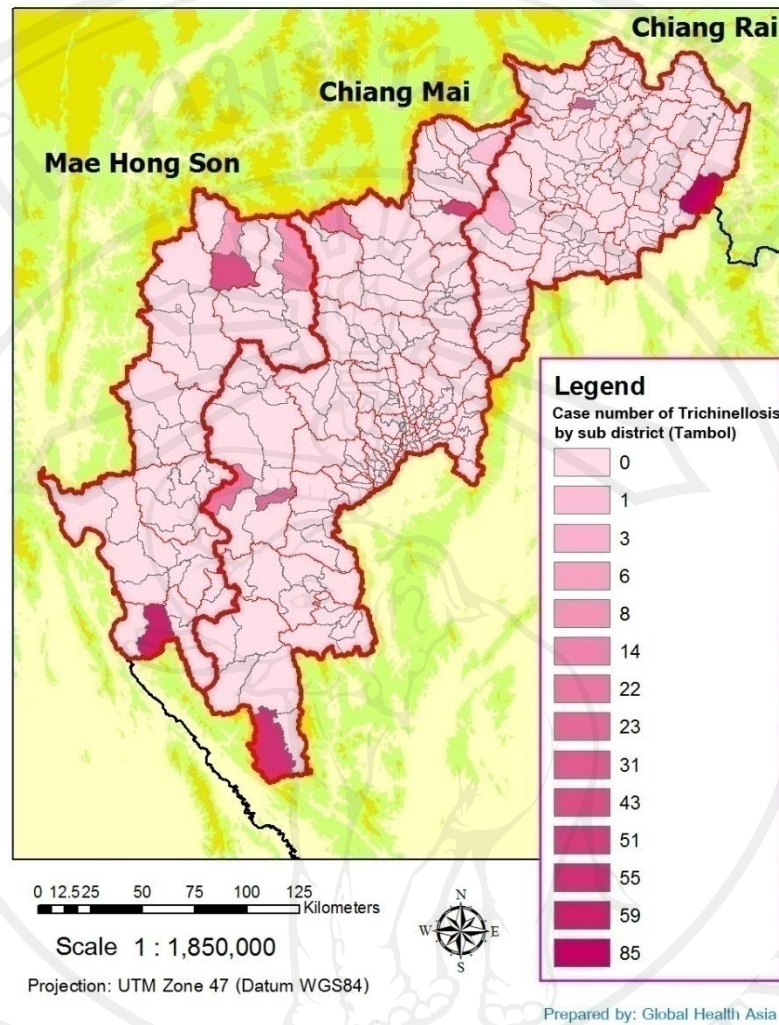


Figure A-2: Reported cases of Trichinellosis by sub district (Tambol) during 2003-2012

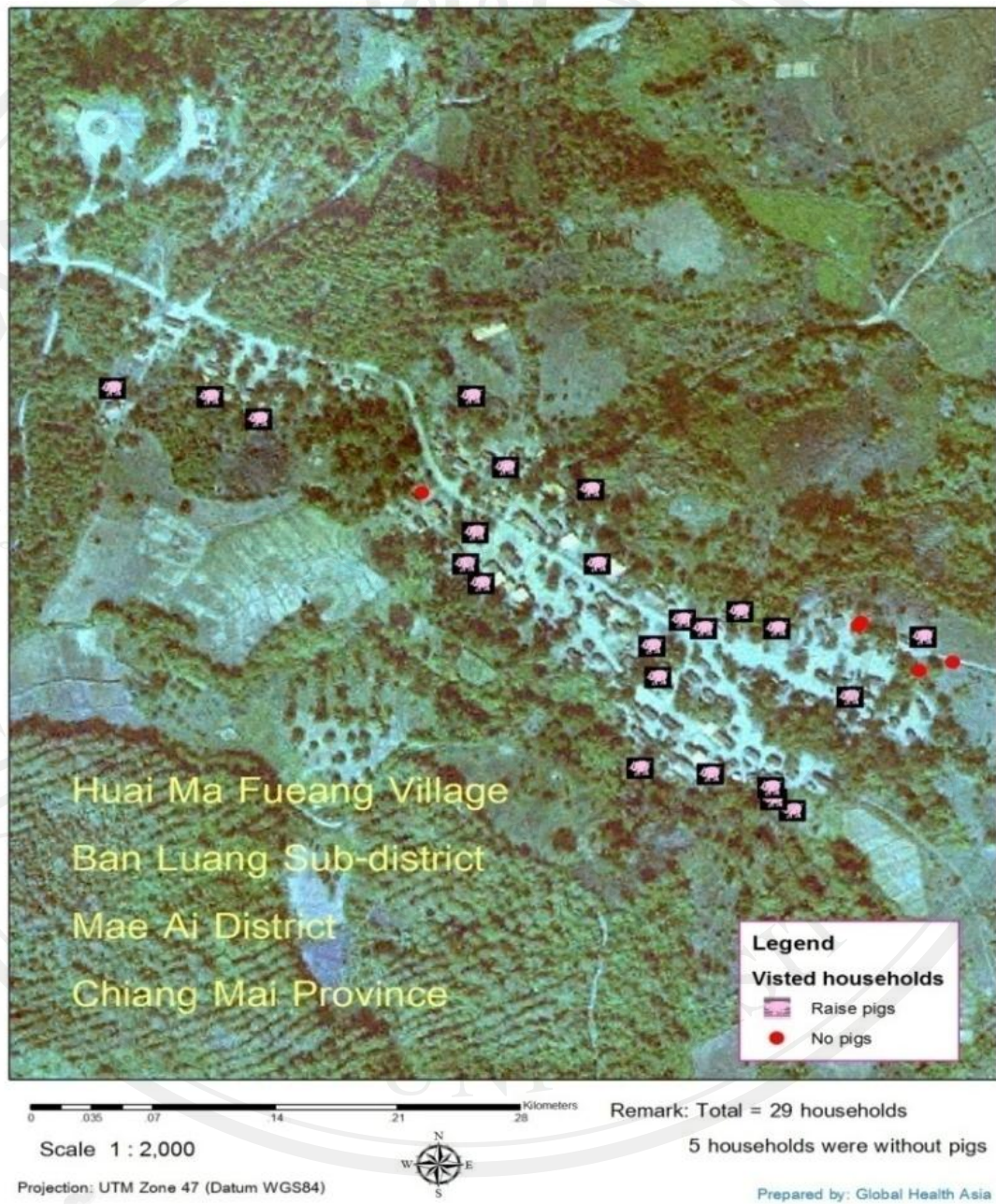
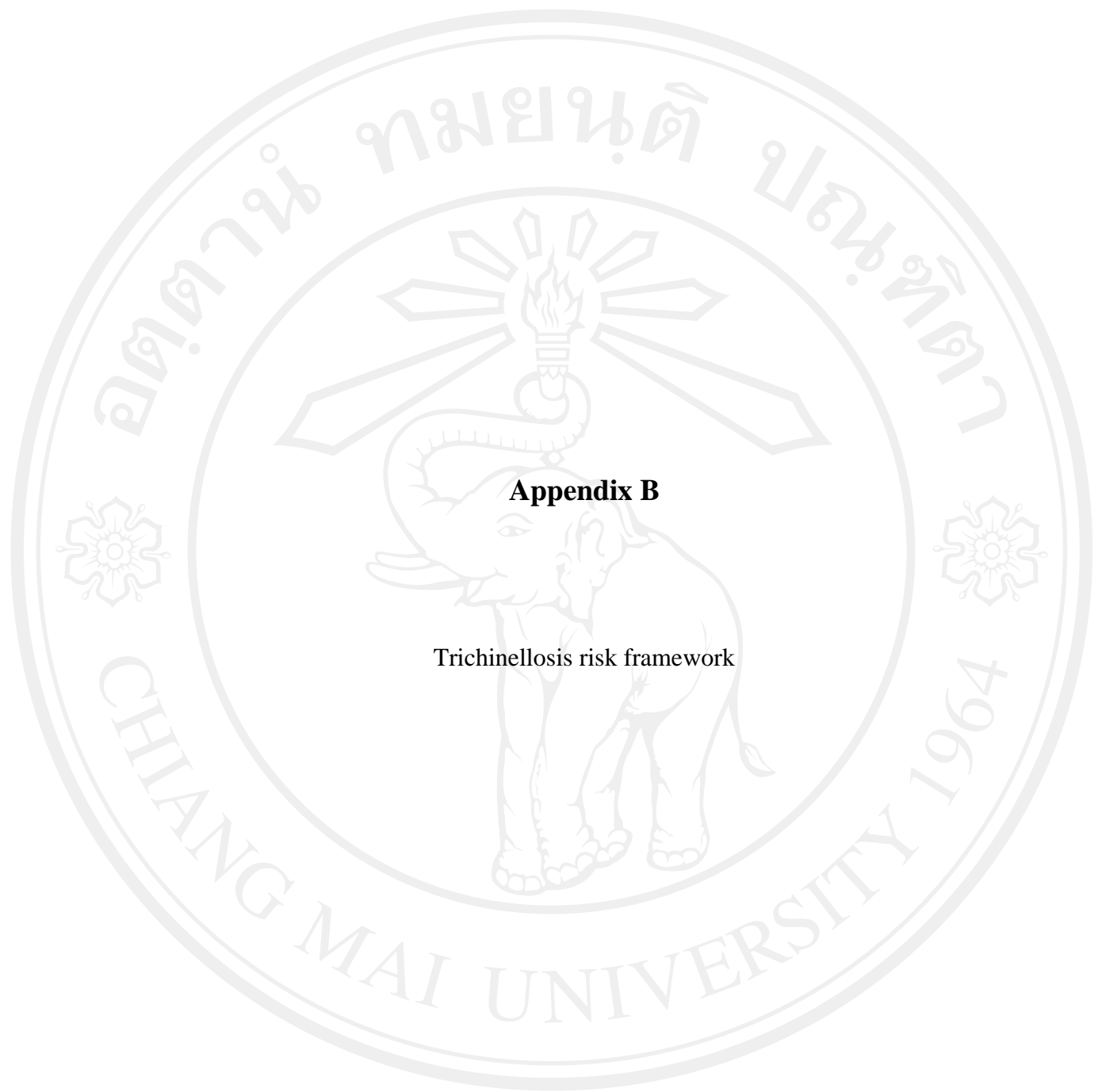


Figure A-3: Visited households in Huai Ma Fueang Village



Figure A-4: Visited households in Huai Chan Si Village



Appendix B

Trichinellosis risk framework

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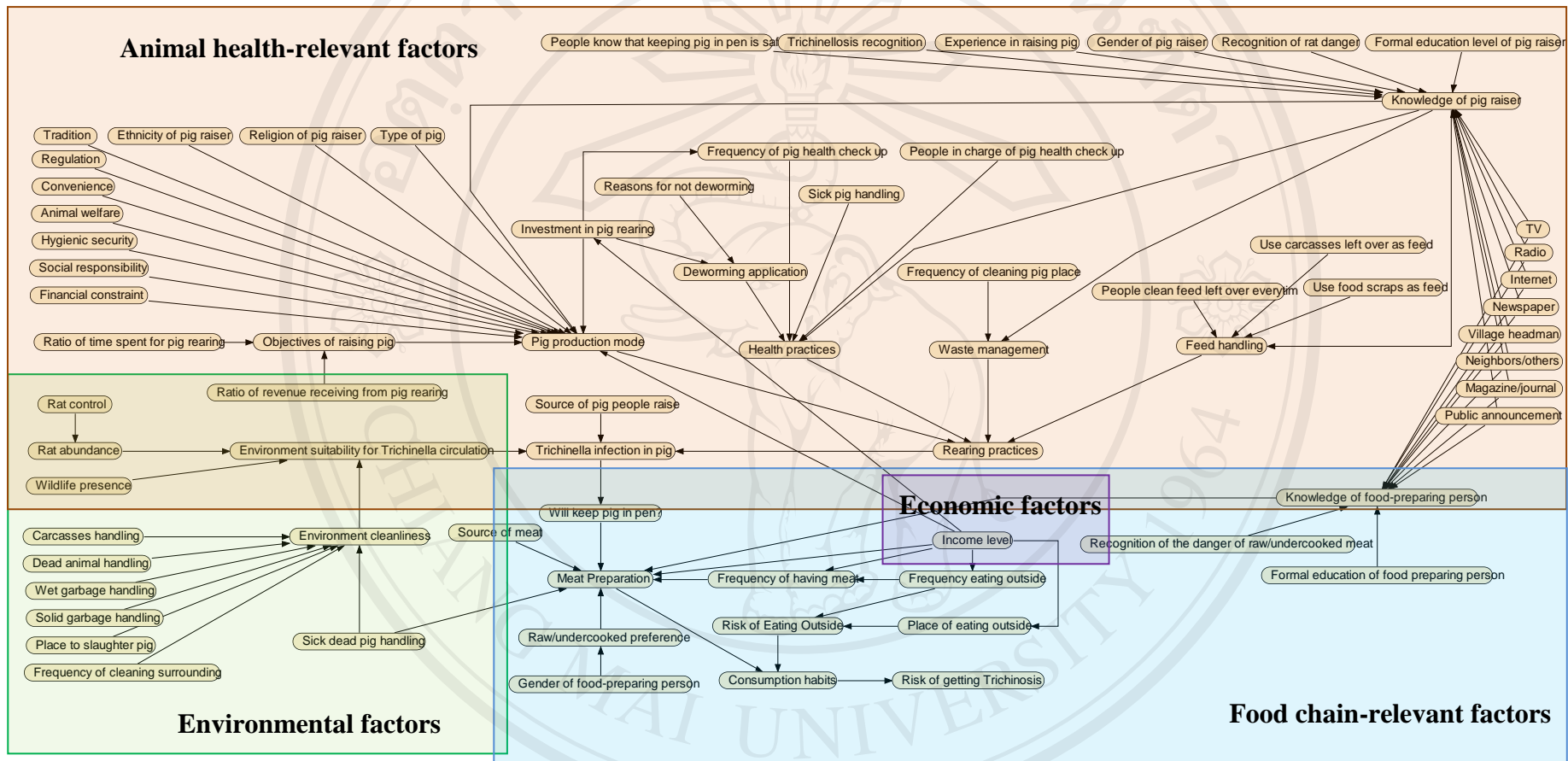


