

Result of Land use / land cover change in Xiengkhuang province, Lao PDR (2002-2015)

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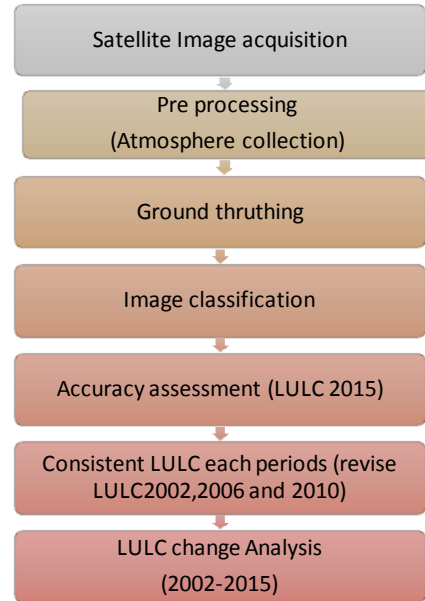
Outline:

- LULC change analysis framework
- Ground survey in Xiengkhuang
- LULC classification 2002,2006, 2010 and 2015 in Kham and Nonghet, Xiengkhuang
- LULC change 2002-2015 in Kham and Nonghet, Xiengkhuang Province
- LULCC in Kham basin
 - LULC classification 2002, 2006, 2010 and 2015 in Kham basin
 - Forest Change in each periods during 2002-2015 in Kham basin
 - Paddy field Change in each periods during 2002-2015 in Kham basin
- LULCC in western of Nonghaet district
 - LULC classification 2002,2006,2010 and2015 in Nonghaet
 - Forest Change in each periods during 2002-2015 in Nonghaet

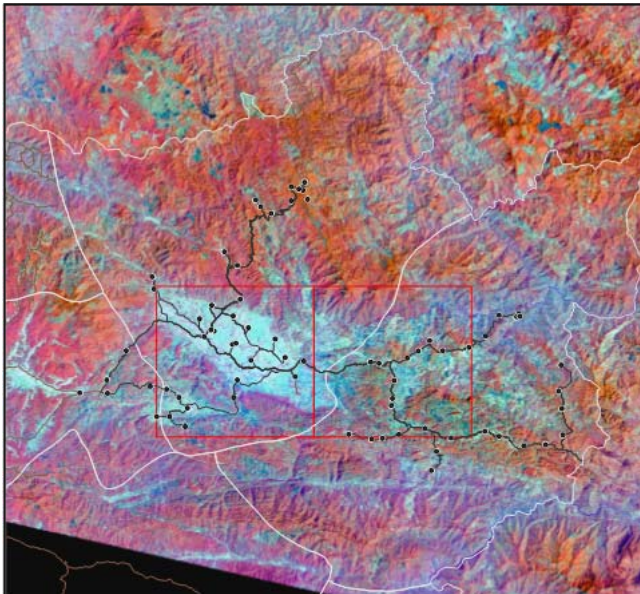
Land Use Land Cover change Analysis Framework

Satellite image datasets:

Satellite image	Date Acquirement	Benefits
Landsat TM	17/02/2002	Historical LULC change
Landsat TM	22/12/2006	Historical LULC change
Landsat ETM+	13/04/2010	Historical LULC change
Landsat OLT_TIRS	18/03/2015	Historical LULC change
SPOT 6	11/2/2016	Accuracy assessment



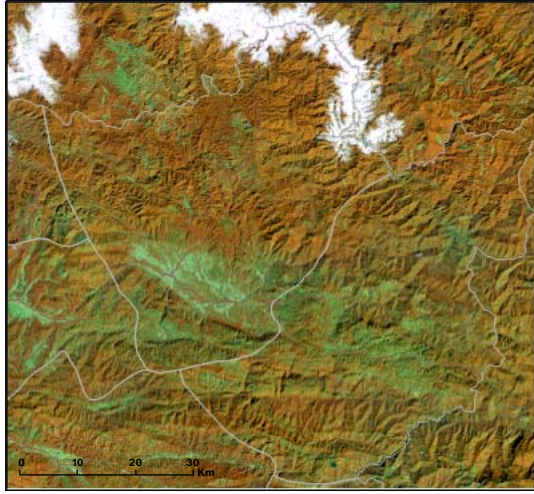
Ground survey on February 2016 in Xiengkhuang province



Landsat-OLT satellite image (18/02/2015)

- Field Survey on Febuary 2016
- ~ Track Febuary 2016
- District boundary
- PW boxes

Land Use Land Cover classification 2002 in Kham and Nonghet, Xiengkhuang Province



