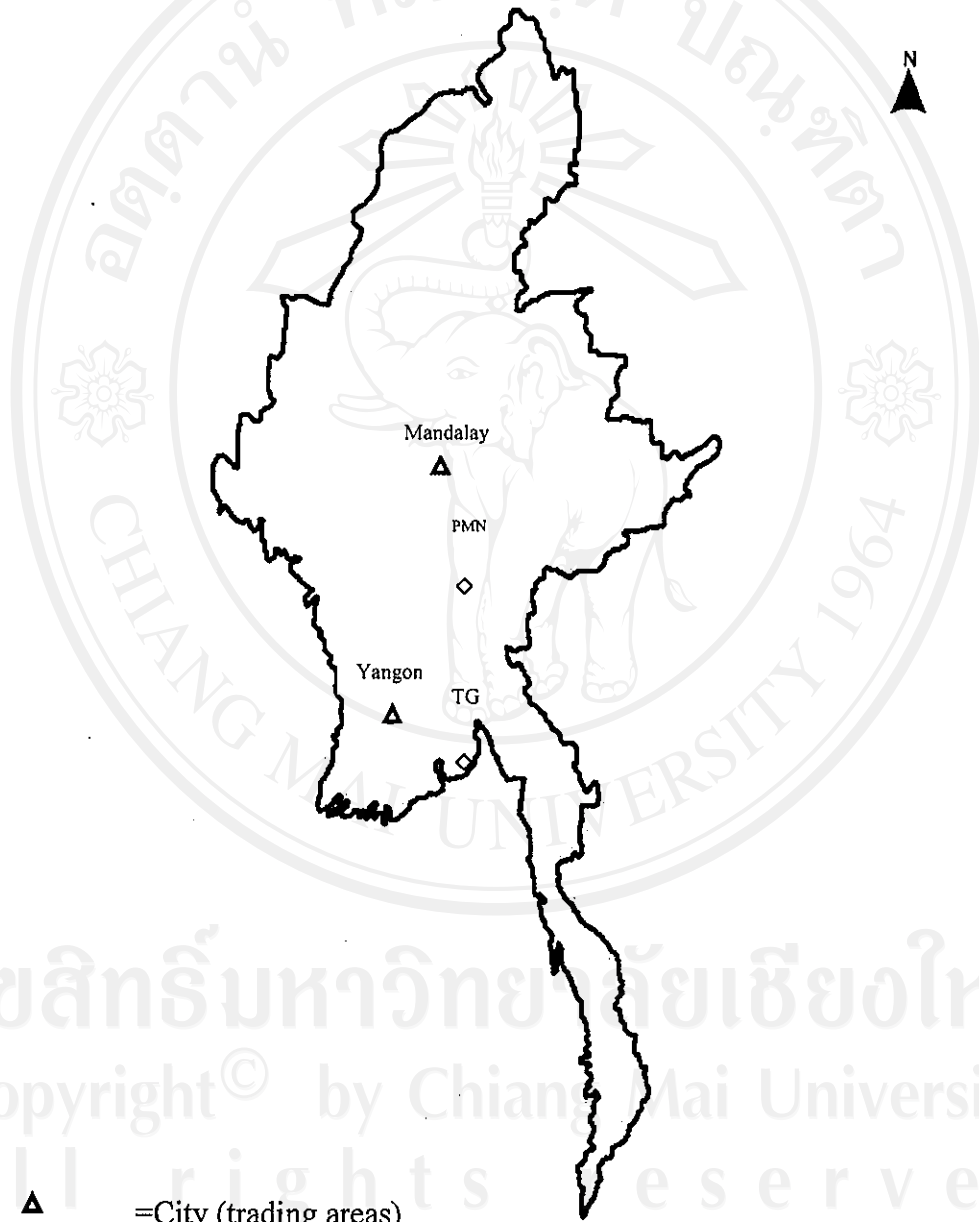


APPENDICES

Appendix 1. The sowing and trading areas of mung bean in Myanmar

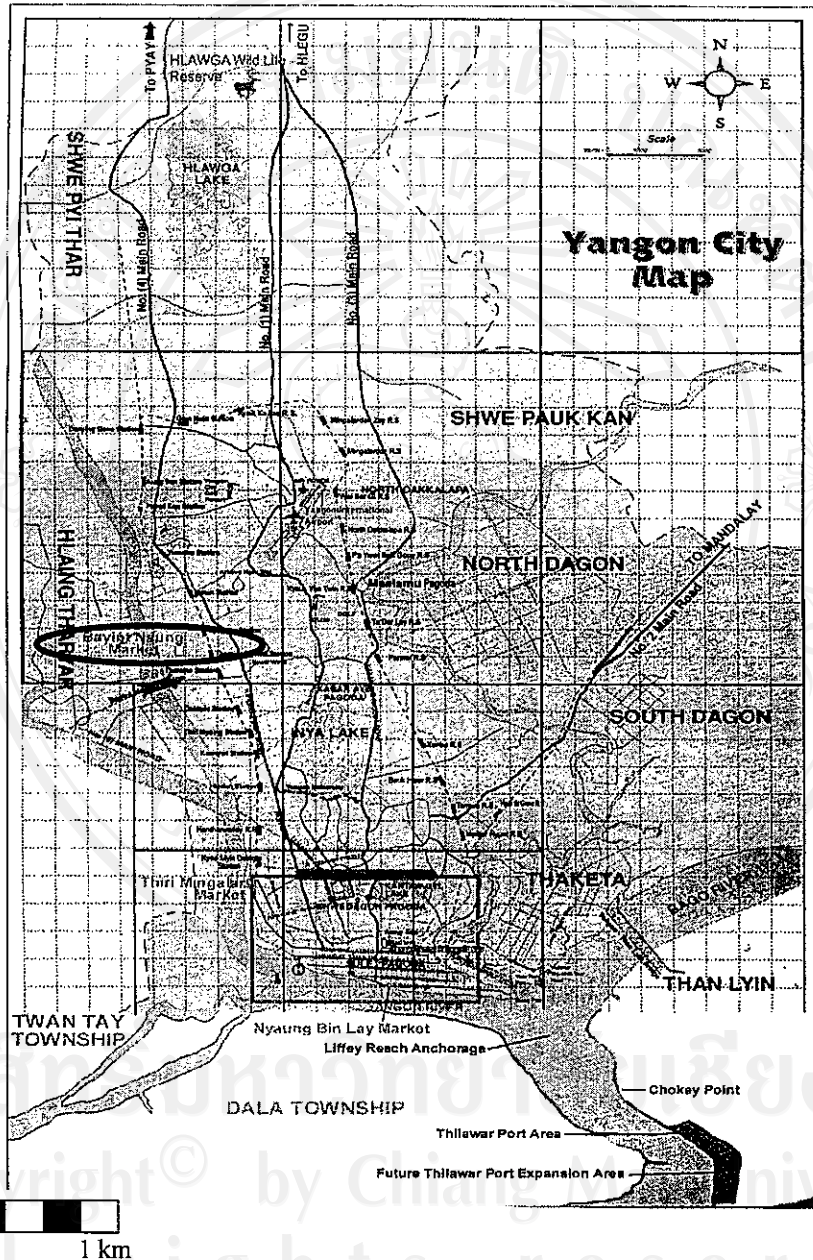


- ▲ =City (trading areas)
- ◇ = Township (growing areas)
- PMN = Pyinmana
- TG = Thonegwa

Source: 1) [http:// www.myanmarmap.com](http://www.myanmarmap.com) (7.5.2007).

2) Observation from survey conducted in May 2006.