Figure B-1: Trichinellosis risk framework

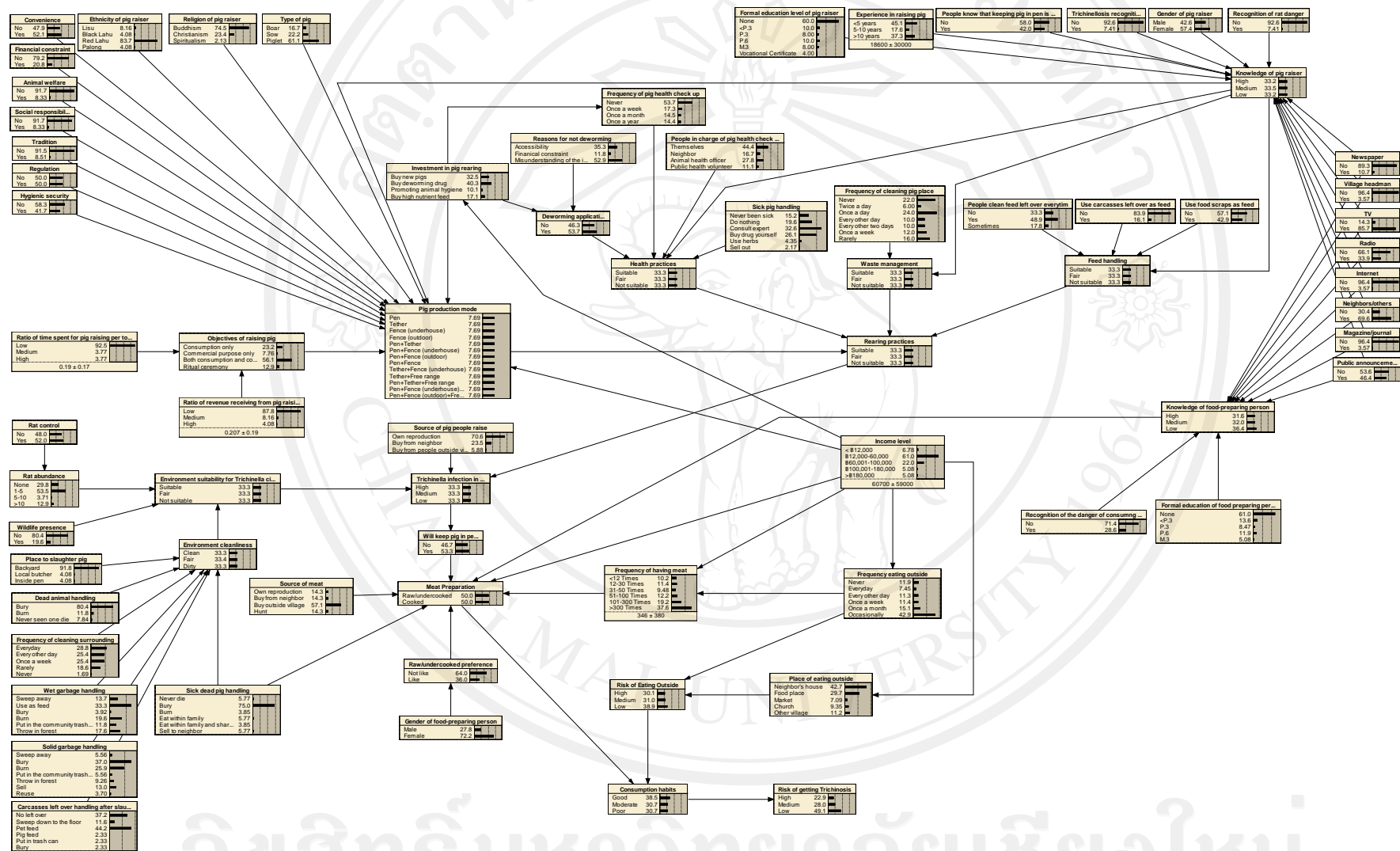
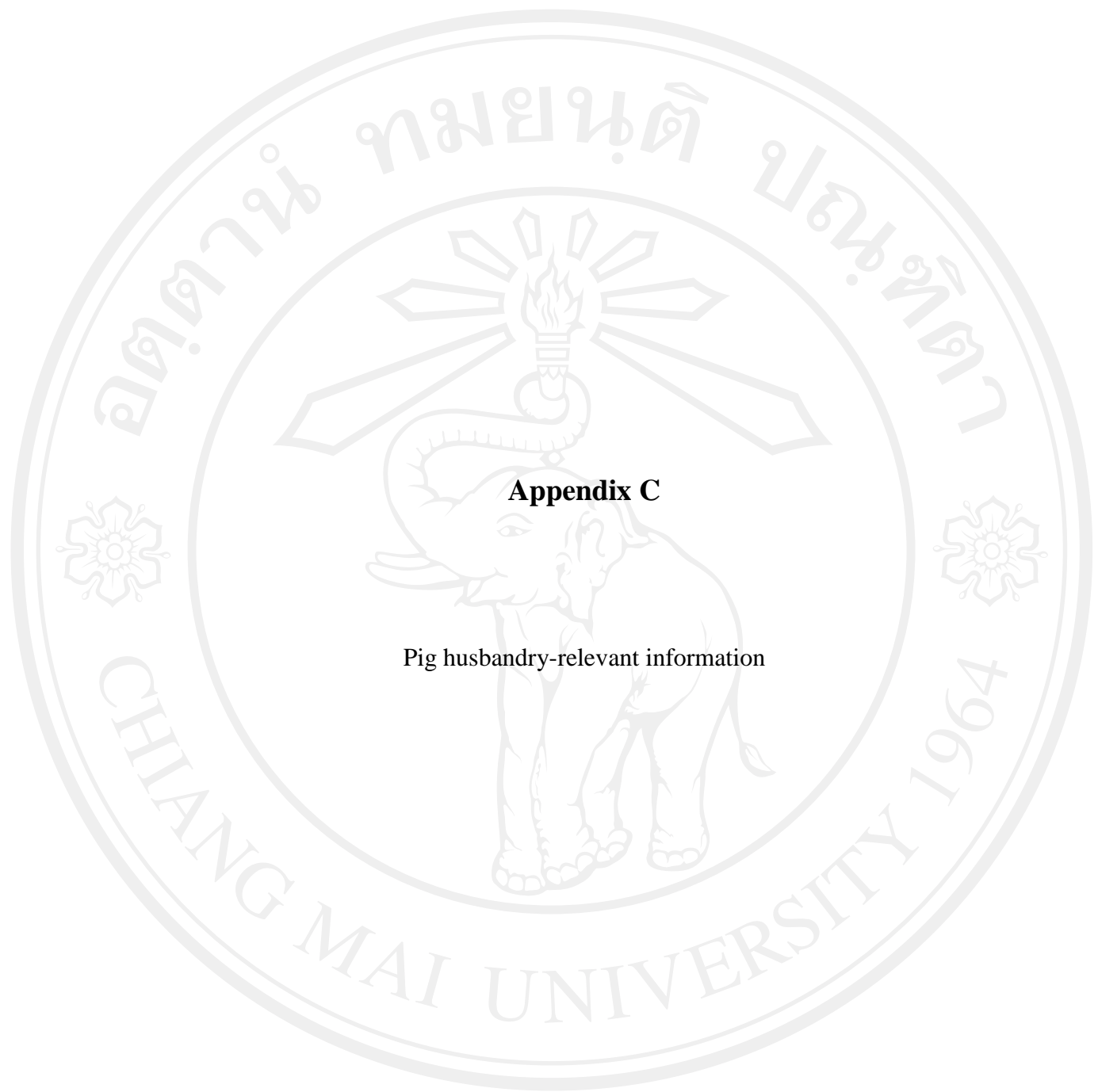


Figure B-2: Trichinellosis risk framework with belief bars



Appendix C

Pig husbandry-relevant information

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Table C-1: Gains and losses from switching to keep pigs in pen

Unit: Baht

Types of pig production mode	Avg. gains (฿)	Gains/losses from switching to keep pigs in pen	
		With support ²	Without support ³
Pen	12,126.70 ¹	-	-
Tether	10,366.67	1,760.03	-2,221.40
Fence underneath the house	3,016.87	9,109.83	5,128.40
Outdoor-located fence	2,625	9,501.70	5,520.27
Outdoor-located fence+Pen	12,706.91	-580.21	-4,561.64
Pen+Free range	40,900	-28,773.30	-32,754.73
Fence underneath the house + Pen	31,513.56	-29,386.86	-23,368.29
Fence underneath the house+Pen+Free range	38,455.01	-26,328.31	-30,309.74
Tether+Pen	32,379	-20,252.30	-24,233.73
Tether+Free range	3,850	8,276.70	4,295.27
Fence underneath the house+Tether	12,240	113.30	-4,094.73
Pen+Tether+Free range	56,480	-44,353.30	-48,334.73
Outdoor-located fence+Pen+Free range	2,265.63	9,861.07	58,79.64

¹Without cost of pig pen construction

²Gains from switching to keep pigs in pen (with the support) = gains from original pig production mode – gain from raising pig in pen

³Gains from switching to keep pigs in pen (without the support) = (gains from original pig production mode – gain from raising pig in pen)-cost of constructing a pen

Table C-2: Utility table of animal health perspective

Unit: Baht

A10	D1	A19	U1
P	N	N	0
P	N	Y	0
P	Y	N	0
P	Y	Y	0
T	N	N	0
T	N	Y	-2,221.40
T	Y	N	0
T	Y	Y	1,760.00
FU	N	N	0
FU	N	Y	5,128.40
FU	Y	N	0
FU	Y	Y	9,109.80
FO	N	N	0
FO	N	Y	5,520.27
FO	Y	N	0
FO	Y	Y	9,501.70
P+T	N	N	0
P+T	N	Y	-4,561.60
P+T	Y	N	0
P+T	Y	Y	-580.21
P+FU	N	N	0
P+FU	N	Y	-32,754.70
P+FU	Y	N	0
P+FU	Y	Y	-28,773.00
P+FO	N	N	0
P+FO	N	Y	-23,368.30
P+FO	Y	N	0
P+FO	Y	Y	-19,386.90
P+F	N	N	0
P+F	N	Y	-30,309.70
P+F	Y	N	0
P+F	Y	Y	-26,328.30
T+FU	N	N	0
T+FU	N	Y	-24,233.70
T+FU	Y	N	0
T+FU	Y	Y	-20,252.30
T+F	N	N	0
T+F	N	Y	4,295.27
T+F	Y	N	0
T+F	Y	Y	8,276.70
P+T+F	N	N	0
P+T+F	N	Y	-4,094.73

A10	D1	A19	U1
P+T+F	Y	N	0
P+T+F	Y	Y	113.30
P+FU+F	N	N	0
P+FU+F	N	Y	-48,334.70
P+FU+F	Y	N	0
P+FU+F	Y	Y	-44,353.30
P+FO+F	N	N	0
P+FO+F	N	Y	5,879.64
P+FO+F	Y	N	0
P+FO+F	Y	Y	9,861.10

