CHAPTER IV
RESULTS

4.1 Classifications data land use with satellite images

4.1.1 Image Pre-processing

The classifications of abandoned areas used process from Thaichote satellite images in wavelength 1 to 4 by through modified process of image to image geometrics method and edited to precision of radiometric correction method of enhancement image series finally (Figure 4-1) at studied around of Phuttamonthon district Nakon Pathom province (Land Development Department, 2007)

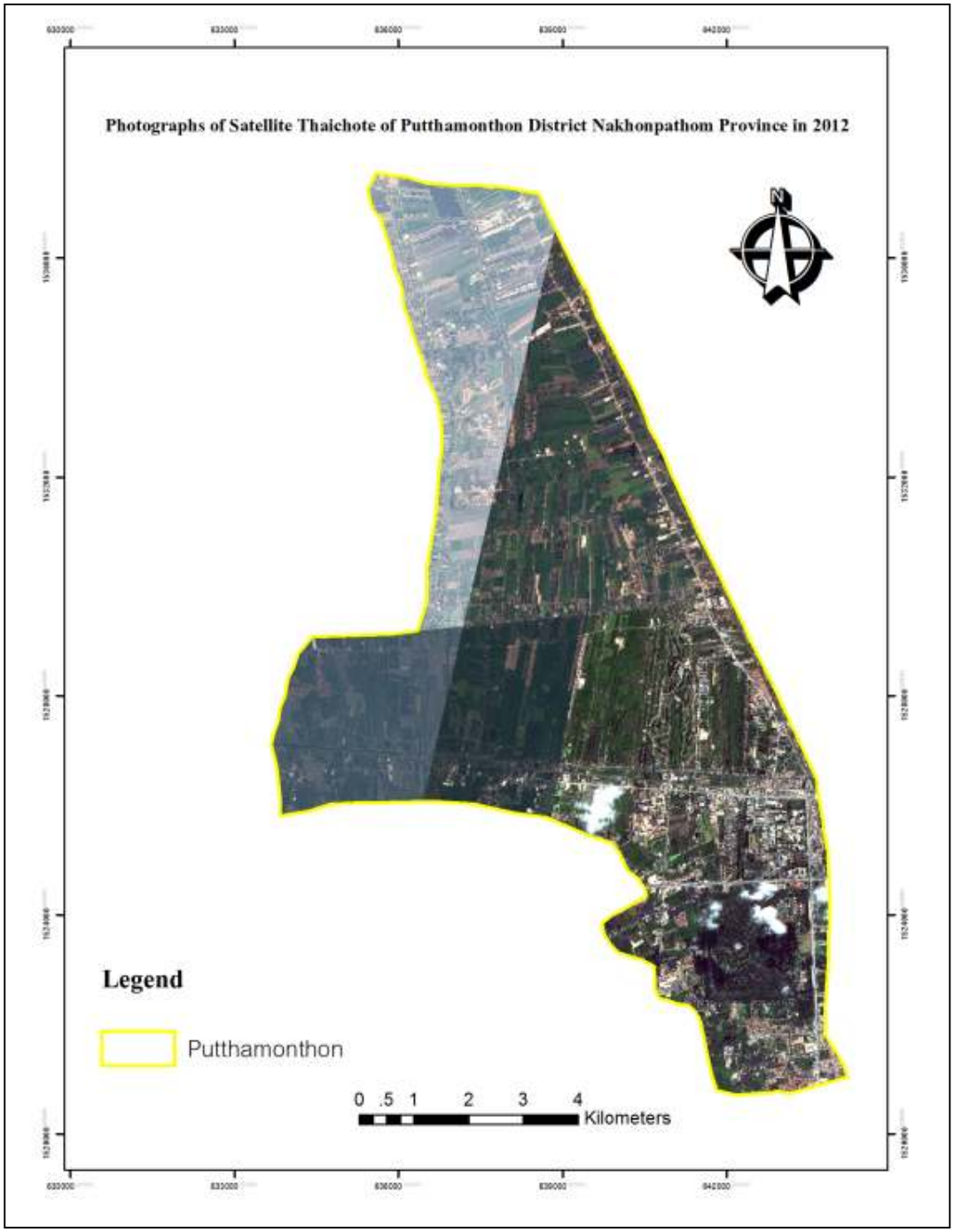


Figure 4-1 Thaichote satellite images though pre-processing in Phuttamonthon district Nakhon Pathom province in 2012

4.1.2 Land use Classification

Used classification methods for interpretation of semi - automatics interpretation by applying the principles for interpretation by computer and visual interpretation of land in Phuttamonthon district, Nakhon Pathom. To classify the based on land use level 3 and decorated with processed was screen by sight measurement and adjust data post classification with abandoned land data base and land used other in studies (Edited; Land development Department and Department of public works, 2009 and Town & Country planning, 2012). The result was classification of abandoned land and other land used in Table 4-1 and Figure 4-2.