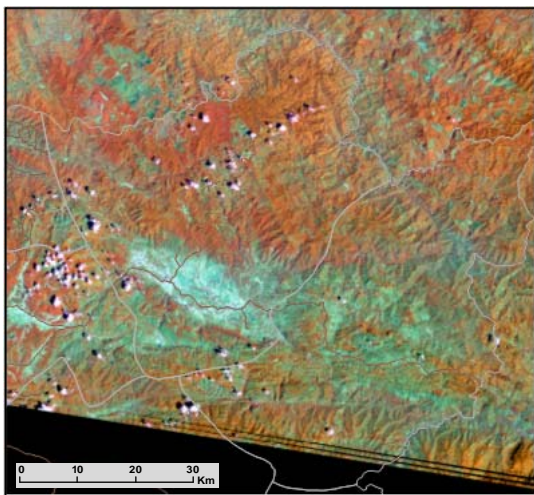
Landsat-TM (17/02/2002): image composite NIR-IR-Red



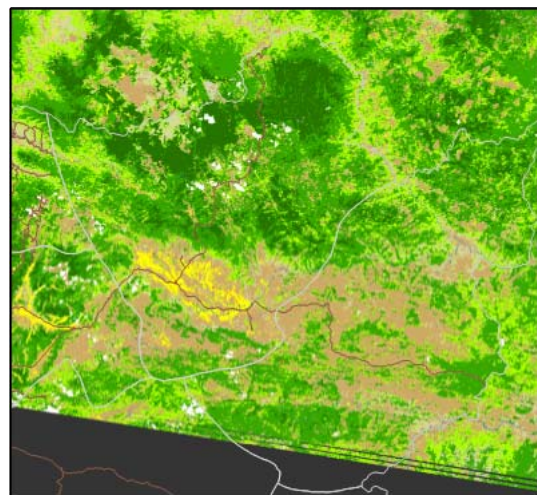
LULC 2002

[0] Unclassified	[3] Shrub	[6] Dense forest
[1] Paddy field	[4] Fallow	[7] Water
[2] Upland crop	[5] Open/mixed forest	[8] settlement
		[9] Cloud

Land Use Land Cover classification 2006 in Kham and Nonghet, Xiengkhuang Province



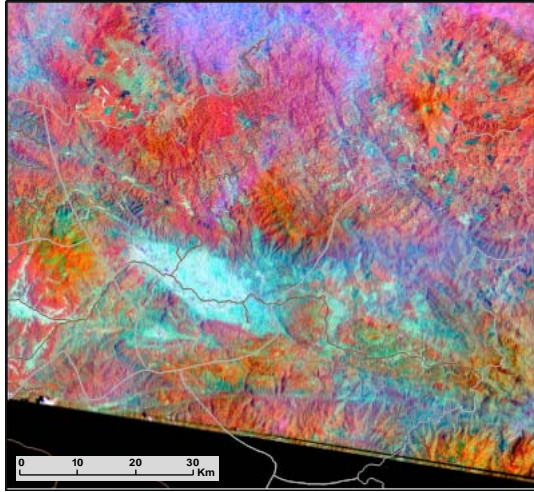
Landsat-TM (22/12/2006): image composite NIR-IR-Red



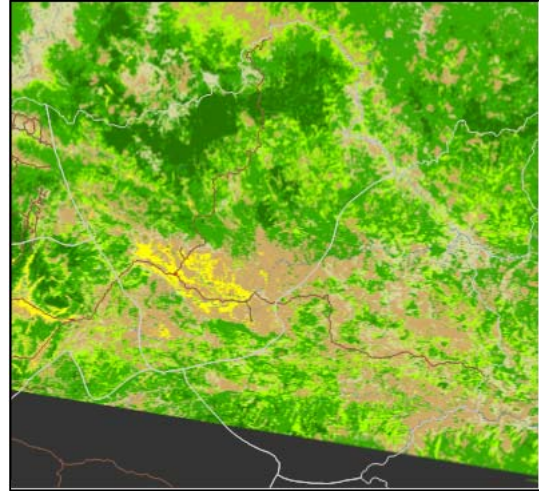
LULC 2006

[0] Unclassified	[3] Shrub	[6] Dense forest
[1] Paddy field	[4] Fallow	[7] Water
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		[9] Cloud

Land Use Land Cover classification 2010 in Kham and Nonghet, Xiengkhuang Province



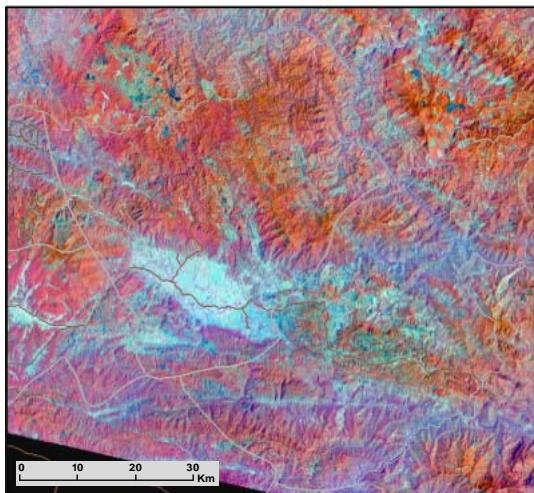
Landsat-ETM (13/04/2010): image composite NIR-IR-Red



LULC 2010

[0] Unclassified	[3] Shrub	[6] Dense forest
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[2] Upland crop	[5] Open/mixed forest	[8] settlement
		[9] Cloud