Abbreviations

P = Pen

T = Tether

FU = Fence underneath the house

FO = Fence outdoor

F = Free range

N = No

Y = Yes

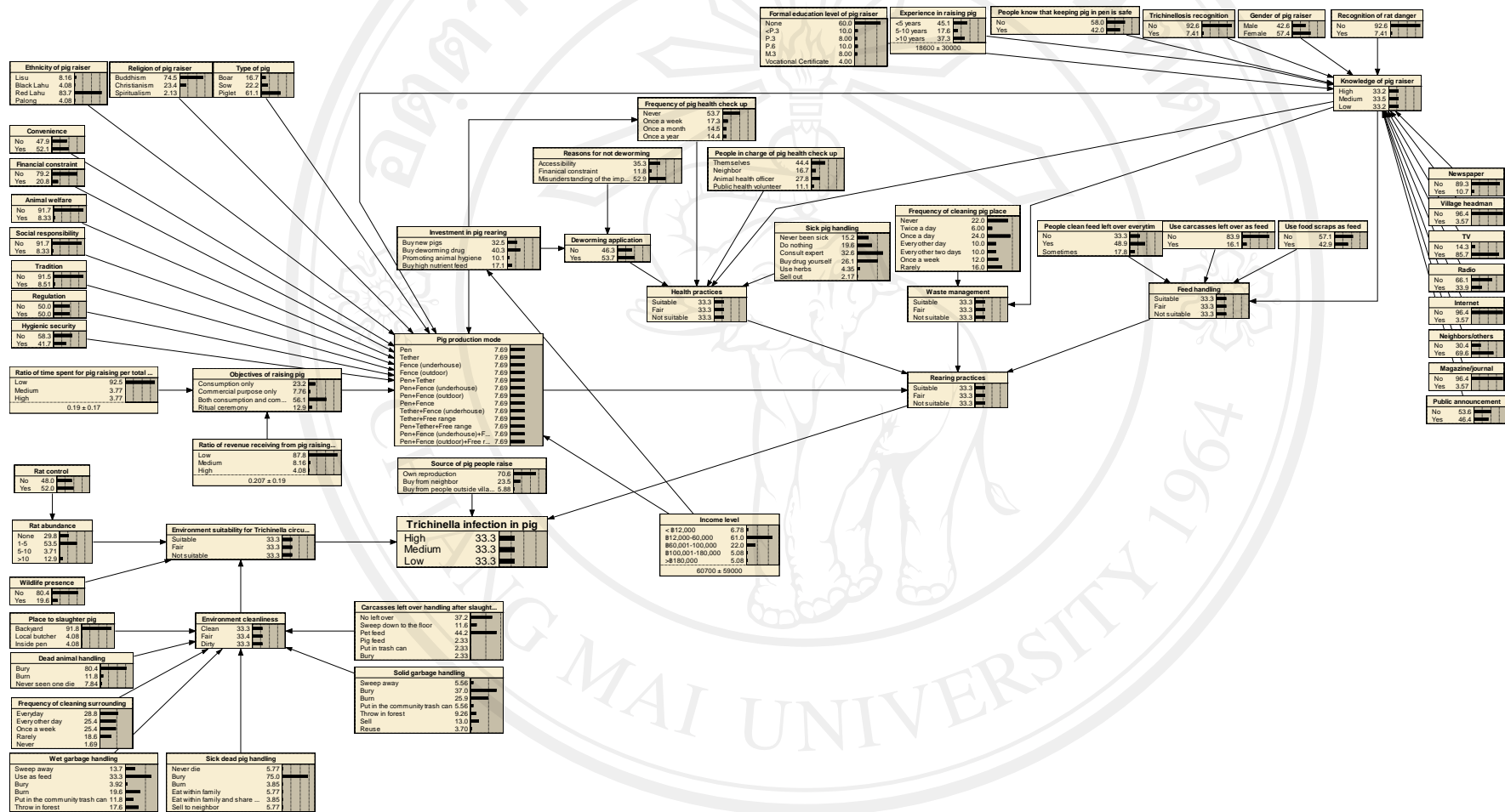


Figure C-1: Trichinella infection risk framework (animal perspective) – Model 1

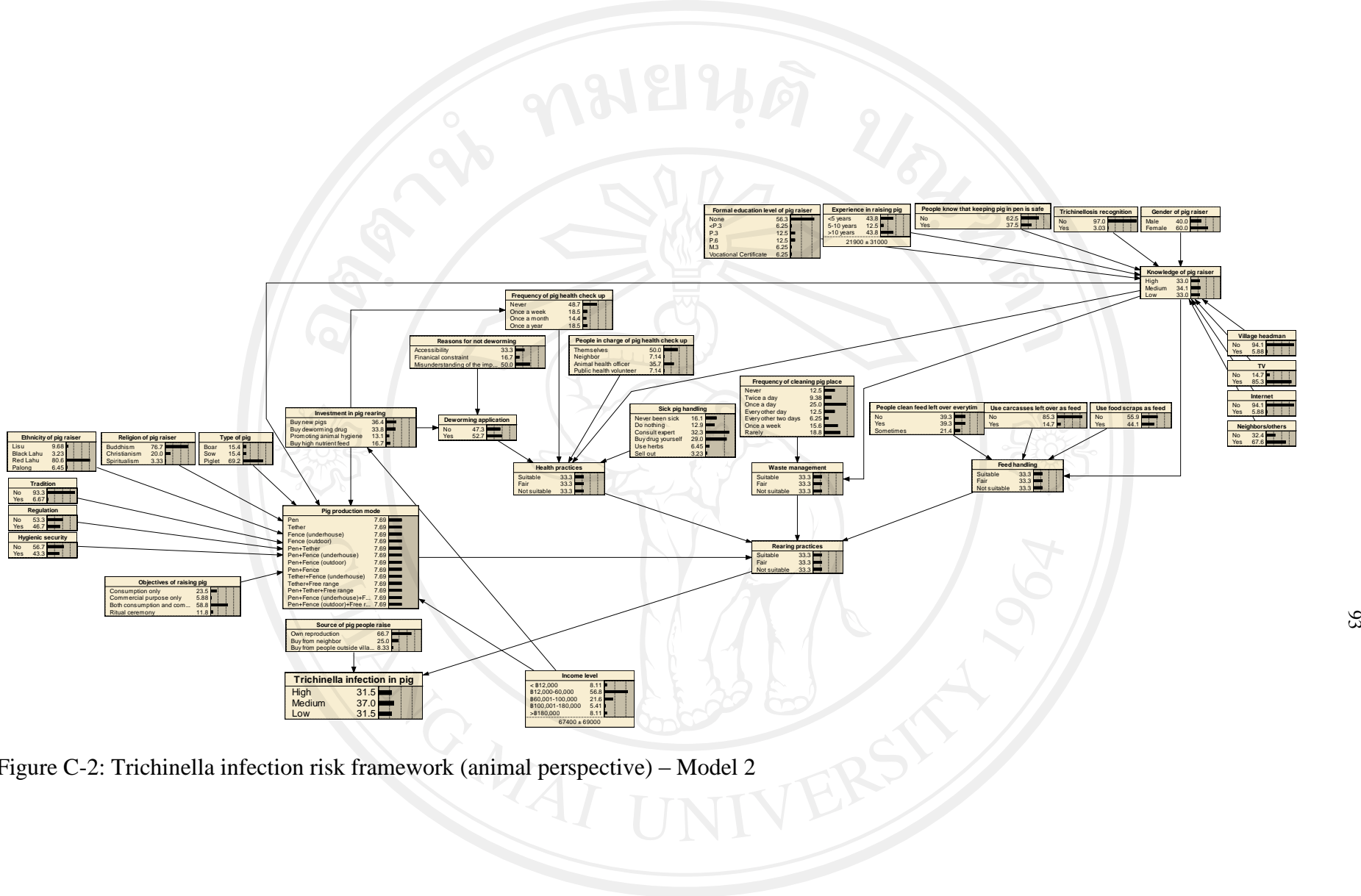


Figure C-2: Trichinella infection risk framework (animal perspective) – Model 2

Table C-3: Scoring rule results of the *Trichinella* infection in pig

Scoring rule results	Values	
	Model 1	Model 2
Logarithmic loss	1.0990	0.9201
Quadratic loss	0.6667	0.5416
Spherical payoff	0.5774	0.6840
Error rate	100%	20%

Table C-4: Probability table of the Trichinellosis risk in animal

Household	P(TIP=High)			P(TIP=Medium)			P(TIP=Low)		
	Observed	Predicted		Observed	Predicted		Observed	Predicted	
		Model 1	Model 2		Model 1	Model 2		Model 1	Model 2
1	0	0	0	1.00	1.00	1.00	0	0	0
10	0	0	0	0.75	0.75	0.78	0.25	0.25	0.22
13	0.50	0.50	0.5	0.50	0.50	0.50	0	0	0
15	0	0	0	1.00	1.00	1.00	0	0	0
17	0.50	0.50	0.45	0.50	0.50	0.55	0	0	0
19	0.50	0.50	0.37	0.50	0.50	0.63	0	0	0
20	0.50	0.50	0.46	0.50	0.50	0.54	0	0	0
21	0	0	0	0.75	0.75	0.84	0.25	0.25	0.16
22	*	0.33	0.31	*	0.33	0.37	*	0.33	0.31
23	*	0.33	0.31	*	0.33	0.37	*	0.33	0.31
25	0	0	0	1.00	1.00	1.00	0	0	0
26	0	0	0	0.75	0.75	0.79	0.25	0.25	0.21
27	0.25	0.25	0.22	0.75	0.75	0.78	0	0	0
31	0	0	0	1.00	1.00	1.00	0	0	0
36	*	0.33	0.31	*	0.33	0.37	*	0.33	0.31
37	0.25	0.25	0.19	0.75	0.75	0.81	0	0	0
41	*	0.333	0.31	*	0.33	0.37	*	0.333	0.31
42	0	0	0	1.00	1.00	1.00	0	0	0
44	0.50	0.50	0.50	0.50	0.50	0.5	0	0	0
46	0.50	0.50	0.38	0.50	0.50	0.62	0	0	0
47	0.50	0.50	0.47	0.50	0.50	0.53	0	0	0
51	0.50	0.50	0.50	0.50	0.50	0.50	0	0	0

SSE Model 1 = 0, SSE Model 2 = 0.104

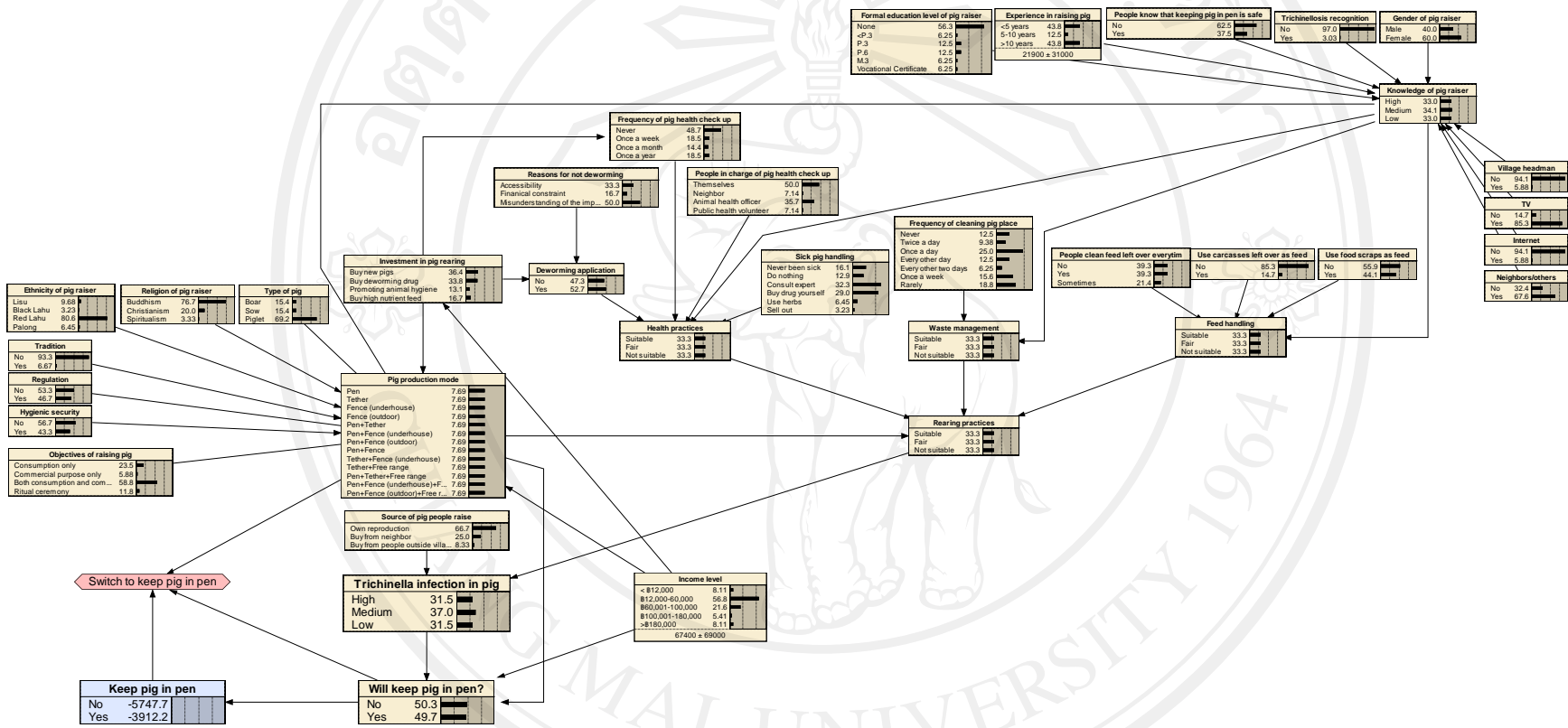


Figure C-3: Trichinella infection risk framework (animal health perspective with decision and utility nodes) – Model 2

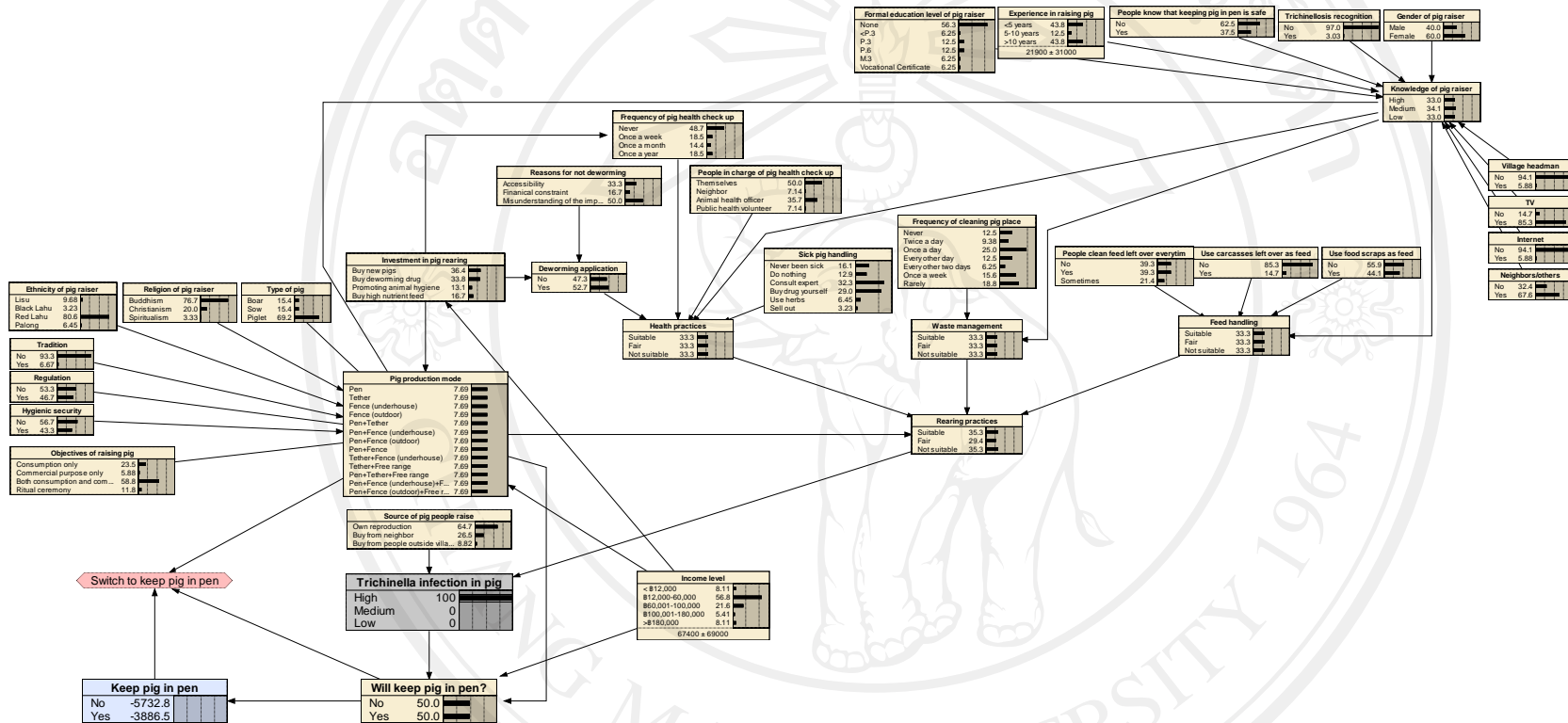


Figure C-4: Trichinella infection risk framework (animal health perspective with decision and utility nodes) – Model 2, when there is information about the level of risk that pigs will be infected by Trichinella



Appendix D

Human health-relevant information

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Table D-1: Economic losses of illness and death per capita from Trichinellosis in human

Unit: Baht

Economic losses	Severity ¹			
	Average	High	Medium	Low
Direct costs				
Hospital operating costs	22,773.81	115,067.50	11,696.67	5,795.20
OPD costs	1,778.07	-	1,636.67	1,956.40
Pharmacy	248.07	-	260.11	226.40
Lab investigation	1,300.00	-	1,195.56	1,488.00
Service	202.14	-	180.00	242.00
Radiology	195.00	-	220.00	1,990.40
IPD costs	22,745.20	115,067.50	10,060.00	3,838.00
Room and meal	2,853.33	7,200.00	2,700.00	820.00
Pharmacy	6,506.53	41,717.50	1,313.78	467.80
Lab investigation	3,040.00	9,455.00	2,299.44	1,199.00
Radiology	630.00	1,265.00	548.57	186.67
Service	2,784.00	8,280.00	2,433.33	660.00
Medical supplies	8,218.33	21,430.00	2,775.00	450.00
Anesthetic service	13,520.00	38,830.00	870.00	-
Special test	2,000.00	-	2,000	2,000
Blood	12,620.00	12,620	-	-
Serodiagnosis	200.00	200.00	200.00	200.00
Total direct costs	22,973.81	115,267.50	11,896.67	5,995.20
Indirect costs				
Transportation ²	327.25	102.00	347.56	380.80
Absenteeism ³	1,790.63	2,325.00	1,966.67	1,260.00
Premature mortality ⁴	2,340.00	2,340.00	-	-
Total indirect costs	2,410.38	4,767.00	2,314.22	1,640.80
Total economic losses⁵	25,384.19	120,034.50	14,210.89	7,636.00

Source (raw data): Acting Lt.Sathian Pattamawath, Pua Crown Prince Hospital, Nan Province.