Table 4-1 Land use in Phuttamonthon district Nakhon Pathom province in 2012.

No.	Code	Type of land use	Area (km^2)	Area(rai)
1	A100	Abandoned paddy field	0.76	465.76
2	A101	Paddy field	28.33	17,712.96
3	A401	Mixed orchard	5.4	3,329.00
4	A405	Coconut	0.09	53.67
5	A502	Truck crop	6.47	4,082.31
6	A503	Floricultural	3.18	1,997.81
7	A704	Swine farm house	0.12	72.37
8	A801	Mixed Aquatic plant	1.44	923.28
9	A807	Watercress	0.06	36.53
10	A902	Fish farm	0.74	462.17
11	M102	Scrub Land	2.35	1,486.36
12	M2	Marsh and Swamp	0.06	37.70
13	M40	Other	0.04	31.32
14	U1	City, Town , Commercial	1.3	811.45
15	U200	Abandon Village	0	7.20
16	U201	Village	12.09	7,546.13
17	U3	Institutional land	8.59	5,367.76
18	U405	Road	1.37	852.11

Table 4-1 Land use in Phuttamonthon district Nakhon Pathom province in 2012. (cont.)

No.	Code	Type of land use	Area (km^2)	Area(rai)
19	U406	Railway	0.37	234.35
20	U500	Abandon Factory	0.01	4.69
21	U502	Factory	1.59	1,017.21
22	U602	Golf course	1.34	836.48
23	W101	River, Canal	0.39	246.67
24	W102	Lake	1.5	958.31
25	W201	Reservoir	0.31	192.49
26	W202	Farm pond	0.23	281.90
27	W203	Irrigation canal	1.57	987.99
Total			**79.7**	**50,035.99**