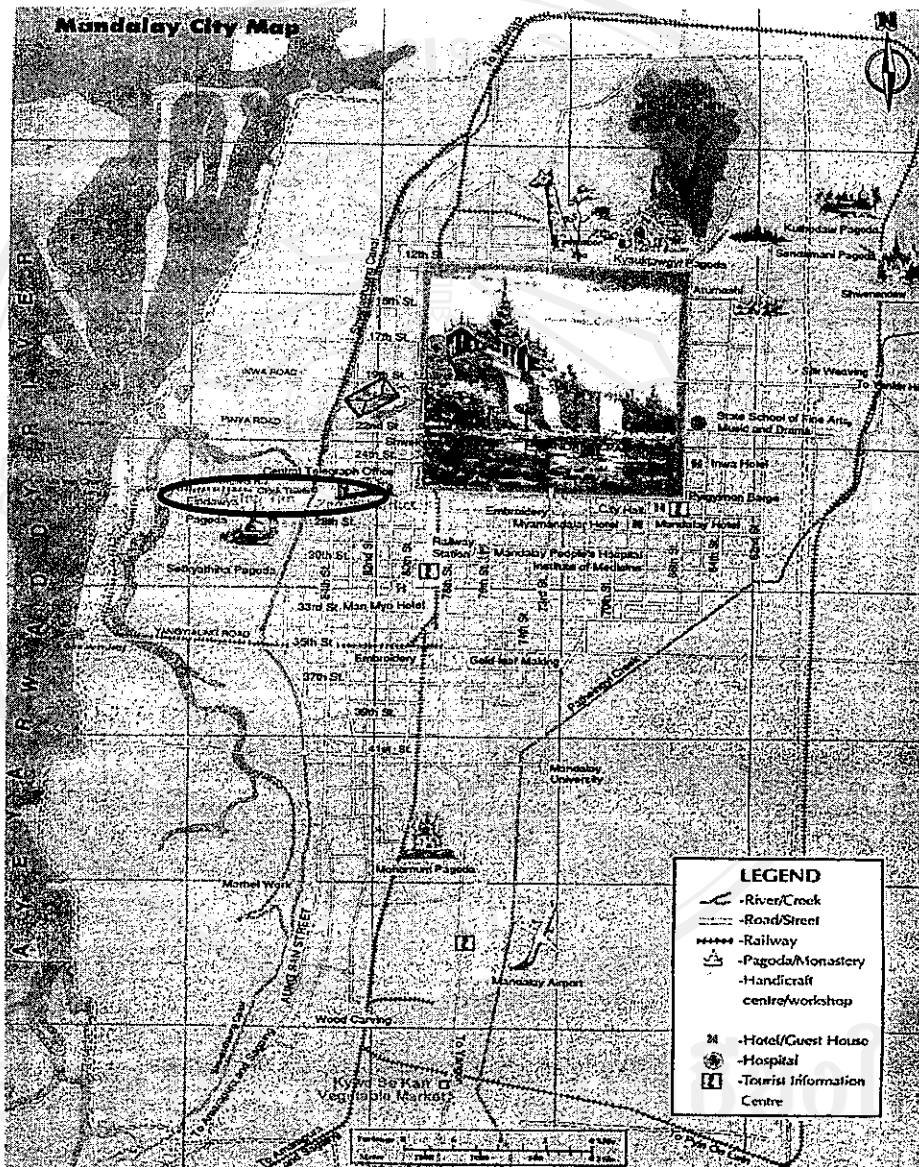
Appendix 1.1 Yangon map



Source: 1) Agricultural Marketing in Myanmar, Ministry of Agriculture and Irrigation, Market Information Service project, TCP/MYA/8821, October, 2000.

2) Observation from survey conducted in May 2006.