Land Use Land Cover classification 2015 in Kham and Nonghet, Xiengkhuang Province



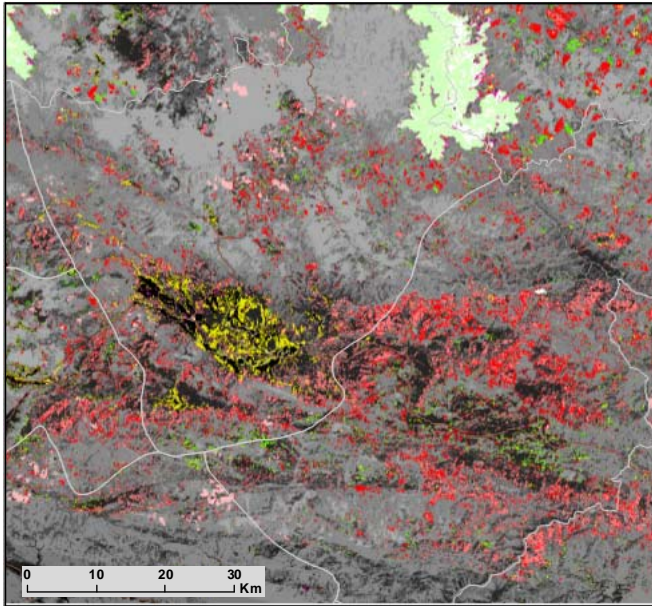
Landsat-OLT (18/02/2015): image composite NIR-IR-Red



LULC 2015

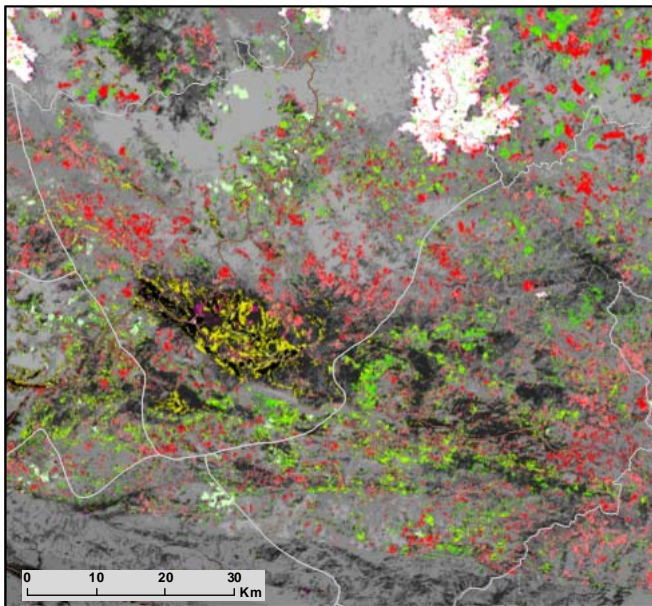
[0] Unclassified	[3] Shrub	[6] Dense forest
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[2] Upland crop	[5] Open/mixed forest	[8] settlement
		[9] Cloud

Land Use Land Cover Change 2002-2006 in Kham and Nonghet, Xiengkhuang Province



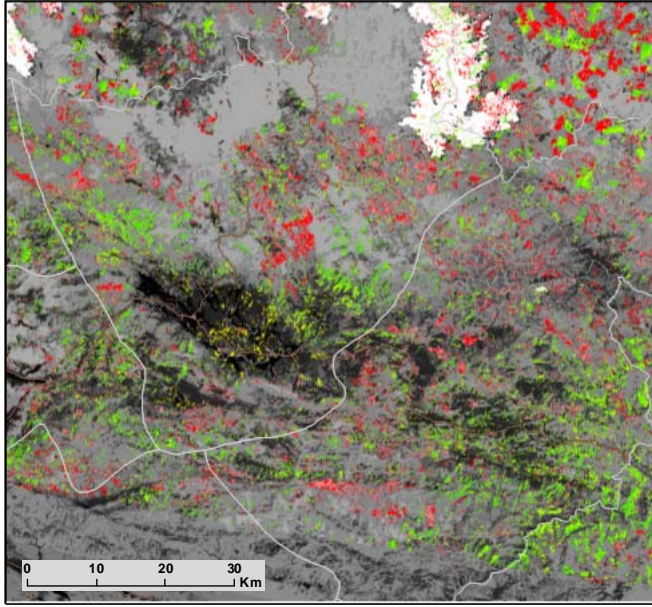
- Forest change**
- Decreasing forest
- 4-1
 - 4-2
 - 4-7,8,9; 5-7,9; 6-7,8,9
 - 5-1; 6-1
 - 5-2; 6-2
- Increasing forest
- 1-4
 - 1-5; 1-6
 - 2-4
 - 2-5; 2-6
 - 7-4,5,6; 8-4,5,6; 9-4,5,6
- Paddy field change**
- Decreasing Paddy field
- 1-2
 - 1-4
 - 1-5; 1-6
 - 1-7; 1-8; 1-9
- Increasing Paddy field
- 2-1
 - 4-1
 - 5-1; 6-1
 - 7-1; 8-1; 9-1