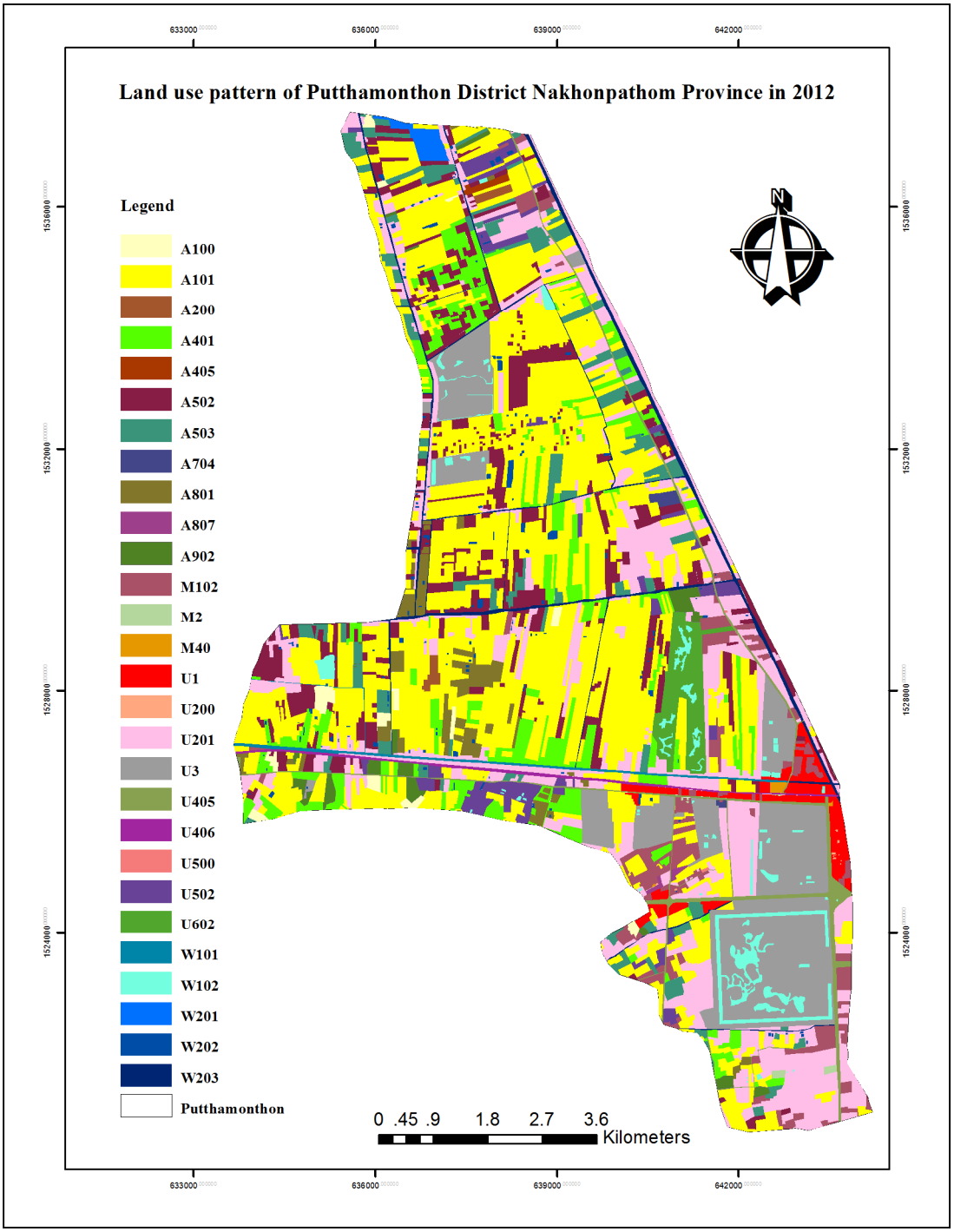


Figure 4-2 Land used in Phuttamonthon district Nakhon Pathom province in 2012

The analytically accumulate precision in classification abandoned areas and land used other. These were comparisons satellite image and ground truth data. In this was all sample covers points data of Phuttamonthon district about 250 sample

points. The overall accuracy resulted was percentage 80.10 and Kappa index 0.90. The results of analytically accuracy considered acceptable and Kappa index was rang acceptable in most and mostly follow as (Table 4-2)

Table 4-2 Analysis from satellite data in ground truth.

Ground Truth		Semi – automatic interpretation classification		
		Abandoned areas	Non abandoned areas	Overall
	Abandoned areas	92	22	114
	Non abandoned areas	19	61	80
	Overall	111	83	191
% Accuracy		82.88	73.49	80.10

4.2 Classifications of abandoned areas in Phuttamonthon district, Nakhon Pathom province.

4.2.1 Nomenclature identification

Forms of land use by the land development in Level 3 selected types of land use in Level 3, which can be classified at all eight types of abandoned village, abandoned factory, abandoned area, abandoned paddy field, abandoned field crop / bush follow, abandoned farm house, abandoned aqua cultural land and abandoned mine / pit for the current land use by the Department of Public Works and Town Planning Grove area include marsh / wetlands. arid desert of empty space does not specify the use of fallow and abandoned buildings / towers that are not utilized.

Identification of semi - automatics interpretation Land development department and Department of Public works and Town & country planning and ground truth data was 5 abandoned areas data classification ; abandoned paddy field, rangeland, marsh and swamp, open space / bare soil and abandoned building follow as Table 4-3

Table 4-3 Typed of abandoned areas in Phuttamonthon district Nakhon Pathom province

Coordinate values X, Y	**Type of abandoned areas**	**Thaichote images**	**Present images**
638111 1536971	abandoned paddy field		
640093 1525455	rangeland		
637977 1526259	marsh and swamp		
640862 1531122	open space / bare soil		
640300 1530054	abandoned building		