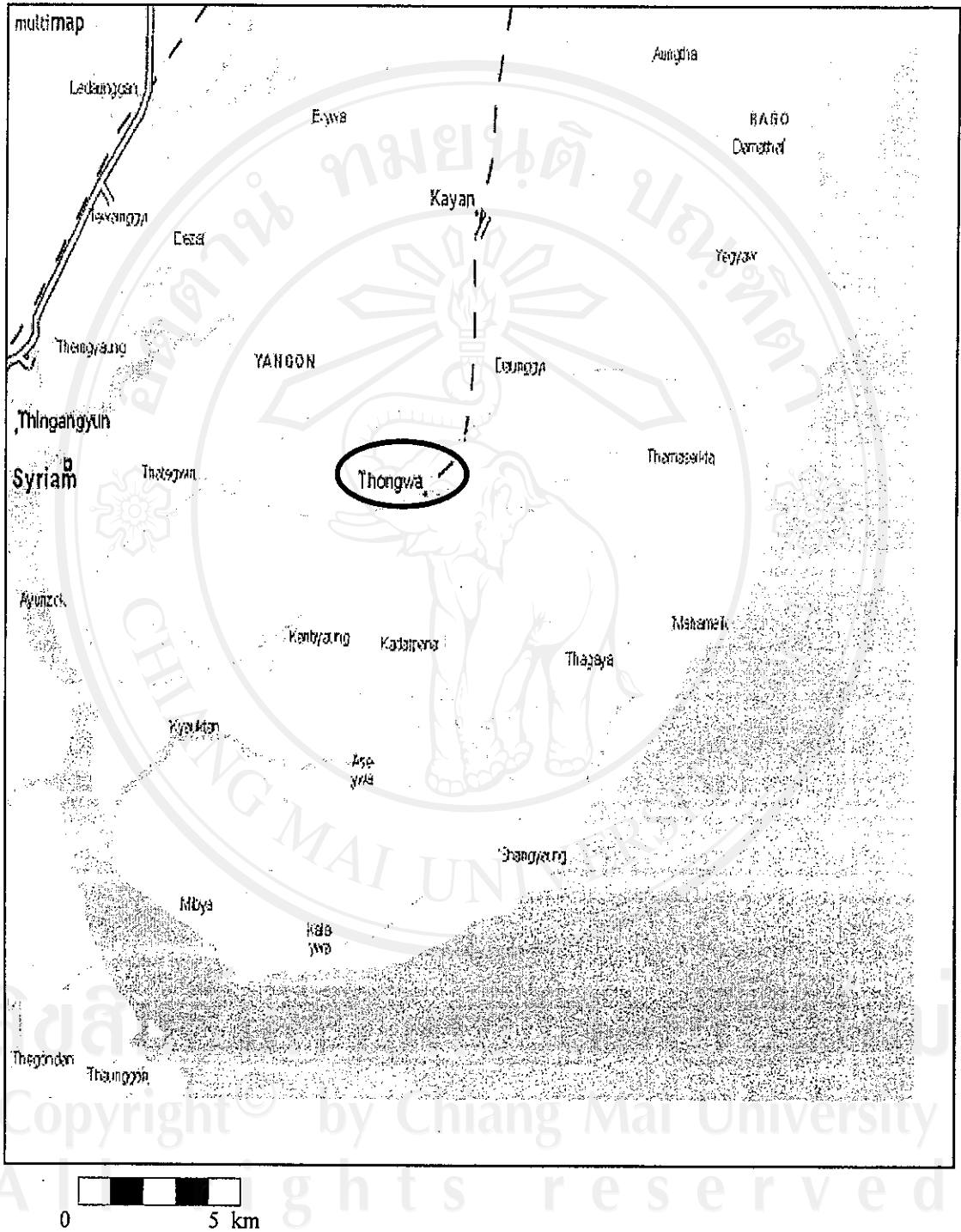
Appendix 1.2 Mandalay map



Source: 1) Agricultural Marketing in Myanmar, Ministry of Agriculture and Irrigation, Market Information Service project, TCP/MYA/8821, October, 2000.

2) Observation from survey conducted in May 2006.