Land Use Land Cover Change 2006-2010 in Kham and Nonghet, Xiengkhuang Province



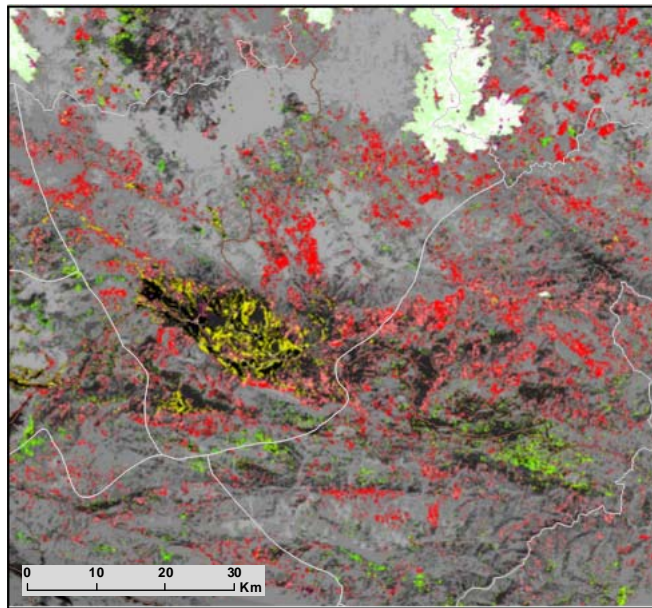
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- Decreasing forest
- 4-1
 - 4-2
 - 4-7,8,9; 5-7,9; 6-7,8,9
 - 5-1; 6-1
 - 5-2; 6-2
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- 1-4
 - 1-5; 1-6
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 - 2-5; 2-6
 - 7-4,5,6; 8-4,5,6; 9-4,5,6
- Paddy field change**
- Decreasing Paddy field
- 1-2
 - 1-4
 - 1-5; 1-6
 - 1-7; 1-8; 1-9
- Increasing Paddy field
- 2-1
 - 4-1
 - 5-1; 6-1
 - 7-1; 8-1; 9-1

Land Use Land Cover Change 2010-2015 in Kham and Nonghet, Xiengkhuang Province



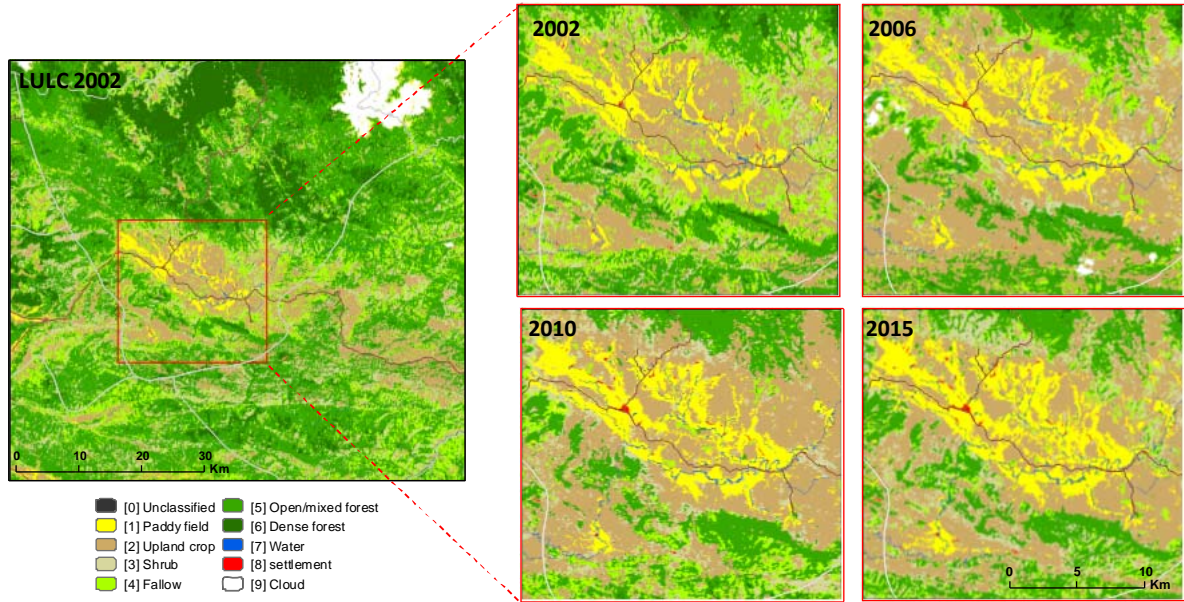
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- Paddy field change**
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 - 7-1; 8-1; 9-1