4.2.2 Abandoned Areas Classification

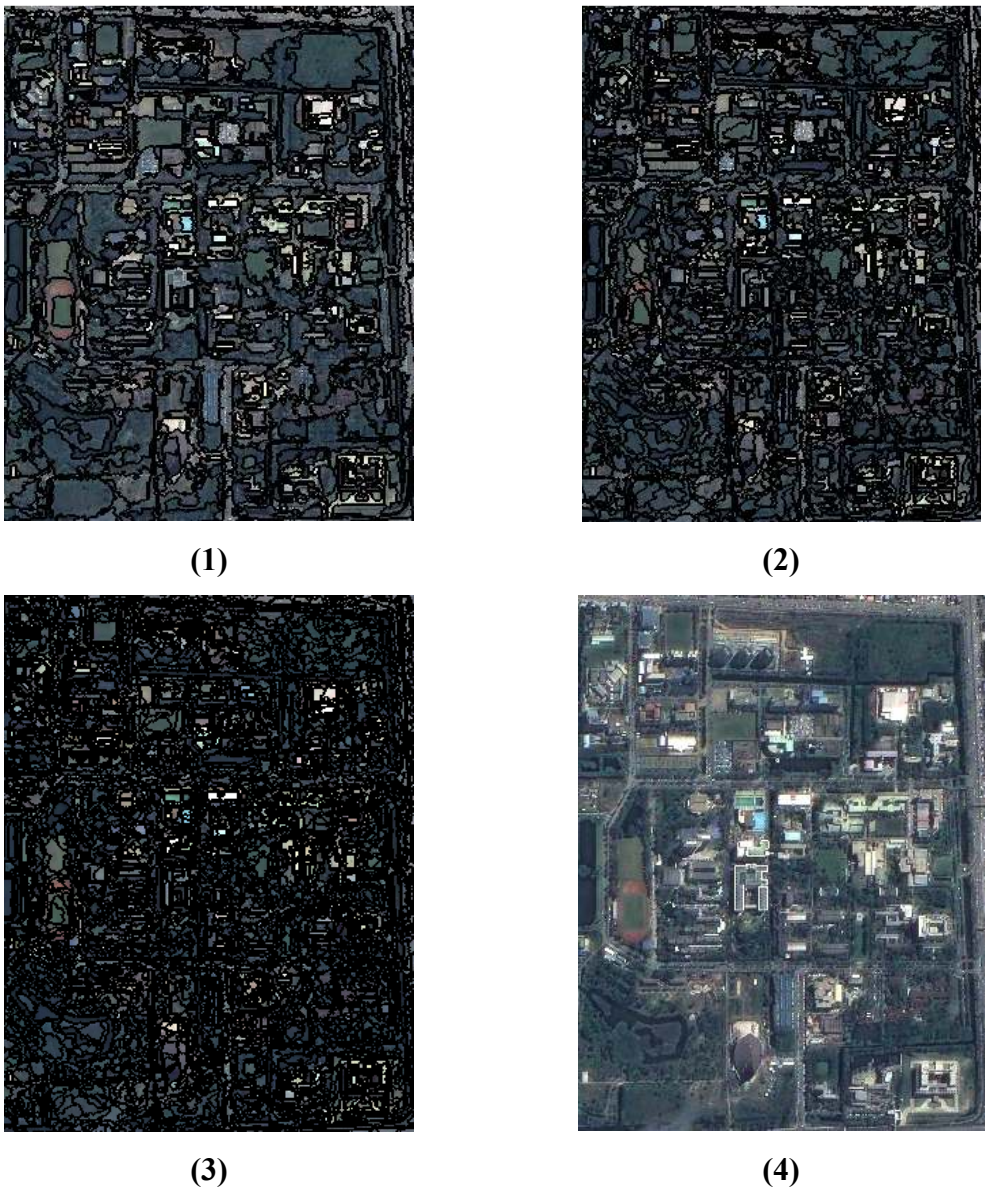
The object oriented classification techniques was 1) processed classify segmentation of data level to step scale; used selection and segmentation of object data by top down techniques for mostly accuracy and 2) To classify object images from a segmentation with conditions. Statistical values of reflectivity and the plant index.

4.2.2.1 Creation from object satellite data (Multi – scale segmentation)

The creating process multi scale segment for picture scales was 3 factors 1) scale values 2) color and shape values and 3) flatness values in addition to factor classified as dependent variable was based on land use; road river and communities. The studies detail of satellite data could prefer to classification of detail in satellite data from scales satellite image. The processed multi-resolution of segment was 3 levels 1) first how to separate of water scales between water area and not water area since water reflection was water apparent from not water area. The processed was studied of comparison units; scale = 50, shape = 0.1 and compactness = 0.5 in this studies to band weight use near wave rang 4 only (NIR=1). The wave rang at 4 only because showed was wave rang clear of water area. Next 2) how to separate plant and not plant use scales unit was scale = 30, shape = 0.1 and compactness = 0.5 and band weight = 1 by blue and red color in wave rang at 3 only finally 3) studies was separate of small objects use for abandon land, swamp, abandon farmland, prairie and bark by used scale units was scale = 17, shape = 0.1 and compactness = 0.5.