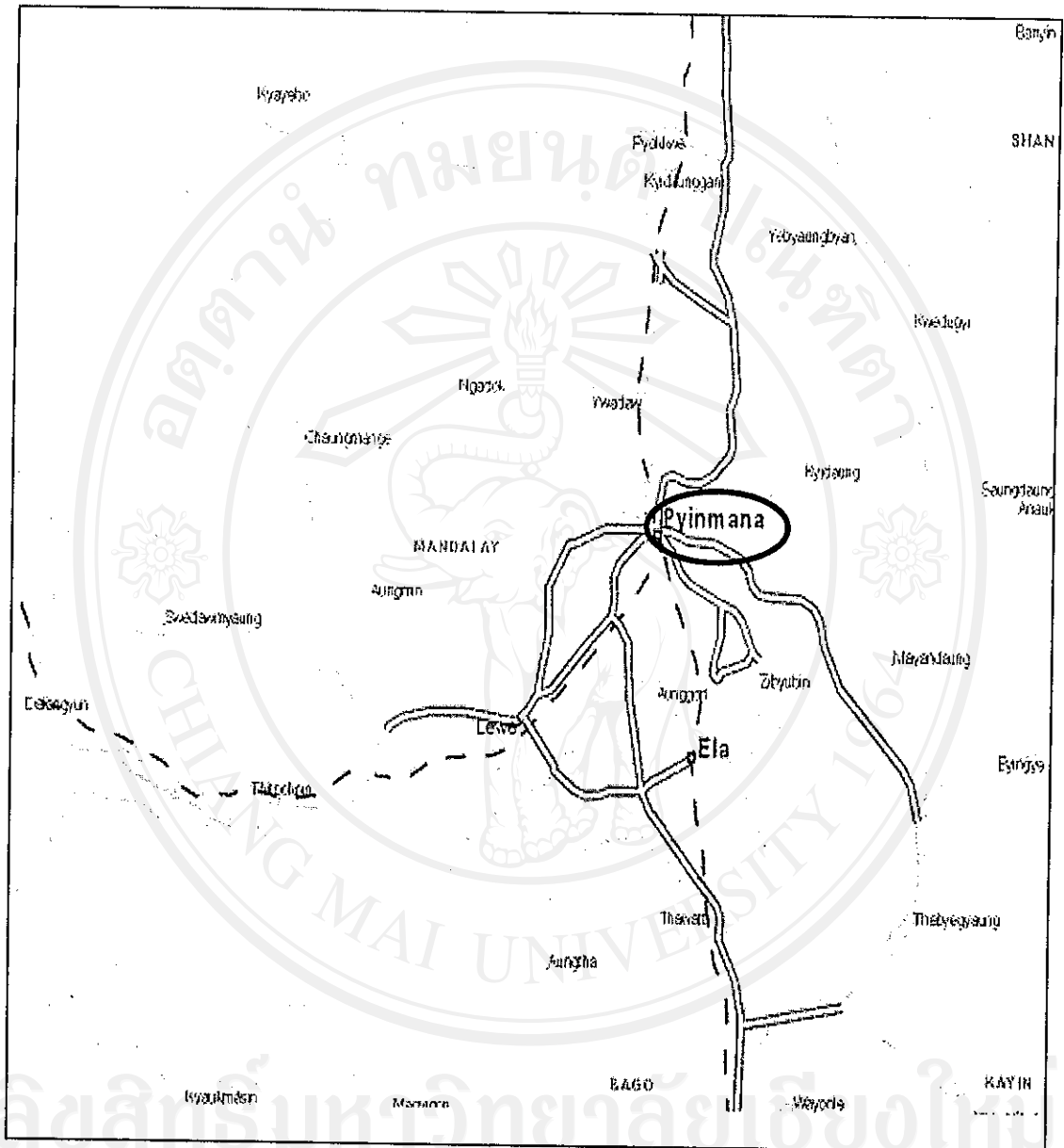
Appendix 1.3 Thongwa township map



Source: 1) <http://www.myanmarmap.com> (5.7.2007).

2) Observation from survey conducted in May 2006.

Appendix 1.4 Pyinmana township map



Source: 1) <http://www.myanmarmap.com> (5.7.2007).

2) Observation from survey conducted in May 2006.

Appendix 2. Statistic of samples farmers and traders

Appendix 2.1 Summary statistic of farmers in mung bean production in Thonegwa

Variables	Unit	Minimum	Maximum	Mean
Number of observation (40)				
Sown area	ha	0.81	8.10	4.34
Yield	kg	848.90	11,427.50	4,158.79
Amount of seed	kg/ha	12.00	16.33	14.00
Fertilizer amount	kg/ha	12.50	25.00	17.13
Pesticide amount	bottle/ha	3.00	4.00	3.75
Farm yard manure amount	cartload/ha	1.00	4.00	2.58
Chemical foliar spray	bottle/ha	2.00	5.00	2.85
Input cost	myk/ha	38,406.42	199,705.31	79,197.80
Hired labor	person	5.00	20.00	12.75
Hired labor cost	myk/ha	5,000.00	20,000.00	12,750.00
Transaction cost	myk/ha	5,231.50	156,935.00	71,468.18
Family labor cost	myk/ha	5,346.00	213,840.00	82,282.84
Family labor	person	6.00	24.00	15.30
Total production cost	myk/ha	56,506.64	333,070.39	118,315.37
Break-even production cost	myk/kg	51.01	714.37	91.80
Selling price	myk/kg	474.73	496.17	486.22

Appendix 2.2 Summary statistic of farmers in mung bean production in Pyinmana

Variables	Unit	Minimum	Maximum	Mean
Number of observation (30)				
Sown area	ha	1.22	4.05	1.81
Yield	kg	326.50	6,530.00	1,600.94
Amount of seed	kg/ha	11.22	14.28	13.43
Fertilizer amount	kg/ha	0.00	20.00	8.08