Land Use Land Cover Change 2002-2015 in Kham and Nonghet, Xiengkhuang Province

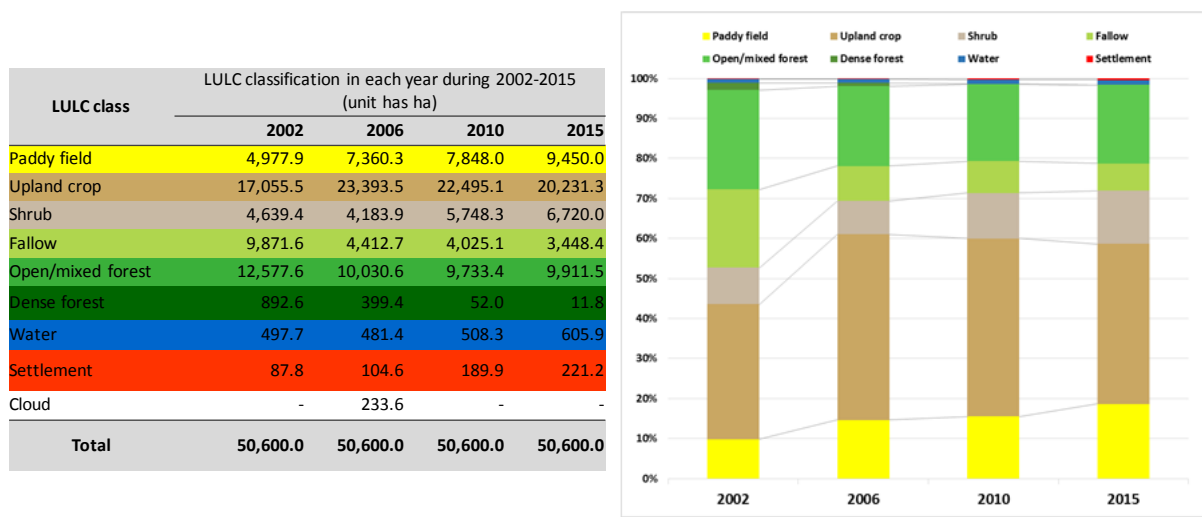


- Forest change**
- Decreasing forest
- 4-1
 - 4-2
 - 4-7,8,9; 5-7,9; 6-7,8,9
 - 5-1; 6-1
 - 5-2; 6-2
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 - 2-5; 2-6
 - 7-4,5,6; 8-4,5,6; 9-4,5,6
- Paddy field change**
- Decreasing Paddy field
- 1-2
 - 1-4
 - 1-5; 1-6
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 - 5-1; 6-1
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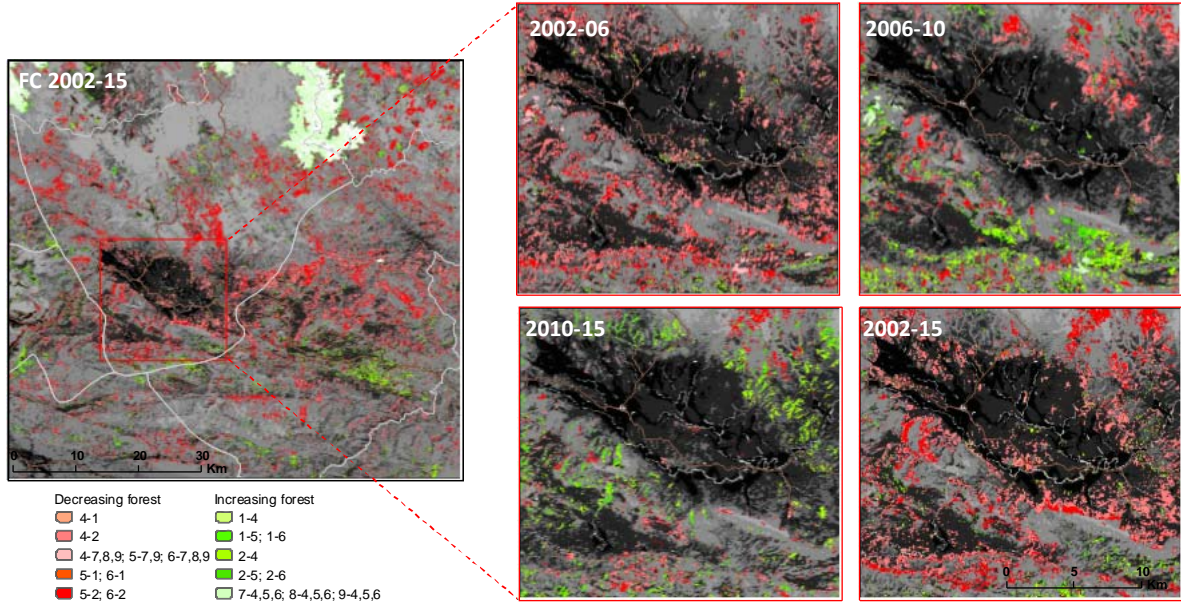
Land Use Land Cover classification 2002-2016 in Kham basin, Xiengkhuang Province