Table 4-4 Parameter from multi scale segmentation

Segmentation level	Scale	Color	Shape	Shape setting	
				Smoothness	Compactness
Level 1	50	0.9	0.1	0.5	0.5
Level 2	30	0.9	0.1	0.5	0.5
Level 3	17	0.9	0.1	0.5	0.5



(1) **(2)**

(3) **(4)**

Figure 4-3 Thaichote Section of satellite images at scale = 50 (picture 1), scale = 30 (picture 2), scale = 17 (picture 3) and satellite image (Pan sharpened) resolution = 2 m (picture 4).

4.2.3.2 Select training areas

In object-oriented analysis to classify the image data. The analysis will be based segmentation process. And characteristics of the reflection of light on a different object processing. This process will need to select the sample. In this study, there are 10 types of data, including the areas of abandoned paddy field,

rangeland, marsh and swamp, open space / bare soil and abandoned building, paddy field, truck crop, mixed orchard, street and water. Number of the examples above are more than 20 examples of each type of land use and to determine the extent of the area to an area of 40 x 40 m (1 rai)

4.2.3.3 Characterization of the statistical sample.

When the extent of the area of each land use type. Examples of the wavelength used for processing. Samples from each of the waves are the statistics that can be analyzed statistically. To assess whether the sample selected by the various waves. Are reliable and represent good or not. The statistics used in this study, including mean, standard deviation, brightness, NDVI, NDWI, BI, Texture (homogeneity, entropy) on select samples and calculate statistical information for each type of land use of the area.

Table 4-5 Characterization of the statistical abandoned areas sample

	The average reflection				
	abandoned paddy field	**rangeland**	**marsh and swamp**	**open space / bare soil**	**abandoned building**
Mean Blue	42-103	41-64	31-94	52.58-245.19	0-255
Mean green	51-104	53-71	39-132	54.79-237.74	0-255
Mean red	58-97	59-75	46-105	56.98-192.75	0-255
Mean NIR	61-127	101-153	31-215	66.32-252	0-255
Std. blue	3.35-17.32	4.60-15.96	3.52-15.15	3.34-48.62	0-54.46
Std. green	3.39-16.38	5.08-16.38	3.11-20.89	2.87-43.23	0-54.66
Std. red	3.57-14.27	5.49-16.75	3.57-16.75	4.44-54.52	0-52.74
Std. NIR	4.50-20.50	11.56-22.86	5.25-35.21	5.02-50.90	0-61.26
Brightness	60-108	65-84	39-137	60.14-192	0-254.99

Table 4-5 Characterization of the statistical abandoned areas sample (cont.)

	The average reflection				
	abandoned paddy field	**rangeland**	**marsh and swamp**	**open space / bare soil**	**abandoned building**
NDVI	-0.04-0.35	0.15-0.40	-0.29-0.41	-0.06-0.37	-0.44-1
NDWI	-0.48-(-0.36)	48.90-171.72	99.18-214-25	1	1
BI	49.55-67.29	25.39-96.50	58.00-140.56	56.15-206.36	0-255
GLCM Homogeneity	0.18-0.50	0.03-0.42	0.01-0.37	0-0.17	0-0.81
GLCM Entropy	4.70-7.94	5.93-7.76	4.41-8.05		

Table 4-6 Characterization of the statistical other land use sample

Statistics	**The average reflection**			
	Paddy field	**Truck crop**	**Mixed orchard**	**building**
Mean Blue	47-255	45-60	30-41	27.11-241.88
Mean green	50-255	53-73	43-58	33.68-243.65
Mean red	56-255	58-73	51-65	39.92-242.82
Mean NIR	56-250	67-143	94-132	48.59-240.56
Std. blue	0.27-56.82	8.12-9.74	3.79-5.68	2.56-71.62
Std. green	0.28-52.52	8.47-12.14	4.8-7.62	2.61-67.16
Std. red	4.39-54.63	8.51-11.80	5.49-8.78	2.88-69.69
Std. NIR	9.46-53.34	8.41-23.38	11.30-17.08	2.89-69.44
Brightness	52-254	58-85	54-74	37.79-242.23
NDVI	-0.12-0.22	-0.02-0.33	0.26-0.34	-0.19-0.37

Table 4-6 Characterization of the statistical other land use sample (cont.)