Pesticide amount	bottle/ha	2.00	5.00	3.67
Farm yard manure amount	cartload/ha	0.00	0.00	0.00
Chemical foliar spray	bottle/ha	3.00	4.00	3.67
Input cost	myk/ha	29,499.15	166,639.20	65,553.33
Hired labor	person	5.00	10.00	6.00
Hired labor cost	myk /ha	4,000.00	9,500.00	5,366.67
Transaction cost	myk /ha	6,092.00	43,635.00	12,855.78
Family labor cost	myk	5,832.00	43,740.00	12,563.10
Family labor	person	4.00	8.00	4.80
Total production cost	myk	47,361.85	299,122.52	104,307.04
Break-even production cost	myk /kg	45.81	641.85	80.86
Selling price	myk /kg	401.23	419.60	413.48

Appendix 2.3 Summary statistic of farmers in mung bean marketing in Thonegwa

Variables	Unit	Minimum	Maximum	Mean
Number of observation (40)				
Processing	myk /kg	5.51	6.13	5.86
Transportation from farm to home	myk/kg	0.92	1.23	1.10
Packaging material cost	myk /kg	5.21	5.82	5.55
Packaging	myk /kg	0.61	0.92	0.79
Selling quantity to MAPT	kg	131.00	1,306.00	700.34
Transportation to MAPT	myk /kg	6.13	7.96	6.93
Loading	myk /kg	0.77	0.77	0.77
Break-even marketing cost	myk /kg	7.37	11.07	9.05

Appendix 2.4 Summary statistic of farmers in mung bean marketing in Pyinmana

Variables	Unit	Minimum	Maximum	Mean
Number of observation (30)				
Processing	myk /kg	5.51	6.13	5.98
Transportation	myk /ha	0.98	1.53	1.37
Packaging material cost	myk /kg	5.21	6.13	5.82
Packaging	myk /kg	0.61	0.92	0.82
Selling quantity to MAPT	kg	195.9	653.00	293.85
Transportation	myk /kg	4.59	7.66	6.74
Loading	myk /kg	25.00	25.00	25.00
Break even marketing cost	myk /kg	8.37	266.80	17.79