Land Use Land Cover classification 2002-2015 in Kham basin, Xiengkhuang Province

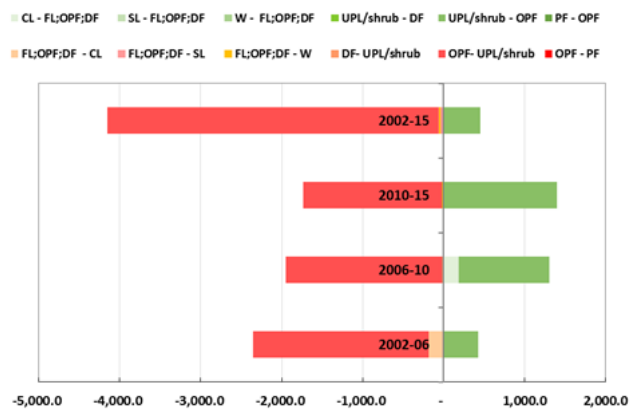


Forest Change in each periods during 2002-2015 in Kham basin, Xiengkhuang Province

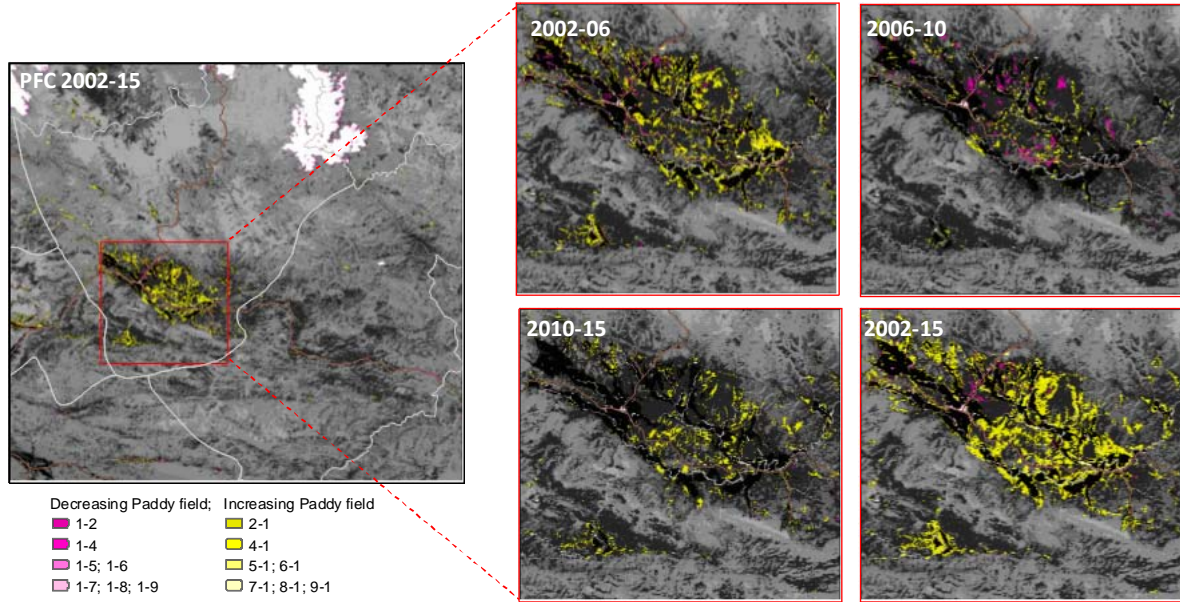


Forest Change in each periods during 2002-2015 in Kham basin, Xiengkhuang Province

Forest change in each time periods during 2002-2015 (Unit has ha)				
Forest decrease	2002-06	2006-10	2010-15	2002-15
FL - PF	158.8	9.7	9.9	431.8
FL - UPL/shrub	7,089.9	2,530.2	1,795.1	6,648.9
OPF - PF	22.6	1.3	7.4	43.0
OPF - UPL/shrub	2,356.0	1,951.1	1,731.5	4,156.0
DF - UPL/shrub	7.3	16.7	1.8	60.5
FL;OPF;DF - W	-	9.2	21.9	51.4
FL;OPF;DF - SL	-	6.6	8.7	36.7
FL;OPF;DF - CL	181.3	-	-	-
Overall Forest decrease	2,385.9	1,984.8	1,771.3	4,347.7
Forest increase				
PF - FL	3.60	-	-	2.97
UPL/shrub-FL	883.28	1,994.98	1,862.05	970.67
PF - OPF	-	-	-	0.27
UPL/shrub - OPF	429.87	1,302.47	1,403.68	448.61
UPL/shrub - DF	-	0.09	-	-
W - FL;OPF;DF	-	1.62	-	-
SL - FL;OPF;DF	-	-	-	-
CL - FL;OPF;DF	-	188.87	-	-
Overall forest increase	429.87	1,493.05	1,403.68	448.88
Net forest loss	1,956.02	491.76	367.66	3,898.79