¹Levels of the severity is determined by Assoc.Prof.Dr.Pichart Uparanukraw, Department of Parasitology, Faculty of Medicine, Chiang Mai University.²Transportation cost = Gasoline cost per km.×distance from village to hospital×days visiting hospital
Gasoline cost per km. = 4 Baht (Diesel, 29.99Baht/litre), avg.distance from village to hospital = 17 km.³Absenteeism = Absent days×wage per day⁴Premature mortality cost = (Life expectancy at birth of this population - Average age of the villagers)×12 months×wage per day

Life expectancy at birth = 40.9 ys, average age of the villagers = 39.6 yrs, wage per day = 150 Baht.

⁵Total economic losses per capita, calculated by author.

Table D-2: Utility table of human health perspective

Scenarios	RTH	F6	D2	F15	U2
1	H	R	N	N	-120,034.50
2 ¹	H	R	N	Y	60,017.25
3	H	R	Y	N	-126,034.50
4	H	R	Y	Y	114,034.50
5	H	C	N	N ²	0
5	H	C	N	Y	0
6	H	C	Y	N ²	-6,000.00
6	H	C	Y	Y	-6,000.00
1	M	R	N	N	-14,210.89
2 ¹	M	R	N	Y	7,105.44
3	M	R	Y	N	-20,210.89
4	M	R	Y	Y	8,210.89
5	M	C	N	N ²	0
5	M	C	N	Y	0
6	M	C	Y	N ²	-6,000.00
6	M	C	Y	Y	-6,000.00
1	L	R	N	N	-7,636.00
2 ¹	L	R	N	Y	3,818.00
3	L	R	Y	N	-13,636.00
4	L	R	Y	Y	1,636.00
5	L	C	N	N ²	0
5	L	C	N	Y	0
6	L	C	Y	N ²	-6,000.00
6	L	C	Y	Y	-6,000.00

¹U2 of these scenarios = cost saved from being Trichinellosis×probability to divert the behavior back to consume raw or undercooked meat (we assume to be 0.50).

²These cases mean they continuing consume cooked meat.

Possible scenarios

1. Risk loving without intervention

This scenario considers those who love to eat raw or undercooked meat. They are seen as the risk lovers. Without any intervention, these people continue consuming raw or undercooked meat. They face the possibility of getting Trichinellosis and may bear some economic losses from the illness. The size of the losses depends on the severity of the illness.

2. Diverting risk without intervention

This scenario considers those who previously love to eat raw or undercooked meat and then divert the behavior to stop consuming it without any intervention or being educated. To stop consuming raw or undercooked meat, we can say that the risk of being Trichinellosis will be 0%. However, we assume that these people can easily divert behaviors back to consume raw or undercooked meat.

3. Risk loving with intervention (ineffective intervention)

This scenario considers the situation when there is an intervention from an institution attempting to encourage people to stop consuming raw or undercooked meat. The institution bears the cost from introducing its campaign. Though people are educated about the danger of consuming raw or undercooked meat, they tend not to be aware of. The campaign is ineffective to change their behaviors. These people face the possibility of getting Trichinellosis and may bear some economic losses from the illness. The size of the losses depends on the severity of the illness.

4. Diverting risk with intervention (effective intervention)

This scenario considers the situation when there is an intervention from an institution attempting to encourage people to stop consuming raw or undercooked meat. The institution bears the cost from introducing its campaign. After people are educated about the danger of consuming raw or undercooked meat, they tend to divert their behaviors. These people can save the economic losses from the illness. The size of the losses depends on the possibility that they could get Trichinellosis if they do not divert the behavior.

5. Risk aversion without intervention

This scenario considers those who already aware the danger of consuming raw or undercooked meat and never consuming some. Without the intervention, there are no gains and no losses.

6. Risk aversion with intervention

This scenario considers the situation when there is an intervention from an institution attempting to encourage people to stop consuming raw or undercooked meat. The institution bears the cost from introducing its campaign. However, the intervention does not have an effect on those who already aware the danger of consuming raw or undercooked meat because they never consuming some

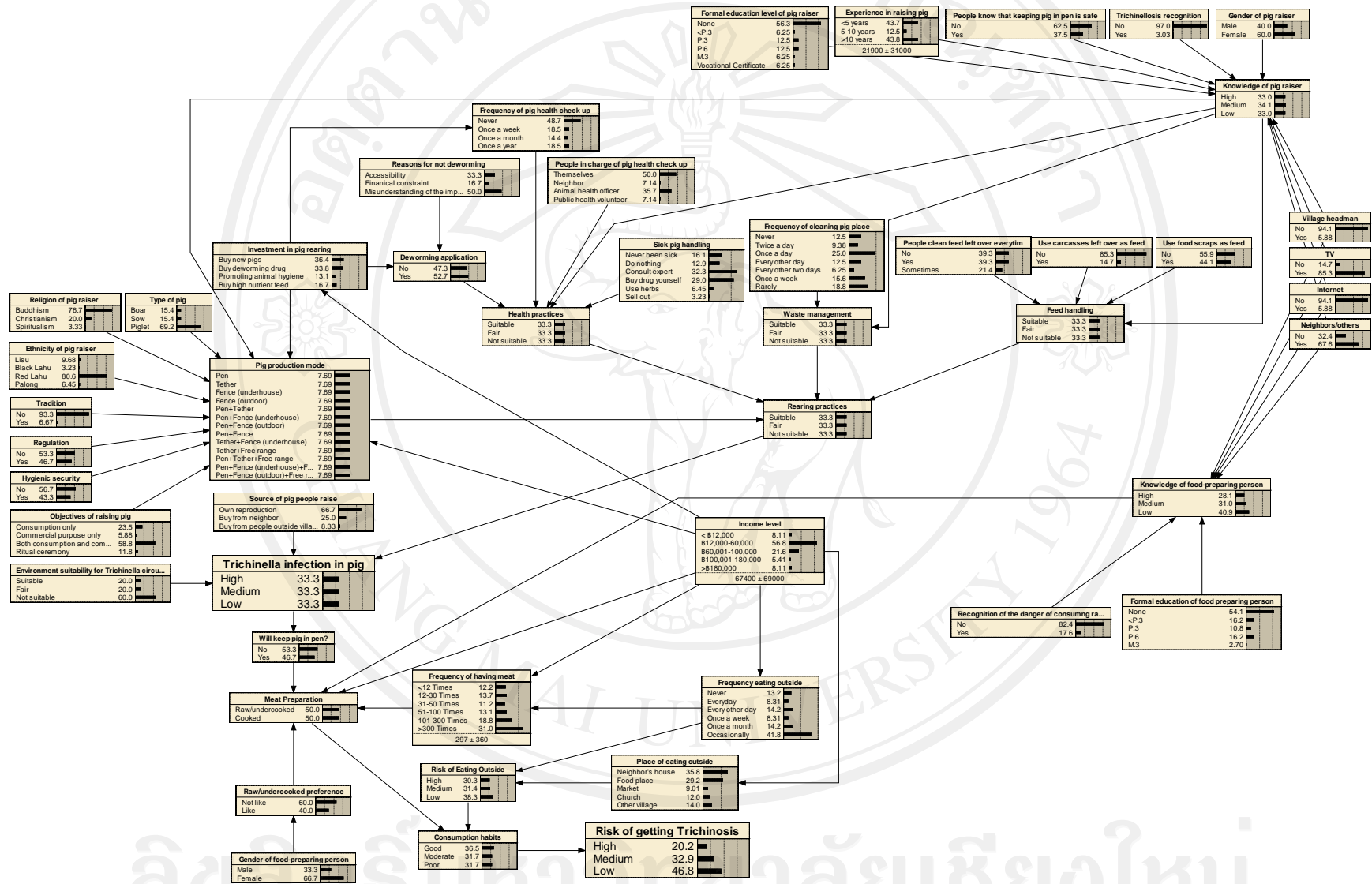


Figure D-1: Trichinella infection risk framework (human perspective) – Model 1

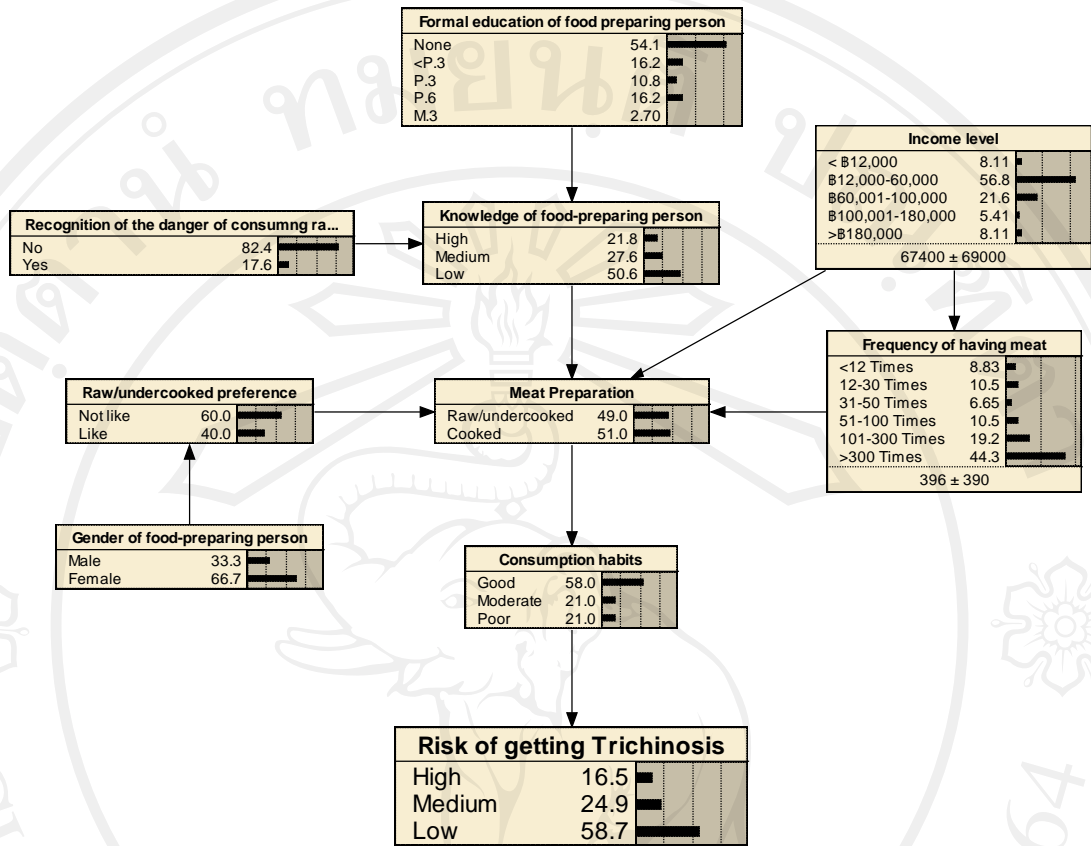


Figure D-2: Trichinellosis risk framework (human perspective) – Model 2

Table D-3: Scoring rule results of the Trichinellosis risk in human

Scoring rule results	Values	
	Model 1	Model 2
Logarithmic loss	0.6074	0.6107
Quadratic loss	0.3346	0.3403
Spherical payoff	0.7957	0.7882
Error rate	33.33%	33.33%

Table D-4: Probability table of the Trichinellosis risk in human

Household	P(RTH=High)			P(RTH =Medium)			P(RTH =Low)		
	Observed	Predicted		Observed	Predicted		Observed	Predicted	
		Model 1	Model 2		Model 1	Model 2		Model 1	Model 2
1	0	0	0	1	0	0	0	1	0
10	0	0	0	10	0	0	0	10	0
13	0	0	0	13	0	0	0	13	0
15	0	0	0	15	0	0	0	15	0
17	0	0	0	17	0	0	0	17	0
19	0.33	0.24	0.24	19	0.33	0.24	0.24	19	0.33
20	0.33	0.08	0.05	20	0.33	0.08	0.05	20	0.33
21	0.33	0.17	0.08	21	0.33	0.17	0.08	21	0.33
22	0	0	0	22	0	0	0	22	0
23	0	0	0	23	0	0	0	23	0
25	0.33	0.14	0.14	25	0.33	0.14	0.14	25	0.33
26	0	0	0	26	0	0	0	26	0
27	0	0	0	27	0	0	0	27	0
31	0	0	0	31	0	0	0	31	0
36	0.67	0.49	0.49	36	0.67	0.49	0.49	36	0.67
37	1.00	1.00	1.00	37	1.00	1.00	1.00	37	1.00
41	0	0	0	41	0	0	0	41	0
42	1.00	1.00	1.00	42	1.00	1.00	1.00	42	1.00
44	0.67	0.49	0.48	44	0.67	0.49	0.48	44	0.67
46	0.67	0.40	0.40	46	0.67	0.40	0.40	46	0.67
47	0	0	0	47	0	0	0	47	0
51	0.33	0.16	0.11	51	0.33	0.16	0.11	51	0.33