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Appendix 2.5 Summary statistic of marketing agents in Thonegwa

Variable	Unit	Minimum	Maximum	Mean
Number of observation (6)				
Purchasing quantity	kg	130,600.00	212,225.00	171,412.50
Purchasing price	myk /kg	535.99	535.99	535.99
Commission fee	myk /kg	3.06	3.06	3.06

Appendix 2.6 Summary statistic of town wholesalers in Thonegwa

Variable	Unit	Minimum	Maximum	Mean
Number of observation (4)				
Buying amount	kg	310,175.00	391,800.00	346,906.25
Buying price	myk /kg	486.22	486.22	486.22
Cleaning	myk /kg	3.06	3.06	3.06
Packaging material	myk /kg	7.65	7.65	7.65
Packaging	myk /kg	0.92	0.92	0.92
Loading	myk /kg	3.06	3.06	3.06
Transportation to city market	myk /kg	4.59	4.59	4.59
Unloading	myk /kg	0.92	0.92	0.92
Commission fee	myk /kg	3.06	3.06	3.06
Hired storage	myk /kg	1.53	1.53	1.53
Pesticide cost	myk /kg	1.53	1.53	1.53
Selling price	myk /kg	566.62	566.62	566.62

Appendix 2.7 Summary statistic of marketing agents in Pyinmana

Variables	Unit	Minimum	Maximum	Mean
Number of observation (6)				
Purchasing amount	kg	65,300.00	120,805.00	97,950.00
Purchasing price	myk /kg	474.73	474.73	474.73
Commission fee (kg)	myk /kg	3.06	3.06	3.06

Appendix 2.8 Summary statistic of town wholesalers in Pyinmana

Variables	Unit	Minimum	Maximum	Mean
Number of observation (4)				
Buying amount	kg	163,250.00	2,448,750.00	763,193.75
Buying price	myk /kg	413.8	413.48	413.48
Cleaning	myk /kg	1.53	1.53	1.53
Packaging material	myk /kg	5.51	5.51	5.51
Packaging	myk /kg	0.92	0.92	0.92
Loading	myk /kg	0.92	0.92	0.92
Transportation to city market	myk /kg	26.03	26.03	26.03
Unloading	myk /kg	0.92	0.92	0.92
Commission fee	myk /kg	3.06	3.06	3.06
Hired storage	myk /kg	0.92	0.92	0.92
Pesticide cost	myk /kg	1.53	1.53	1.53
Selling price	myk /kg	566.62	566.62	566.62

Appendix 2.9 Summary statistic of city wholesalers

Variable	Unit	Minimum	Maximum	Mean
Number of observation (3)				
Buying price	myk /kg	566.62	566.62	566.62
Loading	myk /kg	0.92	0.92	0.92
Packaging material	myk /kg	0.92	0.92	0.92
Packaging	myk /kg	0.92	0.92	0.92
Cleaning	myk /kg	6.13	6.13	6.13
Warehouse	myk /kg	1.53	1.53	1.53
Fumigation	myk /kg	1.53	1.53	1.53
Selling price	myk /kg	635.52	635.52	635.52

Appendix 2.10 Summary statistic of exporters

Variable	Unit	Minimum	Maximum	Mean
Number of observation (2)				
Buying price	MYK/kg	673.81	673.81	673.81
Port charge	MYK/kg	1.53	1.53	1.53
Stevedoring	MYK/kg	1.53	1.53	1.53
Loading	MYK/kg	1.53	1.53	1.53
Packaging material	MYK/kg	9.18	9.18	9.18
Packaging	MYK/kg	1.53	1.53	1.53
Handling	MYK/kg	3.06	3.06	3.06
Selling price	MYK/kg	856.04	856.04	856.04

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Appendix 3. Augmented Dickey-Fuller test

Appendix 3.1 ADF level test for Yangon market price

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.48	0.12
Test critical values:		
1% level	-3.45	
5% level	-2.87	
10% level	-2.57	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(InPY)

Method: Least Squares

Date: 03/21/07 Time: 17:22

Sample(adjusted): 1/08/2000 12/31/2005

Included observations: 313 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
InPY(-1)	-0.03	0.01	-2.48	0.01
C	0.15	0.06	2.52	0.01
R-squared	0.02	Mean dependent var		0.00
Adjusted R-squared	0.02	S.D. dependent var		0.08
S.E. of regression	0.08	Akaike info criterion		-2.13
Sum squared resid	2.16	Schwarz criterion		-2.10
Log likelihood	334.64	F-statistic		6.14
Durbin-Watson stat	2.00	Prob(F-statistic)		0.01