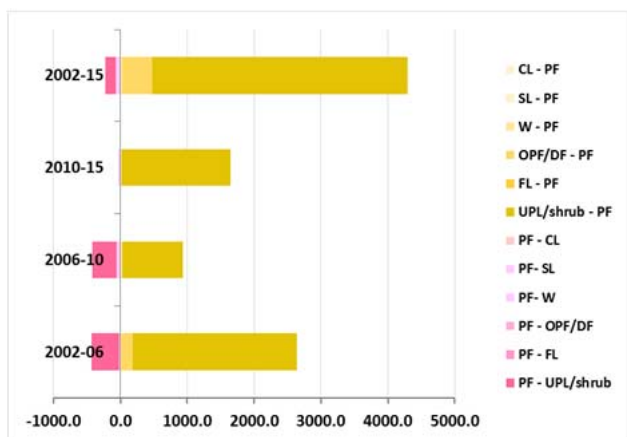


Paddy field Change in each periods during 2002-2015 in Kham basin, Xiengkhuang Province

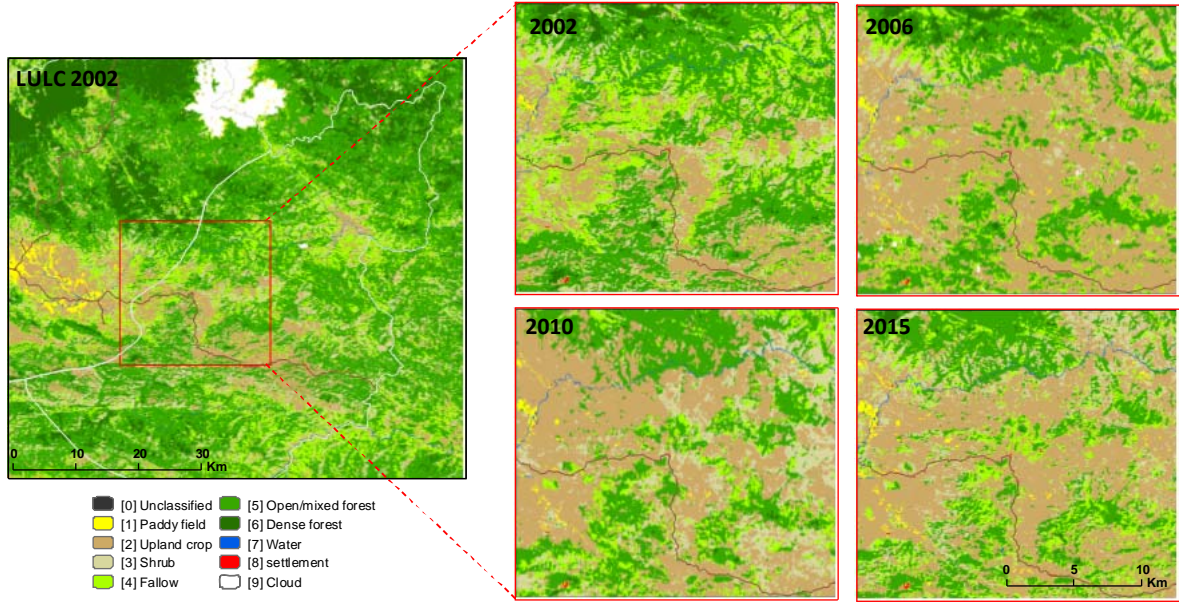


Paddy field Change in each periods during 2002-2015 in Kham basin, Xiengkhuang Province

Paddy increase	2002-06	2006-10	2010-15	2002-15
PF - UPL/shrub	430.3	424.2	7.6	222.0
PF - FL	3.6			3.0
PF - OPF/DF				0.3
PF - W		13.3	35.8	34.5
PF - SL	15.2	60.0	22.1	66.3
PF - CL	1.9			
Overall Forest decrease	451.0	497.5	65.5	326.0
Paddy increase				
UPL/shrub - PF	2,638.0	938.5	1,648.0	4,292.7
FL - PF	158.8	9.7	9.9	431.8
OPF/DF - PF	181.4	11.0	17.3	474.9
W - PF	14.0	24.1	2.1	25.5
SL - PF		9.5	0.1	5.0
CL - PF		2.1		
Overall forest increase	2,992.3	994.9	1,677.4	5,229.9
Net forest change	2,541.2	497.4	1,611.9	4,903.9

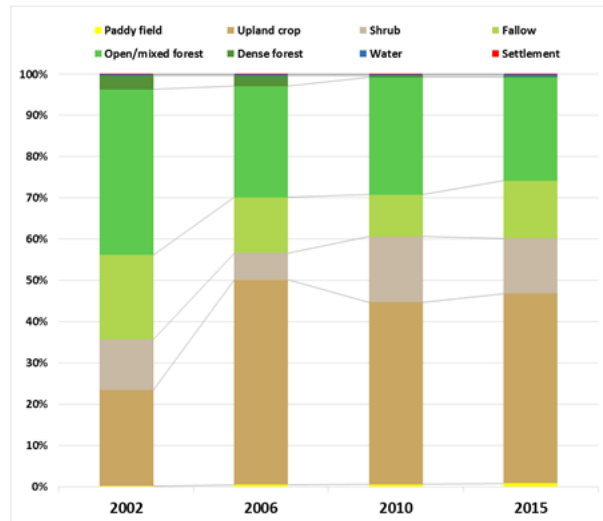


Land Use Land Cover classification 2002-2016 in western of Nonghaet district, Xiengkhuang Province