SSE Model 1 = 7.955, SSE Model 2 = 8.207

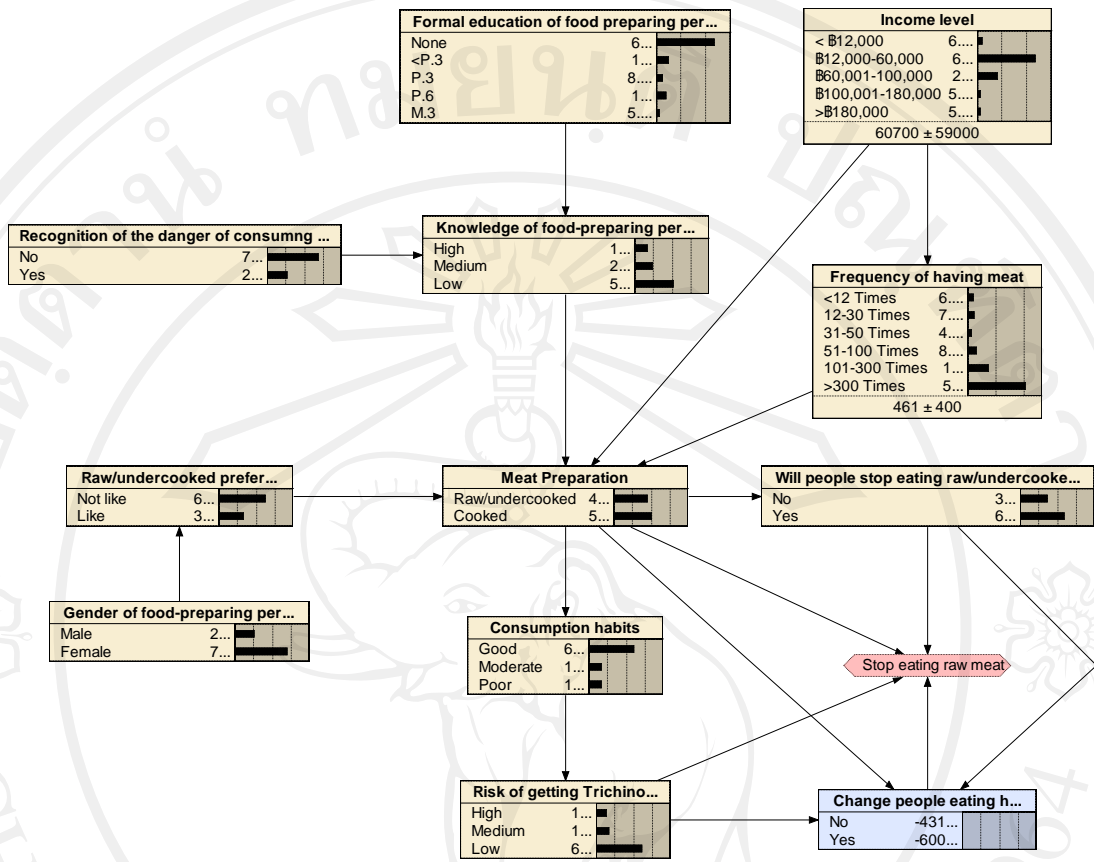


Figure D-3: Trichinellosis risk framework (human health perspective with decision and utility nodes) – Model 2

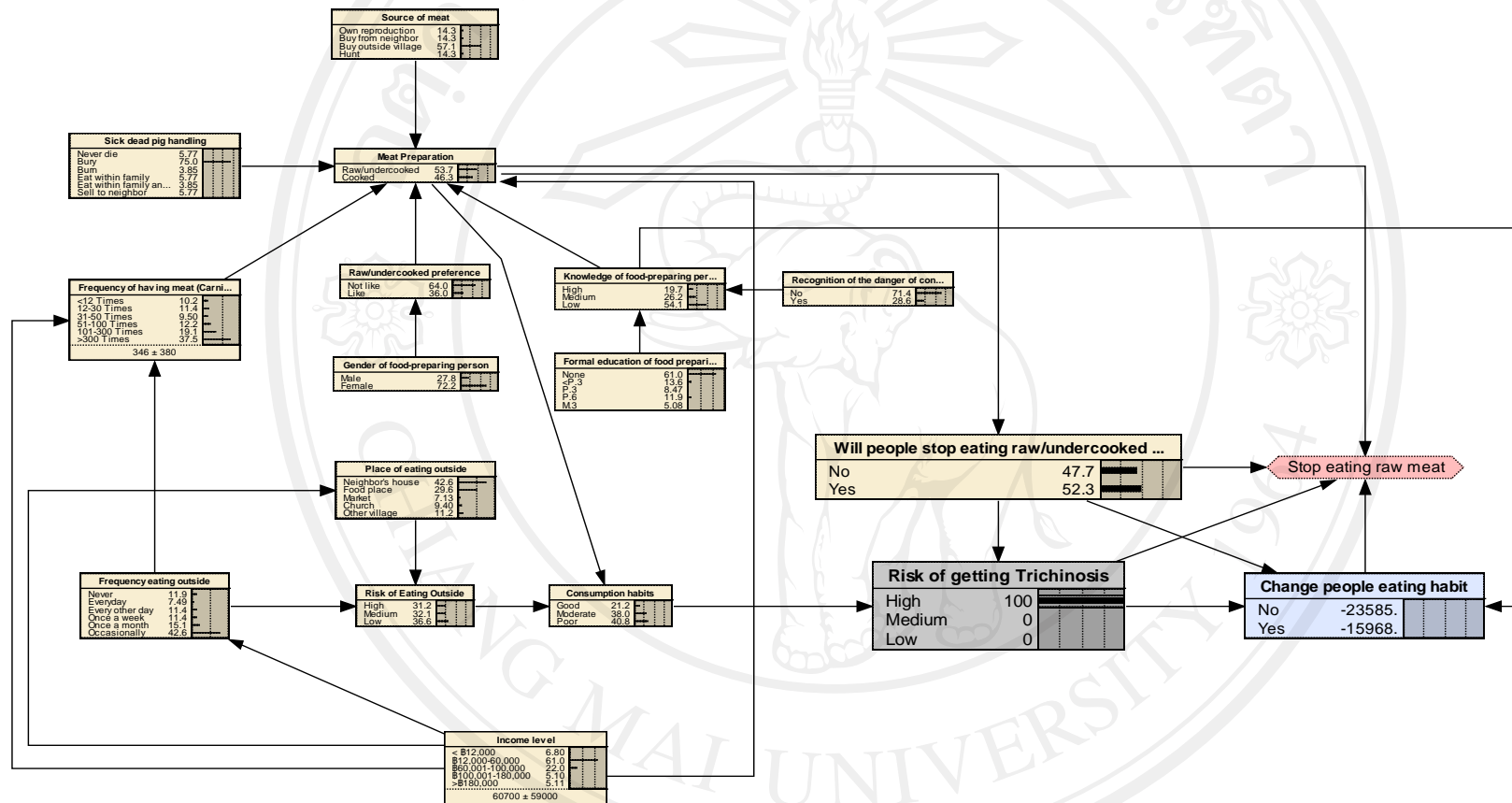


Figure D-4: Trichinellosis risk framework (human health perspective with decision and utility nodes) – Model 2, when there is information about the level of risk that people will be Trichinosis



Appendix E

Abbreviations of variables used in Bayesian Belief Network

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Table E-1: Abbreviations of variables used in Bayesian Belief Network

Abbrev.	Topic	States	Descriptions
TIP	Trichinella infection in pig	Not infected	Pig is infected by Trichinella
		Infected	Pig is not infected by Trichinella
RTH	Risk of getting Trichinellosis in human	High	High risk of getting Trichinellosis in human
		Medium	Medium risk of getting Trichinellosis in human
		Low	Low risk of getting Trichinellosis in human
D ₁	Campaign to support pig pen	No	Do not support pig pen to farmer
		Yes	Support pig pen to farmer
D ₂	Campaign to encourage people to stop eating raw/undercooked meat	No	Do not launch a campaign to encourage people to stop eating raw/undercooked meat
		Yes	Launch a campaign to encourage people to stop eating raw/undercooked meat
U ₁	Benefits from switching to keep pigs in pen	(see Table C-3 and C-4)	Expected benefits a pig grower will receive from the decision of an institution to support the construction cost of pen for him
U ₂	Benefits from stop eating raw/undercooked meat	(see Table D-3 and D-4)	Expected benefits an individual will receive from the decision of an institution to encourage them to stop consuming raw/undercooked meat
X ₁	Gender of pig raiser	Male	Pig raiser is a man
		Female	Pig raiser is a woman
X ₂	Ethnicity of pig raiser	Lisu	Pig raiser is Lisu
		Black Lahu	Pig raiser is Balck Lahu
		Red Lahu	Pig raiser is Red Lahu
		Palong	Pig raiser is Palong
X ₃	Religion of pig raiser	Buddhism	Pig raiser is Buddhist
		Christianity	Pig raiser is Christian
		Spiritualism	Pig raiser pays respect to spirits
X ₄	Formal education level of pig raiser	None	Pig raiser does not go to school
		<P.3	Pig raiser does not finish Prathom 3 (Grade 3)
		P.3	Pig raiser finishes Prathom 3

Abbrev.	Topic	States	Descriptions
			(Grade 3)
		P.6	Pig raiser finishes Prathom 6 (Grade 6)
		M.3	Pig raiser finishes Mathayom 3 (Grade 9)
		Vocational Certificate	Pig raiser finishes Vocational Certificates
X ₅	Experience in pig raising	<5 years	People have raised pig less than 5 years
		5-10 years	People have raised pig 5-10 years
		>10 years	People have raised pig more than 10 years
X ₆	Source of pig people raise	Own reproduction	Pigs people raise are from their own reproduction
		Buy from neighbor	Pigs people raise are from their neighbor
		Buy from people outside village	Pigs people raise are from outside village
X ₇	Type of pig	Boar	People raise boar
		Sow	People raise sow
		Piglet	People raise piglet
X ₈	Pig production mode	Free range	People allow pig to wandering around the village
		Tether	People tether pig with rope underneath their house
		Fence (under house)	People keep pig in fence underneath their house
		Fence (outdoor)	People keep pig in fence located outdoor
		Pen	People keep pig in pen
X ₉	Convenience	No	People choose pig production mode not based on convenience
		Yes	People choose pig production mode based on convenience
X ₁₀	Hygienic security	No	People choose pig production mode not based on hygienic security
		Yes	People choose pig production mode based on hygienic security
X ₁₁	Regulation	No	People choose pig production mode not based on regulation

Abbrev.	Topic	States	Descriptions
		Yes	People choose pig production mode based on regulation
X ₁₂	Tradition	No	People choose pig production mode not based on tradition
		Yes	People choose pig production mode based on tradition
X ₁₃	Social responsibility	No	People choose pig production mode not based on social responsibility
		Yes	People choose pig production mode based on social responsibility
X ₁₄	Animal welfare	No	People choose pig production mode not based on animal welfare
		Yes	People choose pig production mode based on animal welfare
X ₁₅	Financial constraint	No	People choose pig production mode not based on financial constraint
		Yes	People choose pig production mode based on financial constraint
X ₁₆	Frequency of pig health check up	Never	Never check pig health
		Once a week	Check pig health once a week
		Once a month	Check pig health once a month
		Once a year	Check pig health once a year
X ₁₇	People in charge of pig health check up	Themselves	People check pig health by themselves
		Neighbor	People ask neighbor to check pig health
		Animal health officer	People ask animal health officer to check pig health
		Public health volunteer	People ask public health volunteer to check pig health
X ₁₈	Sick pig handling	Never been sick	People's pigs have never been sick
		Do nothing	People do nothing when their pigs are sick
		Consult expert	People consult with expert if

Abbrev.	Topic	States	Descriptions
			their pigs are sick
		Buy drug themselves	People buy drug for their pigs when they get sick
		Use herbs	People use herbs for their pigs when they get sick
		Sell out	People sell out their pigs when they are sick
X ₁₉	Deworming application	No	Do not use deworming drug
		Yes	Use deworming product
X ₂₀	Trichinellosis recognition	No	People do not know anything about Trichinellosis
		Yes	People know what Trichinellosis is
X ₂₁	People recognition that keeping in pen is safe	No	People know that keeping pig in pen is hygienically safe
		Yes	People do not know that keeping pig in pen is hygienically safe
X ₂₂	Household's decision to keep pigs in pen	No	If people know that keeping pig in pen is hygienically safe, they will decide to keep pig in pen
		Yes	Though people know that keeping pig in pen is hygienically safe, they will not to keep pig in pen
X ₂₃	Use of food scraps as feed	No	Do not use food scraps as feed
		Yes	Use food scraps as feed
X ₂₄	Use of carcasses left over as feed	No	Do not use carcasses left over as feed
		Yes	Use carcasses left over as feed
X ₂₅	Carcasses left over handling after slaughtering a pig	No left over	There is not carcasses left over after slaughtering a pig
		Sweep down to the floor	After slaughtering a pig, people sweep carcasses left over down to the floor
		Pet feed	After slaughtering a pig, people use carcasses left over as pet feed
		Pig feed	After slaughtering a pig, people use carcasses left over as pig feed
		Put in trash can	After slaughtering a pig,

Abbrev.	Topic	States	Descriptions
			people put carcasses left over in trash can
		Bury	After slaughtering a pig, people bury carcasses left over
X ₂₆	Frequency of cleaning surrounding	Everyday	People clean surrounding everyday
		Every other day	People clean surrounding every other day
		Once a week	People clean surrounding once a week
		Rarely	People rarely clean surrounding
		Never	People never clean surrounding
X ₂₇	Wet garbage handling	Sweep away	People sweep wet garbage down to the floor
		Use as feed	People use wet garbage as feed
		Bury	People bury wet garbage
		Burn	People burn wet garbage
		Put in the community trash can	People put wet garbage in the community trash can
		Throw in forest	People throw wet garbage in forest nearby
X ₂₈	Solid garbage handling	Sweep away	People sweep solid garbage down to the floor
		Bury	People bury solid garbage
		Burn	People burn solid garbage
		Put in the community trash can	People put solid garbage in the community trash can
		Thrown in forest	People throw solid garbage in forest nearby
		Sell	People sell solid garbage
		Reuse	People reuse solid garbage
X ₂₉	Frequency of cleaning pig place	Never	People never clean pig place
		Twice a day	People clean pig place twice a day
		Once a day	People clean pig place once a day
		Every other day	People clean pig place every other day
		Every other two	People clean pig place every