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Appendix 3.2 ADF level test for Mandalay market price

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.54	0.11
Test critical values:		
1% level	-3.45	
5% level	-2.87	
10% level	-2.57	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(InPM)

Method: Least Squares

Date: 03/21/07 Time: 17:00

Sample(adjusted): 1/08/2000 12/31/2005

Included observations: 313 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
InPM(-1)	-0.03	0.01	-2.54	0.01
C	0.16	0.06	2.57	0.01
R-squared	0.02	Mean dependent var		0.00
Adjusted R-squared	0.02	S.D. dependent var		0.08
S.E. of regression	0.08	Akaike info criterion		-2.25
Sum squared resid	1.90	Schwarz criterion		-2.23
Log likelihood	354.59	F-statistic		6.46
Durbin-Watson stat	1.96	Prob(F-statistic)		0.01

Appendix 3.3 ADF first different test for Yangon market price

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-18.02	0.00
Test critical values:		
1% level	-3.45	
5% level	-2.87	
10% level	-2.57	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(InPY,2)

Method: Least Squares

Date: 03/21/07 Time: 17:27

Sample(adjusted): 1/15/2000 12/31/2005

Included observations: 312 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(InPY(-1))	-1.15	0.06	-18.02	0.00
C	0.00	0.00	0.83	0.41
R-squared	0.51	Mean dependent var		0.00
Adjusted R-squared	0.51	S.D. dependent var		0.12
S.E. of regression	0.08	Akaike info criterion		-2.12
Sum squared resid	2.16	Schwarz criterion		-2.10
Log likelihood	332.83	F-statistic		324.74
Durbin-Watson stat	1.75	Prob(F-statistic)		0.00

Appendix 3.4 ADF first different test for Mandalay market price

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-17.60	0.00
Test critical values:		
1% level	-3.45	
5% level	-2.87	
10% level	-2.57	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(InPM,2)

Method: Least Squares

Date: 03/21/07 Time: 17:11

Sample(adjusted): 1/15/2000 12/31/2005

Included observations: 312 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(InPM(-1))	-1.14	0.06	-17.60	0.00
C	0.00	0.00	0.66	0.51
R-squared	0.50	Mean dependent var		0.00
Adjusted R-squared	0.50	S.D. dependent var		0.11
S.E. of regression	0.08	Akaike info criterion		-2.25
Sum squared resid	1.91	Schwarz criterion		-2.22
Log likelihood	352.23	F-statistic		309.78
Durbin-Watson stat	1.77	Prob(F-statistic)		0.00

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Appendix 4. Co-integration analysis

Appendix 4.1 Yangon long-run forward Mandalay price transmission model

Dependent Variable: InPY

Method: Least Squares

Date: 03/22/07 Time: 18:51

Sample: 1/01/2000 12/31/2005

Included observations: 314

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.38	0.11	-3.49	0.00
InPM	1.11	0.02	53.97	0.00
R-squared	0.90	Mean dependent var		5.51
Adjusted R-squared	0.90	S.D. dependent var		0.45
S.E. of regression	0.14	Akaike info criterion		-1.09
Sum squared resid	6.08	Schwarz criterion		-1.07
Log likelihood	173.78	F-statistic		2,913.04
Durbin-Watson stat	0.51	Prob(F-statistic)		0.00

Estimation Equation:

$$\text{InPY} = C(1) + C(2) * \text{InPM}$$

Substituted Coefficients:

$$\text{InPY} = -0.3820739661 + 1.106248938 * \text{InPM}$$

Appendix 4.2: Testing a restriction on α_2 with Wald-F-test

Test Statistic	Value	df	Probability
F-statistic	26.87	(1, 312)	0.00
Chi-square	26.87	1.00	0.00

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
-1 + C(2)	0.11	0.02

Restrictions are linear in coefficients.