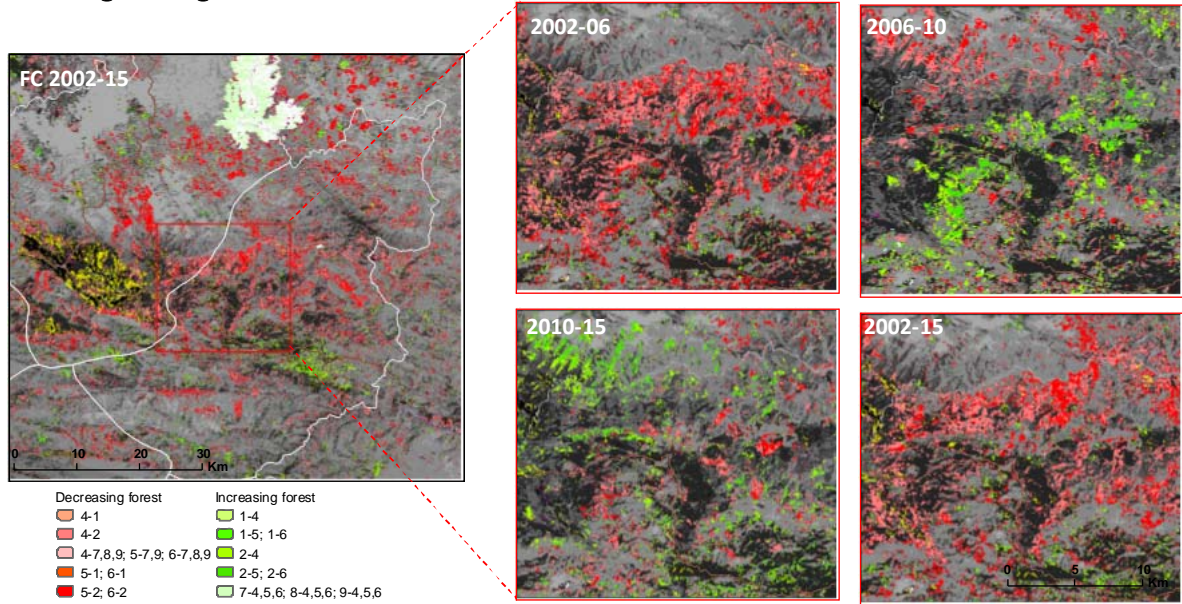


Land Use Land Cover classification 2002-2016 in western of Nonghaet district, Xiengkhuang Province

LULC class	LULC classification in each year during 2002-2015 (unit has ha)			
	2002	2006	2010	2015
Paddy field	100.4	273.0	281.7	424.7
Upland crop	11,748.8	25,078.5	22,346.1	23,295.0
Shrub	6,233.9	3,306.0	8,055.8	6,743.8
Fallow	10,368.8	6,795.4	5,129.1	7,075.8
Open/mixed forest	20,275.9	13,611.2	14,410.9	12,659.7
Dense forest	1,675.6	1,272.4	170.4	165.0
Water	163.2	163.2	167.7	191.0
Settlement	33.3	33.3	38.2	44.9
Cloud		67.1		
Total	50,600.0	50,600.0	50,600.0	50,600.0



Forest Change in each periods during 2002-2015 in western of Nonghaet district, Xiengkhuang Province



Forest Change in each periods during 2002-2015 in Nonghaet, Xiengkhuang Province

Forest change in each time periods during 2002-2015 (Unit has ha)				
Forest decrease	2002-06	2006-10	2010-15	2002-15
FL - PF	43.5	0.4	3.7	53.5
FL - UPL/shrub	7,663.9	3,930.4	2,362.3	7,868.9
OPF - PF	5.1	-	1.3	6.1
OPF - UPL/shrub	5,226.7	2,907.4	3,043.3	6,995.8
DF - UPL/shrub	7.6	59.8	1.6	40.5
FL;OPF;DF - W	-	4.1	2.9	18.4
FL;OPF;DF - SL	-	-	-	0.2
FL;OPF;DF - CL	11.1	-	-	-
Overall Forest decrease	5,239.4	2,971.3	3,049.1	7,060.9
Forest increase				
PF - FL	1.4	-	-	1.6
UPL/shrub-FL	1,772.4	2,847.9	3,477.4	2,123.9
PF - OPF	15.0	0.5	-	-
UPL/shrub - OPF	557.2	2,046.5	2,124.1	437.4
UPL/shrub - DF	0.5	1.1	4.0	0.4
W - FL;OPF;DF	-	-	-	-
SL - FL;OPF;DF	-	0.1	-	-
CL - FL;OPF;DF	-	37.8	-	-
Overall forest increase	572.8	2,086.0	2,128.2	437.7
Net forest loss	4,666.6	885.3	921.0	6,623.2