Abbrev.	Topic	States	Descriptions
		days	other two days
		Once a week	People clean pig place once a week
		Rarely	People rarely clean pig place
X ₃₀	People clean feed left over every time after feeding	No	People do not clean feed left over every time after feeding
		Yes	People clean feed left over every time after feeding
		Sometimes	People sometimes clean feed left over every time after feeding
X ₃₁	Rat abundance	None	People see none of rat around the house
		1-5	People see 1-5 rats around the house
		5-10	People see 5-10 rats around the house
		>10	People see more than 10 rats around the house
X ₃₂	Recognition of rat danger	No	People do not know that rat is dangerous
		Yes	People know that rate is dangerous
X ₃₃	Wildlife presence	No	People see none of wildlife in the village
		Yes	People see some of wildlife in the village
X ₃₄	Rat control	No	People do not use rat control
		Yes	People use rat control
X ₃₅	Sick dead pig handling	Never die	There is no pig that is dead with sickness
		Bury	People bury sick dead pig
		Burn	People burn sick dead pig
		Eat within family	People consume sick dead pig within their family
		Eat within family and share with neighbor	People consume sick dead pig within their family and share to neighbor
		Sell to neighbor	People sell sick dead pig to neighbor
X ₃₆	Dead animal handling	Bury	People usually bury dead animal
		Burn	People usually burn dead animal
		Never seen one	People never see any animal

Abbrev.	Topic	States	Descriptions
		die	die before
X ₃₇	Place to slaughter pig	Back yard	People slaughter pig back yard
		Local butcher	People slaughter pig at local butcher
		Inside pen	People slaughter pig inside the pen
X ₃₈	Environment cleanliness	Clean	The environment of this house is clean
		Fair	The environment of this house is fair
		Dirty	The environment of this house is dirty
X ₃₉	Environment suitability of Trichinella circulation	Suitable	The environment of this household is suitable for Trichinella circulation
		Fair	The environment of this household is fair for Trichinella circulation
		Not suitable	The environment of this household is not suitable for Trichinella circulation
X ₄₀	Feed handling	Suitable	The feed handling is suitable
		Fair	The feed handling is fair
		Not suitable	The feed handling is not suitable
X ₄₁	Health practices	Suitable	The health practices for their pig is suitable
		Fair	The health practices for their pig is fair
		Not suitable	The health practices for their pig is not suitable
X ₄₂	Knowledge of pig raiser	High	Pig raiser has high knowledge about pig rearing
		Medium	Pig raiser has medium knowledge about pig rearing
		Low	Pig raiser has low knowledge about pig rearing
X ₄₃	Rearing practice	Suitable	Rearing practice is suitable
		Fair	Rearing practice is fair
		Not suitable	Rearing practice is not suitable
X ₄₄	Income level	<฿12,000	People receive less than 12,000 Baht annually which is considered to be under poverty (earn less than a US

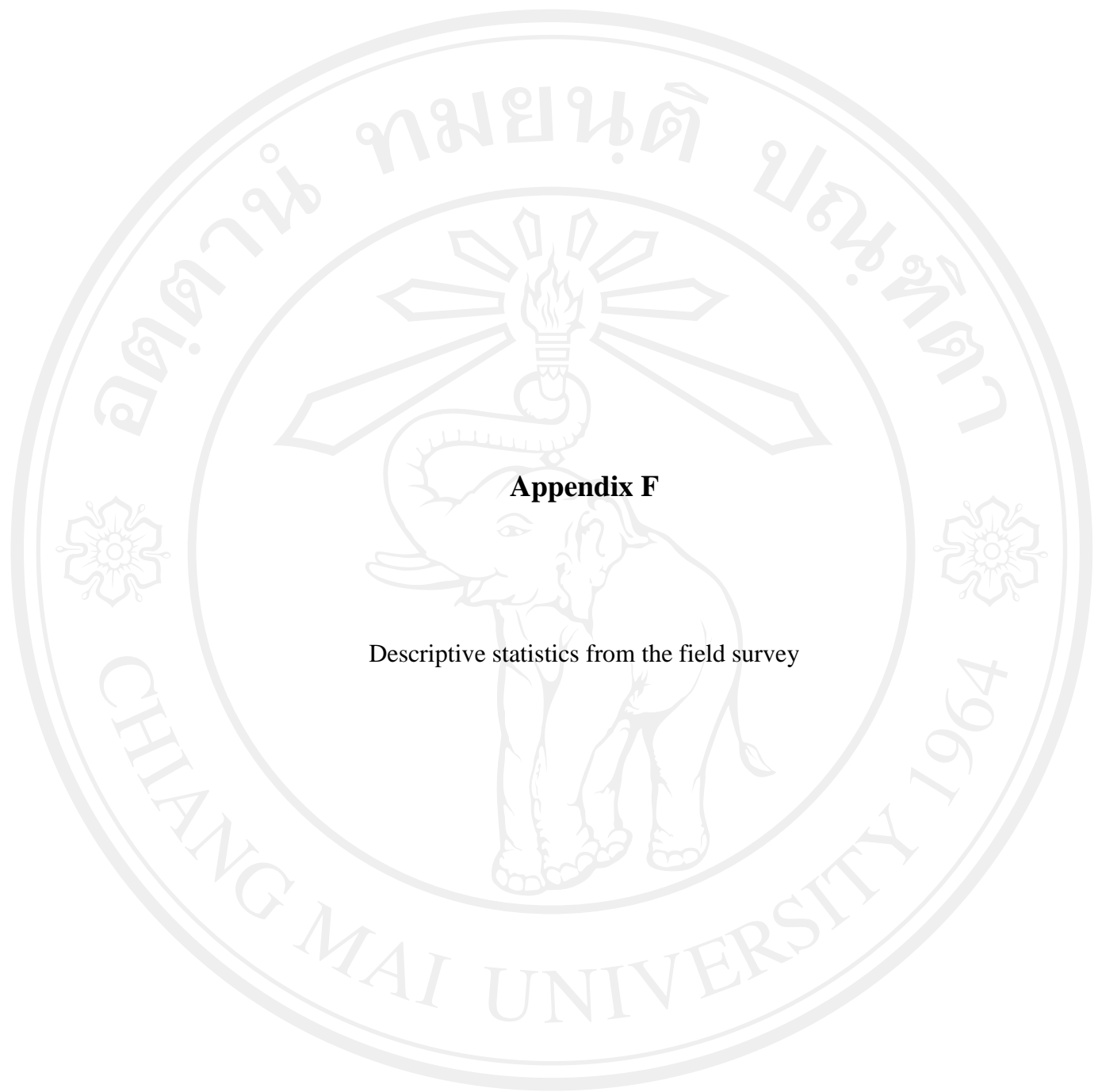
Abbrev.	Topic	States	Descriptions
			dollar a day)
		฿12,00-60,000	People receive 12,000-60,000 Baht annually which is considered to be poor
		฿60,001-100,000	People receive 12,000-60,000 Baht annually which is considered to be normal
		฿100,001-180,000	People receive 12,000-60,000 Baht annually which is considered to be better off
		>฿180,000	People receive greater than 180,000 Baht annually which is the goal that Ministry of Agricultural and Cooperatives set to achieve in 2013
X ₄₅	Investment in pig rearing	Buy new pigs	People use some of their money to invest in buying new pigs
		Buy deworming drug	People use some of their money to invest in buying deworming drug
		Promote animal hygiene	People use some of their money to invest in promoting animal hygiene
		Buy high nutrient feed	People use some of their money to invest in buying high nutrient feed
X ₄₆	Objective of pig rearing	Consumption only	People raise pig for their own consumption only
		Commercial purpose only	People raise pig for commercial purpose only
		Both consumption and commercial purpose	People raise pig for both consumption and commercial purpose
		Ritual use	People raise pig for ritual use only
X ₄₇	Ratio of time spent for pig rearing per total time spent on career	Low	Time spent for pig rearing is around 0-30% of the total time spent on career
		Medium	Time spent for pig rearing is around 31-70% of the total time spent on career
		High	Time spent for pig rearing is around 71-100% of the total

Abbrev.	Topic	States	Descriptions
			time spent on career
X ₄₈	Ratio of revenue receiving from pig rearing per total revenue	Low	Revenue receiving from pig rearing is around 0-30% of the total revenue
		Medium	Revenue receiving from pig rearing is around 31-70% of the total revenue
		High	Revenue receiving from pig rearing is around 71-100% of the total revenue
X ₄₉	Newspaper	No	People do not receive information through newspaper
		Yes	People receive information through newspaper
X ₅₀	Radio	No	People do not receive information through radio
		Yes	People receive information through radio
X ₅₁	TV	No	People do not receive information through television
		Yes	People receive information through television
X ₅₂	Public announcement	No	People do not receive information through public announcement
		Yes	People receive information through public announcement
X ₅₃	Magazine/journal	No	People do not receive information through magazine or journal
		Yes	People receive information through magazine or journal
X ₅₄	Neighbors/others	No	People do not receive information through neighbors or others
		Yes	People receive information through neighbors or others
X ₅₅	Internet	No	People do not receive information through internet
		Yes	People receive information through internet
X ₅₆	Village headman	No	People do not receive information through village

Abbrev.	Topic	States	Descriptions
			headman
		Yes	People receive information through village headman
X ₅₇	Waste management	Suitable	Waste management is suitable
		Fair	Waste management is fair
		Not suitable	Waste management is not suitable
X ₅₈	Gender of food-preparing person	Male	Food-preparing person is a man
		Female	Food-preparing person is a woman
X ₅₉	Formal education of food-preparing person	None	Food-preparing person does not go to school
		<P.3	Food-preparing person does not finish Prathom 3 (Grade 3)
		P.3	Food-preparing person finishes Prathom 3 (Grade 3)
		P.6	Food-preparing person finishes Prathom 6 (Grade 6)
		M.3	Food-preparing person finishes Mathayom 3 (Grade 9)
X ₆₀	Meat preparation	Cooked white pig	People consume cooked white pig
		Raw/undercooked white pig	People consume raw/undercooked white pig
		Cooked native pig	People consume cooked native pig
		Raw/undercooked native pig	People consume raw/undercooked native pig
		Cooked wild boar	People consume cooked wild boar
		Raw/undercooked wild boar	People consume raw/undercooked wild boar
		Cooked varanus	People consume cooked varanus
		Cooked wild cat	People consume cooked wild cat
		Cooked snake	People consume cooked snake
		Cooked dog	People consume cooked dog
		Cooked rat	People consume cooked rat
		Cooked chicken	People consume cooked chicken

Abbrev.	Topic	States	Descriptions
X ₆₁	Place of eating outside	Neighbor's house	When eating outside of the house, people usually go to their neighbor's house
		Food place	When eating outside of the house, people usually go to food place
		Market	When eating outside of the house, people usually go to market
		Church	When eating outside of the house, people usually go to church
		Other village	When eating outside of the house, people usually go to other village
X ₆₂	Raw/undercooked meat consumption preference	Not like	People do not like consuming raw/undercooked meat
		Like	People like consuming raw/undercooked meat
X ₆₃	Recognition of the danger of consuming raw/undercooked meat	No	People do not know the danger of consuming raw/undercooked meat
		Yes	People know the danger of consuming raw/undercooked meat
X ₆₄	Individual's decision to stop eating raw/undercook meat	No	Though people know the danger of consuming raw/undercooked meat, they will not stop eating it
		Yes	If people do not know the danger of consuming raw/undercooked meat, they will stop eating it
X ₆₅	Source of meat	Own reproduction	People consume meat acquiring from their own reproduction
		Buy from neighbor	People consume meat that they buy from neighbor
		But from outside of the village	People consume meat that they buy from outside of the village
		Hunt	People consume meat acquiring from hunting
X ₆₆	Frequency of consuming meat in a	<12 times	People consume meat less than 12 times in a year

Abbrev.	Topic	States	Descriptions
	year	12-30 times	People consume meat around 12-30 times in a year
		31-50 times	People consume meat around 31-50 times in a year
		51-100 times	People consume meat around 51-100 times in a year
		101-300 times	People consume meat around 101-300 times in a year
		>300 times	People consume meat more than 300 times in a year
X ₆₇	Consumption habits	Good	The consumption habits is good
		Fair	The consumption habits is fair
		Poor	The consumption habits is poor
X ₆₈	Knowledge of food-preparing person	High	Food-preparing person has high knowledge about how to prepare good food
		Medium	Food-preparing person has medium knowledge about how to prepare good food
		Low	Food-preparing person has low knowledge about how to prepare good food
X ₆₉	Risk of eating outside the house	High	People face high risk of be infected by Trichinellosis when eating outside
		Medium	People face medium risk of be infected by Trichinellosis when eating outside
		Low	People face low risk of be infected by Trichinellosis when eating outside



Appendix F

Descriptive statistics from the field survey

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่

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Table F-1: General information of the respondents

Unit: Household

Name of village	Number (percent)		
	Raise pig	Do not raise pig	Total
Huai Ma Fueang	23 (42.59)	5 (9.26)	28 (51.85)
Huai Chan Si	23 (42.59)	3 (5.55)	26 (48.15)
Total	46 (85.18)	8 (14.81)	54 (100)
General information of the respondents	Unit: Person		
Respondent's main responsibility			
Prepare food		11 (20.37)	
Raise pig		9 (16.67)	
Both		34 (62.96)	
Average age of respondents(SD.)		39.59 (15.08)	
Average member in family (SD.)		4.70 (2.01)	

Table F-2: General information of the pig growers

Unit: Household

	Number (percent)
Gender of pig growers	
Male	20 (42)
Female	28 (58)
Ethnicity of pig growers	
Lisu	4 (8.89)
Black Lahu	1 (2.22)
Red Lahu	39 (86.67)
Palong	1 (2.22)
Identification of pig growers	
None	-
ID card	43 (93.48)
Burmese migrant (pink card)	1 (2.17)
Highlander (green card)	2 (4.35)
Religion of pig growers	
Buddhism	35 (74.47)
Christianity	10 (21.28)
Islam	-
Spirituality	2 (4.25)
Formal education of pig growers	
None	29 (65.91)
<P.3	4 (9.09)
P.3	3 (6.82)
P.6	4 (9.09)
M.3	3 (6.82)
Vocational Certificate	1 (2.27)
Objectives of pig raising	
Consumption only	8 (17.39)
Commercial purpose only	-
Both consumption and commercial purpose	36 (78.26)
Ritual use	28 (60.87)
Average year of experience in pig raising (SD.)	11.45 (11.85)
Average month of raising a pig until it can be sold (SD.)	10.17 (4.58)
Average selling price of a pig	4,230.83 (2,021.99)
Average weight (kg.) of pig to be sold (SD.)	38.37 (15.51)

Unit: Household

Table F-3: Knowledge and attitude of the pig growers

Unit: Household

	Number (percent)
Trichinellosis recognition	
No	49 (94.23)
Yes	3 (5.77)
People know that keep pigs in pen is safe	
No	28 (59.57)
Yes	19 (40.43)
People will keep pig in pen if they know that it leads to hygienic security	
No	15 (34.09)
Yes	27 (61.36)
Maybe	2 (4.55)