Appendix 4.3 Dickey-Fuller test applied on Yangon price residuals

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.77	0.00
Test critical values: 1% level	-2.57	
5% level	-1.94	
10% level	-1.62	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(E01)

Method: Least Squares

Date: 03/22/07 Time: 18:46

Sample(adjusted): 1/08/2000 12/31/2005

Included observations: 313 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
E01(-1)	-0.26	0.04	-6.77	0.00
R-squared	0.13	Mean dependent var		0.00
Adjusted R-squared	0.13	S.D. dependent var		0.09
S.E. of regression	0.08	Akaike info criterion		-2.20
Sum squared resid	2.02	Schwarz criterion		-2.19
Log likelihood	345.28	Durbin-Watson stat		2.20

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Appendix 4.4 Mandalay long-run backward Yangon price transmission model

Dependent Variable: InPM

Method: Least Squares

Date: 03/22/07 Time: 18:43

Sample: 1/01/2000 12/31/2005

Included observations: 314

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.83	0.08	9.89	0.00
InPY	0.82	0.02	53.97	0.00
R-squared	0.90	Mean dependent var		5.32
Adjusted R-squared	0.90	S.D. dependent var		0.38
S.E. of regression	0.12	Akaike info criterion		-1.40
Sum squared resid	4.49	Schwarz criterion		-1.37
Log likelihood	221.46	F-statistic		2,913.04
Durbin-Watson stat	0.52	Prob(F-statistic)		0.00

Estimation Equation:

$$\text{InPM} = C(1) + C(2)*\text{InPY}$$

Substituted Coefficients:

$$\text{InPM} = 0.8270569464 + 0.8165042607*\text{InPY}$$

Appendix 4.5 Testing a restriction on β_1 with Wald-F-test

Test Statistic	Value	df	Probability
F-statistic	147.12	(1,312)	0.00
Chi-square	147.12	1.00	0.00

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Error
-1 + C(2)	-0.18	0.02

Restrictions are linear in coefficients.

Appendix 4.6 Dickey-Fuller test applied on Mandalay price residuals

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.73	0.00
Test critical values:		
1% level	-2.57	
5% level	-1.94	
10% level	-1.62	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(E02)

Method: Least Squares

Date: 03/22/07 Time: 18:53

Sample(adjusted): 1/08/2000 12/31/2005

Included observations: 313 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
E02(-1)	-0.25	0.04	-6.73	0.00
R-squared	0.13	Mean dependent var		0.00
Adjusted R-squared	0.13	S.D. dependent var		0.10
S.E. of regression	0.09	Akaike info criterion		-1.91
Sum squared resid	2.70	Schwarz criterion		-1.90
Log likelihood	299.56	Durbin-Watson stat		2.21

Appendix 5. Error correction model

Appendix 5.1 Yangon short-run forward Mandalay price transmission model

Dependent Variable: D(InPY)

Method: Least Squares

Date: 03/22/07 Time: 19:14

Sample(adjusted): 1/15/2000 12/31/2005

Included observations: 312 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.00	0.00	0.59	0.55
D(InPM)	0.41	0.06	7.46	0.00
D(InPY(-1))	-0.13	0.06	-2.09	0.04
D(InPM(-1))	0.06	0.07	0.85	0.40
E02(-1)	-0.16	0.03	-4.79	0.00
R-squared	0.20	Mean dependent var		0.00
Adjusted R-squared	0.19	S.D. dependent var		0.08
S.E. of regression	0.08	Akaike info criterion		-2.31
Sum squared resid	1.75	Schwarz criterion		-2.25
Log likelihood	365.50	F-statistic		19.52
Durbin-Watson stat	1.88	Prob(F-statistic)		0.00

Wald Test:

Test Statistic	Value	df	Probability
F-statistic	261.91	(3, 307)	0.00
Chi-square	785.72	3.00	0.00

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
-1 + C(2)	-0.59	0.06
-1 + C(3)	-1.13	0.06
-1 + C(4)	-0.94	0.07

Restrictions are linear in coefficients.

Appendix 5.2 Mandalay short-run backward Yangon price transmission model

Dependent Variable: D(InPM)

Method: Least Squares

Date: 03/22/07 Time: 18:57

Sample(adjusted): 1/15/2000 12/31/2005

Included observations: 312 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.00	0.00	0.29	0.77
D(InPY)	0.37	0.05	7.47	0.00
D(InPM(-1))	-0.10	0.06	-1.67	0.10
D(InPY(-1))	0.10	0.06	1.74	0.08
E01(-1)	-0.17	0.04	-4.62	0.00
R-squared	0.20	Mean dependent var		0.00
Adjusted R-squared	0.19	S.D. dependent var		0.08
S.E. of regression	0.07	Akaike info criterion		-2.44
Sum squared resid	1.55	Schwarz criterion		-2.38
Log likelihood	385.11	F-statistic		19.50
Durbin-Watson stat	1.88	Prob(F-statistic)		0.00

Wald Test:

Test Statistic	Value	df	Probability
F-statistic	277.94	(3, 307)	0.00
Chi-square	833.81	3.00	0.00

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
-1 + C(2)	-0.63	0.05
-1 + C(3)	-1.10	0.06
-1 + C(4)	-0.90	0.06

Restrictions are linear in coefficients.

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