Table F-4: Pig production practices

	Number (percent)
Place to kill pig	
Backyard	44 (95.65)
Local butcher	1 (2.17)
Inside pen	1 (2.17)
Feed	
Food scrap	23 (42.59)
Carcasses left over	3 (5.56)
Corn	28 (51.85)
Rice chaff	43 (79.63)
Banana trunk	43 (79.63)
Vegetable	19 (35.19)
Fruit	3 (5.56)
Instant feed	18 (33.33)
Supplement	5 (9.26)
Frequency of pig health check up	
Never	32 (71.11)
Once a week	5 (11.11)
Once a month	1 (2.22)
Once a year	7 (15.56)
Person in charge of pig health check up	
Themselves	7 (53.85)
Neighbor	2 (15.38)
Animal health officer	4 (30.77)
Public health volunteer	1 (7.69)
Deworming	
No	8 (17.39)
Yes	38 (82.61)
Average application annually (SD.)	1.62 (1.97)
Reason for not using deworming drug	
Difficulty to get	5 (31.25)
Price	2 (12.5)
Misunderstanding of the importance	9 (56.25)
Not important	4 (25)
Don't know	2 (12.5)
Pigs are already healthy	2 (12.5)
Pigs are too old	1 (6.25)
Sick pig handling	
Never been sick before	8 (15.09)
Do nothing	12 (22.64)
Ask someone to check	10 (18.87)
Heal it themselves	18 (33.96)
Use herb	5 (9.43)
Sell out	1 (1.89)

Table F-5: Source of pigs

	Number of pigs (percent)			Total
	Own reproduction	Buy from neighbor	Buy from other villages	
Boar	34 (82.92)	5 (12.20)	2 (4.88)	41 (15.89)
Sow	45 (75)	13 (21.67)	2 (3.33)	60 (23.26)
Piglet	142 (90.45)	11 (7)	4 (2.55)	157 (60.85)
Total	221 (85.66)	29 (11.24)	8 (3.10)	258 (100)

Table F-6: Pig production modes

	Number of pig (percent)					Total
	Free range	Tether	Fence (under house)	Fence (outdoor)	Pen	
Boar	1 (2.44)	4 (9.76)	4 (9.76)	3 (7.32)	29 (70.73)	41 (15.89)
Sow	-	12 (0.20)	6 (0.10)	3 (0.05)	39 (0.65)	60 (23.26)
Piglet	32 (20.38)	13 (8.28)	33 (21.02)	9 (5.73)	70 (44.59)	157 (60.85)
Total	33 (12.79)	29 (11.24)	43 (16.67)	15 (5.81)	138 (53.49)	258 (100)

Unit: Household

Number (percent)	
Reasons why people choose that type of pig production mode	
Convenience	24 (52.17)
Hygienic safe	19 (41.30)
Community regulation	23 (50)
Tradition	4 (8.70)
Social responsibility	3 (6.52)
Animal welfare	3 (6.52)
Financial constraint	9 (19.57)

Table F-7: General information of food-preparing persons

Unit: Household

	Number (percent)
Gender of food-preparing person	
Male	16 (28.57)
Female	40 (71.43)
Ethnicity of food-preparing person	
Lisu	7 (13)
Black Lahu	2 (4)
Red Lahu	45 (83)
Identification of food-preparing person	
None	-
ID card	52 (98.11)
Non-nationality card	1 (1.89)
Religion of food-preparing person	
Buddhism	41 (75.93)
Christianity	12 (22.22)
Islam	-
Spirituality	1 (1.85)
Formal education of food-preparing person	
None	35 (64.81)
<P.3	7 (12.96)
P.3	4 (7.41)
P.6	6 (11.11)
M.3	2 (3.70)
When usually people kill pig	
Not specific	16 (32)
Wedding	28 (56)
Making merit	24 (48)
New year festival	41 (82)
Sacrifice	17 (34)
Funeral	27 (54)
New Rice Alms' ceremony	15 (30)
Commune work	1 (2)
Blessing ceremony	1 (2)
People usually share pork with others	
Never	6 (11.76)
Rarely	3 (5.88)
Sometimes	3 (5.88)
Regularly	36 (70.59)
Occasionally	3 (5.88)
Frequency of consuming meat (carnivore/omnivore) outside home in a year	
Never	5 (9.26)
Everyday	2 (3.70)
Every other day	5 (9.26)

	Number (percent)
Once a week	5 (9.26)
Once a month	8 (14.81)
Occasionally	29 (53.70)
Place to eat outside	
Neighbor's house	31 (58.49)
Restaurant	26 (49.06)
Market	1 (1.89)
Church	2 (3.77)
Other villages	3 (5.66)

Table F-8: Knowledge and attitude of the pig growers

Unit: Household

	Number (percent)
Recognition of the danger of consuming raw/undercooked meat	
No	39 (72.22)
Yes	15 (27.78)
Raw/undercooked meat preference	
Not like	175 (69.44)
Like	73 (28.97)
Reason why people don't like raw/undercooked meat	
Nasty	24 (72.73)
Harmful	15 (45.46)
Parents don't allow	1 (3.03)
Materials are expensive	1 (3.03)
Reason why people don't like raw/undercooked meat	
Delicious	37 (90.24)
Tradition	13 (31.71)
Tonic health	13 (31.71)
They think it is cool	1 (2.44)
Feel used to	1 (2.44)
It is something to eat with alcohol	5 (12.20)
If people know that eating raw/undercooked meat is harmful, do they still love to eat it?	
Never again	28 (59.57)
Occasionally eat it	7 (14.89)
Eat it as usual	10 (21.28)
Unsure	1 (2.13)
Eat less	1 (2.13)
Reasons why people insist to continue eat raw/undercooked meat even they know its harm	
Own preference	10 (62.50)
Tradition	1 (6.25)
Eat with husband	1 (6.25)
Nothing ever happen	2 (12.5)
Eat deworming drug	2 (12.5)
Reasons why people stop eat raw/undercooked meat	
Scared of the danger	10 (100)

Table F-9: Meat preparation and frequency of meat consumption

Meat preparation	Number (percent) Unit: Household		Average days of consumption in a year (SD.)
	Consume	Not consume	
White pig	52 (96.30)	-	
Cooked	47 (87.04)	-	259.92 (137.16)
Raw/undercooked	32 (59.26)	20 (37.04)	85.28 (105.52)
Native pig	53 (98.15)	-	
Cooked	42 (77.78)	11 (20.37)	72.21 (103.78)
Raw/undercooked	38 (70.37)	15 (27.78)	33.07 (51.74)
Chicken	13 (24.07)	41 (75.93)	
Cooked	13 (24.07)	-	52.15 (43.14)
Raw/undercooked	-	-	-
Wild boar	39 (72.22)	15 (27.78)	
Cooked	38 (70.37)	5 (9.26)	11.92 (8.46)
Raw/undercooked	8 (14.81)	46 (85.19)	1.88 (0.83)
Water monitor	3 (5.56)	51 (94.44)	
Cooked	3 (5.56)	-	1.83 (1.11)
Raw/undercooked	-	-	-
Wild cat	1 (1.85)	53 (98.15)	
Cooked	1 (1.85)	-	1 (37.80)
Raw/undercooked	-	-	-
Snake	20 (37.04)	44 (81.48)	
Cooked	20 (37.04)	-	2 (0.98)
Raw/undercooked	-	-	-
Dog	4 (7.41)	50 (92.59)	
Cooked	4 (7.41)	-	0.85 (0.25)
Raw/undercooked	-	-	-
Rat	5 (9.26)	49 (90.74)	
Cooked	5 (9.26)	-	2.9 (1.02)
Raw/undercooked	-	-	-

Table F-10: Source of meat

Unit: Household

	Number (percent)			
	Own reproduction	Buy from neighbor	Buy from other villages	Hunt
White pig	2 (3.77)	15 (28.30)	38 (71.70)	-
Native pig	33 (61.11)	27 (50)	5 (9.26)	-
Chicken	8 (14.81)	-	8 (14.81)	-
Wild boar	2 (3.70)	13 (24.07)	8 (14.81)	14 (25.93)
Varanus	-	1 (1.85)	-	3 (5.56)
Wild cat	-	1 (1.85)	1 (1.85)	-
Snake	-	2 (3.70)	-	8 (14.81)
Dog	-	4 (7.41)	-	-
Rat	-	2 (3.70)	1 (1.85)	3 (5.56)

Table F-11: Environment-Related Trichinellosis Risk Factors

Unit: Household

	Number (percent)
Carcasses disposal	
No left over	15 (32.61)
Sweep down to the floor	7 (15.22)
Use as pet feed	26 (56.52)
Use as pig feed	3 (6.52)
Put in trash can	3 (6.52)
Bury	1 (2.17)
Sick-dead pig disposal	
Never die	2 (4.35)
Bury	38 (82.61)
Burn	1 (2.17)
Eat it within family	2 (4.35)
Eat it within family and share to neighbor	1 (2.17)
Sell it to neighbor	2 (4.35)
Dead animal disposal	
Bury	41 (82)
Burn	6 (12)
Throw in forest	-
Never seen one die	3 (6)
Frequency of cleaning pig place	
Never	9 (21.95)
Twice a day	2 (4.88)
Once a day	10 (24.39)
Every other day	4 (9.76)
Every other two days	4 (9.76)
Once a week	5 (12.20)
Rarely	7 (17.07)
Frequency of waste disposal	
Never	14 (32.56)
Twice a day	2 (4.65)
Once a day	8 (18.60)
Every other day	7 (16.28)
Every other two days	2 (4.65)
Once a week	7 (16.28)
Rarely	3 (6.98)
People clean feed left over every time	
No	13 (30.95)
Yes	22 (52.38)
Sometimes	7 (16.67)
Frequency of cleaning surrounding	
Everyday	16 (29.63)
Every other day	14 (25.93)
Once a week	14 (25.93)

	Number (percent)
Rarely	10 (18.52)
Garbage handling	
Wet garbage	
Sweep down to the floor	10 (18.52)
Use as animal feed	23 (42.59)
Bury	2 (3.70)
Burn	12 (22.22)
Put in community trash can	8 (14.81)
Throw in forest	12 (22.22)
Solid	
Sweep down to the floor	2 (3.70)
Bury	2 (3.70)
Burn	28 (51.85)
Put in community trash can	13 (24.07)
Throw in forest	8 (14.81)
Sell	7 (12.96)
Reuse	1 (1.85)
Numbers of rat people see each day	
None	14 (28.57)
1-5	27 (55.10)
5-10	-
>10	8 (16.33)
Recognition of rat danger	
No	32 (64)
Yes	18 (36)
Rat control	
No	23 (47.92)
Yes	25 (52.08)
Wild life presence	
No	39 (79.59)
Yes	10 (20.41)

Table F-12: Financial status of the respondents

	Average (SD.)
Source of income	Unit: Baht
Primary source of income	43,776.85 (31,853.63)
Labor (5 persons)	35,140 (14,914.69)
Merchandise (3 persons)	81,333.33 (62,010.75)
Crop farming (50 persons)	38,560 (29,089.25)
Animal farming (2 persons)	8,125 (4,419.42)
Secondary source of income	19,927.50 (34,411.34)
Labor (29 persons)	16,317.24 (25,753.87)
Merchandise (1 person)	65,000 (-)
Crop farming (2 persons)	46,000 (48,083.26)
Animal farming (21 persons)	7,947.62 (7,214.59)
Total annual income	58,537.96 (54,758.01)
	Number (percent)
Saving	Unit: Household
No	14 (25.93)
Yes	40 (74.07)
What do people do with left over money?	
Save	40 (74.07)
Buy products	22 (40.74)
Invest in agriculture	30 (55.56)
Provide loan for others	3 (5.56)
Prepare for contingency purposes	7 (12.96)
Prepare for vacation	1 (1.85)
Prepare for kid's education	12 (22.22)
Investment in pig production	
No	14 (31.11)
Yes	31 (68.89)
Buy pigs	15 (48.39)
Buy deworming drug	20 (64.52)
Buy pig feed	5 (16.13)
Improve pig hygiene	4 (12.90)
Debt/on credit	
No	12 (22.22)
Yes	42 (77.78)
Source of fund/loan	
Neighbor	21 (52.50)
Bank for Agriculture and Agricultural Co-operatives (BAAC)	11 (27.50)
Village fund	19 (47.50)
Government saving bank (GSB)	1 (2.50)
Private leasing	4 (10.00)
Informal leasing	8 (20.00)

Convenient Products Possess	Number (percent)
	Unit: Household
TV	45 (83.33)
Radio	21 (38.89)
Stove	12 (22.22)
Fridge	33 (61.11)
Rice cooker	27 (50.00)
VCD/DVD	30 (55.56)
Electric iron	9 (16.67)
Electric fan	34 (62.96)
Satellite dish	43 (79.63)
Water pump	4 (7.41)
Electric generator	3 (5.56)
Bike	25 (46.30)
Motorbike	48 (88.89)
Car/truck	5 (9.26)
Cell phone	19 (35.19)
Cloth washer	4 (7.41)
Laptop	2 (3.70)
Electric pan	1 (1.85)
Water heater	1 (1.85)
Pesticide sprayer	1 (1.85)
Lawn mower	1 (1.85)

Table F-13: Access to medical service of the respondents

	Number (percent)
Right for free medical service	Unit: Person
None	4 (7.41)
Universal coverage	50 (92.59)
Low income	1 (1.85)
Elderly	4 (7.41)
Social security service	1 (1.85)
Community leader	1 (1.85)
Public health volunteer	3 (5.56)
Private insurance	2 (3.70)
Place people usually go for medical service	Unit: Household
Never been treated	1 (1.85)
Buy medicine themselves	34 (62.96)
Nearby clinic	23 (42.59)
Tambon health promoting hospital	36 (66.67)
District hospital	41 (75.93)
Provincial hospital	7 (12.96)
Traditional health care	13 (24.07)
Spiritual treatment	9 (16.67)
Fang hospital (a district hospital in another district)	5 (9.00)
Prasat neurological hospital (provincial hospital)	6 (11.11)
Source of information/news	
Newspaper	5 (9.26)
Radio	18 (33.33)
TV	47 (87.04)
Public announcement	25 (46.30)
Journal/magazine	1 (1.85)
Neighbor	38 (70.37)
Internet	1 (1.85)
Services from institutions	Average Days Visited in a Year (SD.)
Frequency	
Headman	29.43 (45.44)
Teacher	13.32 (52.98)
Public health officer	3.17 (7.84)
Animal health officer	1.46 (5.32)
Public health volunteer	27.50 (76.58)
Animal health volunteer	1.62 (4.44)
Police	0.54 (3.32)
Heifer officer	0.26 (1.65)
Tree bank officer	0.02 (0.14)
Sub district officer	0.25 (1.64)
District officer	0.04 (0.27)

Benefit	Score rank from 0 to 4 (SD.)
Headman	2.09 (1.46)
Teacher	1.81 (1.61)
Public health officer	1.26 (1.60)
Animal health officer	0.87 (1.32)
Public health volunteer	2.31 (1.41)
Animal health volunteer	0.69 (1.33)
Police	0.09 (0.49)
Heifer officer	0.13 (0.67)
Tree bank officer	0.02 (0.14)
Sub district officer	0.22 (0.86)
District officer	0.02 (0.14)

These numbers are low because we count those who did not receive service in the denominators



Appendix G

Cost structures and revenue streams of pig production in highlands

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่

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Table G-1: Cost structures and revenue streams of pig production in highlands

Unit: Baht/year	Overall			Pen			Tether		
	Average	S.D.	n	Average	S.D.	n	Average	S.D.	n
Cost structure									
Fixed cost									
Pig house cost	2,158.50	9,219.44	30	3,981.43	7,948.51	15	1,000	-	1
Pig house cost (depreciation cost/yr)	274.49	968.88	30	391.87	515.80	15	133.33	-	1
Land rent		-	-		-	-		-	-
Variable cost									
Feed cost	4,643.95	5,449.66	42	5,011.76	6,307.56	17	1,200	-	1
Water supply/pig housing maintenance	674.65	810.25	12	724.48	983.82	8		-	
Fine (pigs disturb other properties)	300	-	1		-			-	
Other variable cost	130.67	90.72	5	33.33	28.87	3		-	
Cost per capita	926.41	780.20	43	1,206.94	965.24	18	808.89	-	1
Total cost from pig rearing	5,395.49	6,022.53	43	5,546.69	6,631.08	18	12,133.33	-	1
Total cost (with opp.cost)	5,521.71	5,880.60	43	5,363.26	6,597.85	18	12,266.69	-	1
Revenue per capita	2,953.93	1,877.88	35	2,477.08	2,113.13	18	1,500	-	1
Total revenue from selling pigs	24,231.00	25,133.81	35	21,017.86	27,247.17	18	22,500	-	1
Profit from selling pig	19,484.59	21,229.25	33	17,653.09	22,106.48	13	10,366.67	-	1
Profit per one pig	2,292.23	1,445.70	7	2,308.31	1,197.35	13	691.11	-	1
Loss from selling pig	2,934.78	4,234.02	7	2,832.20	4,785.38	5		-	
Loss per one pig	914.70	984.32	44	804.08	1,035.73	5		-	
Profit (with opp.cost)	18,319.96	20,418.08	44	12,630.45	19,544.03	18	10,233.31	-	1
Profit per one pig (with opp.cost)	2,208.78	1,379.63	40	1,963.44	1,075.37	15	682.22	-	1
Loss per one pig (with opp.cost)	796.50	1,100	4	917.84	1,314.04	3		-	

	Fence underneath house			Outdoor-located fence			Combination of outdoor-located fence and pen		
	Average	S.D.	n	Average	S.D.	n	Average	S.D.	n
Cost structure									
Fixed cost									
Pig house cost	135	143.09	5	-			1,333.33	763.76	4
Pig house cost (depreciation cost/yr)	47.71	25.31	3	-			262.03	176.69	3
Land rent		-		-			-		
Variable cost									
Feed cost	2,662.50	2,209.68	5	5,375	-	1	3,096.56	644.73	4
Water supply/pig housing maintenance	330	381.84	2	-			-		
Fine (pigs disturb other properties)	300	-	1	-			-		
Other variable cost		-		-			-		
Cost per one pig	1,058.88	781.78	5	1,343.75	-	1	594.36	326.74	4
Total cost from pig rearing	2,883.13	2,213.53	5	5,375	-	1	3,293.09	823.57	4
Total cost (with opp.cost)	2,974.81	2,213.92	5	5,391.68	-	1	3,493.08	898.20	4
Revenue per one pig	1,300	1,204.16	5	2,000	-	1	2,825	1,325.08	4
Total revenue from selling pigs	9,833.33	7,285.83	5	8,000	-	1	16,000	2,449.49	4
Profit from selling pig	7,155.62	8,450.41	3	2,625	-	1	12,706.91	1,630.49	4
Profit per one pig	1,196.04	689.60	3	656.25	-	1	2,230.64	999.27	4
Loss from selling pig	3,191.25	3,972.17	2	-			-		
Loss per one pig	1,191.25	1,143.74	2	-			-		
Profit (with opp.cost)	5,156.49	7,893.04	5	2,608.32	-	1	12,506.93	1,555.76	4
Profit per one pig (with opp.cost)	1,145.11	728.01	3	652.08	-	1	2,193.42	975.71	4
Loss per one pig (with opp.cost)	1,216.26	1,108.38	2	-			-		

	Combination of pen and free range			Combination of fence underneath house and pen			Combination of fence underneath house, pen and free range		
	Average	S.D.	n	Average	S.D.	n	Average	S.D.	n
Cost structure									
Fixed cost									
Pig house cost	1,500	-	1	236.67	100.17	4	50	-	1
Pig house cost (depreciation cost/yr)	750	-	1	87.78	25.89	3	4.99	-	1
Land rent	-	-	-	-	-	-	-	-	-
Variable cost									
Feed cost	21,600	-	1	3,699	2,368.97	4	540	-	1
Water supply/pig housing maintenance	-	-	-	-	-	-	-	-	-
Fine (pigs disturb other properties)	-	-	-	300	-	1	-	-	-
Other variable cost	-	-	-	-	-	-	-	-	-
Cost per one pig	1,443.75	-	1	501.43	208.18	4	41.92	-	1
Total cost from pig rearing	23,100	-	1	3,839.83	2,417.30	4	544.99	-	1
Total cost (with opp.cost)	23,199.96	-	1	4,031.53	2,459.34	4	644.95	-	1
Revenue per one pig	4,000	-	1	2,750	2,217.36	4	3,000	-	1
Total revenue from selling pigs	64,000	-	1	36,333.33	20,502.03	4	39,000	-	1
Profit from selling pig	40,900	-	1	31,513.56	18,773.18	4	38,455.01	-	1
Profit per one pig	2,556.25	-	1	3,148.09	1,301.20	4	2,958.08	-	1
Loss from selling pig	-	-	-	-	-	-	-	-	-
Loss per one pig	-	-	-	-	-	-	-	-	-
Profit (with opp.cost)	40,800.04	-	1	25,718.47	19,019.90	4	38,355.05	-	1
Profit per one pig (with opp.cost)	2,550	-	1	3,468.29	1,263	4	2,950.39	-	1
Loss per one pig (with opp.cost)	-	-	-	-	-	-	-	-	-

	Combination of pen and tether			Combination of tether and free range			Combination of fence underneath house and tether		
	Average	S.D.	n	Average	S.D.	n	Average	S.D.	n
Cost structure									
Fixed cost									
Pig house cost	470	-	3	-	-		-	-	
Pig house cost (depreciation cost/yr)	187.99	-	1	-	-		-	-	
Land rent	-	-		-	-		-	-	
Variable cost									
Feed cost	5,805	7,445.15	3	1,102.50	1,347.04	2	5,760	-	1
Water supply/pig housing maintenance	840	-	1	-	-		-	-	
Fine (pigs disturb other properties)	300	-	1	-	-		-	-	
Other variable cost	120	-	1	-	-		-	-	
Cost per one pig	792.37	482.48	3	523.13	713.29	2	960	-	1
Total cost from pig rearing	6,287.66	7,297.19	3	1,102.50	1,347.04	2	5,760	-	1
Total cost (with opp.cost)	6,387.66	7,386.68	3	1,110.84	1,335.24	2	5,960.04	-	1
Revenue per one pig	5,000	3,000	3	250	353.55	1	3,000	-	1
Total revenue from selling pigs	38,666.67	43,143.17	3	4,000	-	1	18,000	-	1
Profit from selling pig	32,379	35,875.78	3	3,850	-	1	12,240	-	1
Profit per one pig	4,207.63	2,544.10	3	481.25	-	1	2,040	-	1
Loss from selling pig	-	-		-	-		-	-	
Loss per one pig	-	-		-	-		-	-	
Profit (with opp.cost)	32,279	35,782.44	3	4,889.16	1,493.18	2	12,039.96	-	1
Profit per one pig (with opp.cost)	4,193.24	2,534.51	3	1,725.83	-	1	2,006.66	-	1
Loss per one pig (with opp.cost)	-	-		-	-		-	-	

	Combination of pen, tether and free range			Combination of outdoor-located fence, pen and free range		
	Average	S.D.	n	Average	S.D.	n
Cost structure						
Fixed cost						
Pig house cost	80	-	1	550	-	1
Pig house cost (depreciation cost/yr)	53.33	-	1	34.37	-	1
Land rent		-			-	
Variable cost						
Feed cost	6,400	-	1	2,700	-	1
Water supply/pig housing	800	-	1		-	
maintenance		-			-	
Fine (pigs disturb other properties)	266.67	-	1		-	
Other variable cost	470	-	1	546.87	-	1
Cost per one pig	7,520	-	1	2,734.37	-	1
Total cost from pig rearing	7,653.36	-	1	2,884.36	-	1
Total cost (with opp.cost)	4,000	-	1	1,000	-	1
Revenue per one pig	64,000	-	1	5,000	-	1
Total revenue from selling pigs	56,480	-	1	2,265.63	-	1
Profit from selling pig	3,530	-	1	453.13	-	1
Profit per one pig		-			-	
Loss from selling pig		-			-	
Loss per one pig	56,346.64	-	1	2,115.65	-	1
Profit (with opp.cost)	3,521.67	-	1	423.13	-	1
Profit per one pig (with opp.cost)		-			-	
Loss per one pig (with opp.cost)		-			-	

CURRICULUM VITAE

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Educational Background

M.A., Economics, Chiang Mai University, Chiang Mai Province, Thailand.

GPA 4.00 (Expected graduation 2013)

B.A., Economics, Chiang Mai University, Chiang Mai Province, Thailand.

GPA 4.00 (2010)

High School Diploma, Uttaradit Daruni School, Uttaradit Province, Thailand.

GPA 3.95 (Study Structure: Arts-Mathematics) (2007)

Exchange Student, Ross Sterling High School, Baytown, Texas, USA.

(August 2005-June 2006)

Junior High School Diploma, Uttaradit Daruni School, Uttaradit Province, Thailand.

GPA 3.84 (2002)

Academic Honors/Awards/Grants

Exceptional Student Oral Presentation Award, 4th Biennial Conference of the

International Association for Ecology and Health, Kunming, China. (15-18

October 2012)

Participant, 5th International Students' Forum, Oita University, Oita, Japan. (24-

28 August 2011)

Scholarship for Undergraduate Program from Bank of Tokyo-Mitsubishi UFJ. (10 September 2010)

Academic Distinction Award (GPA 4.00) Academic Year 2009

Academic Distinction Award (GPA 3.93) Academic Year 2008

Academic Distinction Award (GPA 3.82) Academic Year 2007

Student Body President, Uttaraditdaruni School, Academic Year 2005

First Candidate King's Bestow Award, Uttaradit Educational Service Area Office 1 (2005)

Public Benevolent Student Award, Uttaradit Daruni School, Uttaradit Province, Thailand. (2005)

Admired Juvenile Award in National Children's Day, Ministry of Education, Thailand. (2005)

Honorable Mention for the King's Bestow Award, Ministry of Education, Thailand. (2004)

Academic Distinction Award (GPA 3.93), Study Structure: Sciences-Mathematics (2003)

Public Benevolent and Courteous Student Award, in National Children's Day, Ministry of Education, Thailand. (2000)

Professional Training/Exchange Programs/Internships

Attended Workshop on "GIS and Spatial Analysis in One Health," Faculty of Veterinary Medicine, Chiang Mai University, Thailand. (22 October-2 November 2012)

Attended Workshop on “Integrating EcoHealth in Transboundary Disease Risk Assessment and Management,” EcoHealth-One Health Resource Centre, Chiang Mai University, Chiang Mai Province, Thailand. (25-27 July 2012)

Attended EcoHealth-One Health Lecture Series 2011 “Ecological Epidemiology and the Emergence of Zoonotic Diseases: Toward an Integrative Science”, EcoHealth-One Health Resource Centre, Chiang Mai University, Chiang Mai Province, Thailand. (2011)

Student Exchange Program at College of Business Administration, Chung Chou Institute of Technology, Chang Hua, Republic of China (Taiwan). (15 March-14 May 2011)

SCG Excellent Internship Program at Concrete Products and Aggregate Co., Ltd. (CPAC), an Affiliate of SCG Cement, Chiang Mai Province, Thailand. (22 March-24 May 2010)

Short Term Students Cultural Trip 2009, Kunming, People’s Republic of China. (8-15 October 2009)

Work and Travel Program at SeaWorld, Discovery Cove and Aquatica, Florida, United States of America. (10 March-12 June 2008)

American Foreign Service (AFS) Intercultural Exchange Program. Attended Ross Sterling High School, Texas, United States of America. (12 August 2005-29 June 2006)

Attended Youth Democracy Training Program under the Secretariat of the House of Representatives and King Prajadhipok’s Institute. (20-30 March 2004)

Attended the Promotion of Academic Olympiad and Development of Science and Education Foundation (2nd Camp) under the Patronage of Her Royal

Highness Princess GalyaniVadhana Krom Luang Naradhiwas Rajanagarindra.

(14-29 March 2004)

Academic and Community Service

Teacher Assistant at Workshop on “Creating a Business: Exploring the Different

Steps of How to Set-up and Run a Small Business” in Cooperation with

Faculty of Economics, Chiang Mai University and PUM Netherlands Senior

Experts. (27 February-9 March 2012)

Facilitator at the Global Health Institute Training Course “One Health - Thailand

2012” in Cooperation with the Global Health Institute, the University of

Minnesota, Chiang Mai University, USAID, DAI, and Tufts University. (30

January-9 February 2012)

Assisted the 5th International Conference of the Thailand Econometric Society,

Faculty of Economics, Chiang Mai University, Chiang Mai Province,

Thailand. (12-13 January 2012)

Assisted the 4th International Conference of the Thailand Econometric Society,

Faculty of Economics, Chiang Mai University, Chiang Mai Province,

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