Statistics	The average reflection			
	Paddy field	**Truck crop**	**Mixed orchard**	**building**
NDWI	102.76-201.37	32.35-137.44	67.33-128.24	1
BI	43.06-69.22	34.88-100.63	34.55-58.88	34.59-242.79
GLCM Homogeneity	0.17-0.44	0.02-0.41	0.06-0.17	0-0.38
GLCM Entropy	3.99-8.12	6.67-7.38	6.35-7.09	-

4.2.3.4 Setting Condition for Classification

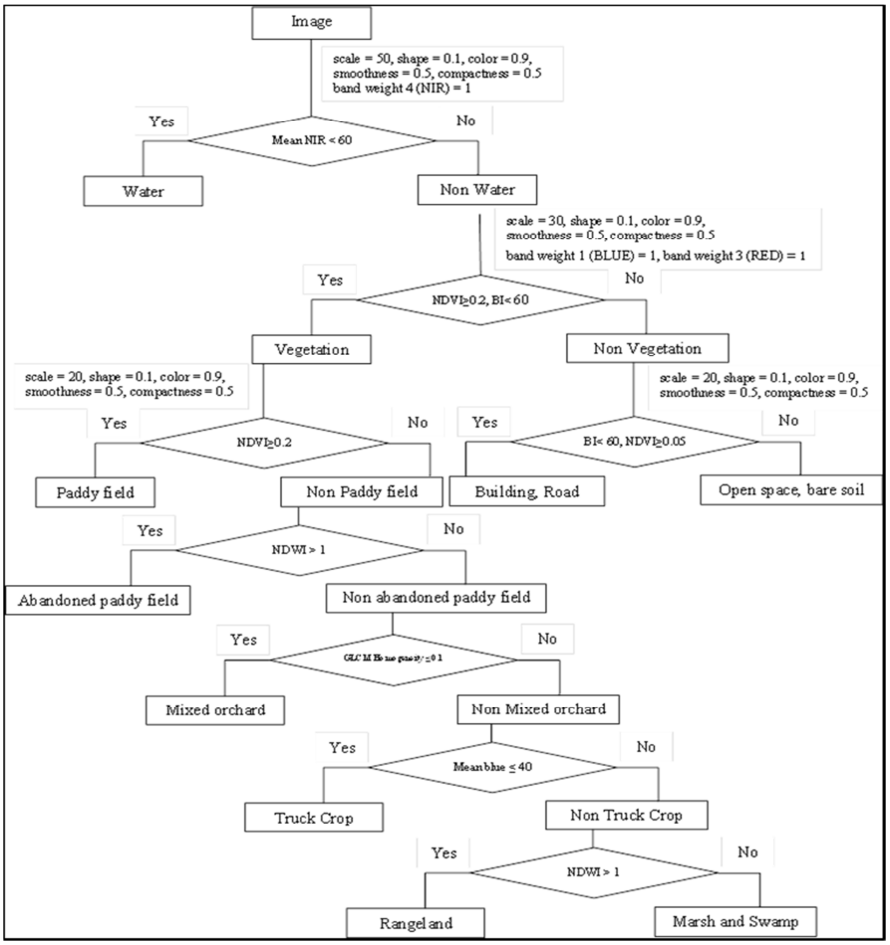


Figure 4-4 Result of Setting Condition for Classification.

4.2.1.2 Object based classification

The creation of object images was processing creates the object images. All the object images separation and structure of statistic principles in studies area; object structure, resolutions, descriptive information characters and difference of group.

Step 1, when finishing separating image, use wetland to divide other data ranks. This step is to separate wetland from other areas except wetland by partial separating process named Multi – resolution Segmentation in 3 levels. Objective of partial separating process in level 1 is to separate wetland from other areas except wetland. Because of light reflection, wetland is separated more easily than other areas by specifying scale = 50, shape = 0.1, color = 0.9, smoothness = 0.5, compactness = 0.5, and band weight at the forth wave length (NIR) = 1, using the forth wave length to separate wetland and other areas except wetland well. The total objects are 17,571.

Because of property of water reflection, separate wetland more easily than other areas except wetland. When considering wave based reflection by the method using samples for classifying the nearest neighboring pattern of using land in two types and comparing these two patterns. It is indicated that wetland has the least mean NIR and area except wetland has high mean NIR. Therefore, specifying a wetland condition, Mean NIR of wetland is less than 60, and Mean NIR of areas except wetland is more than 110, and classifying data. Results from this step are wetland and areas except wetland, and land utilization, not classifying, of other types.

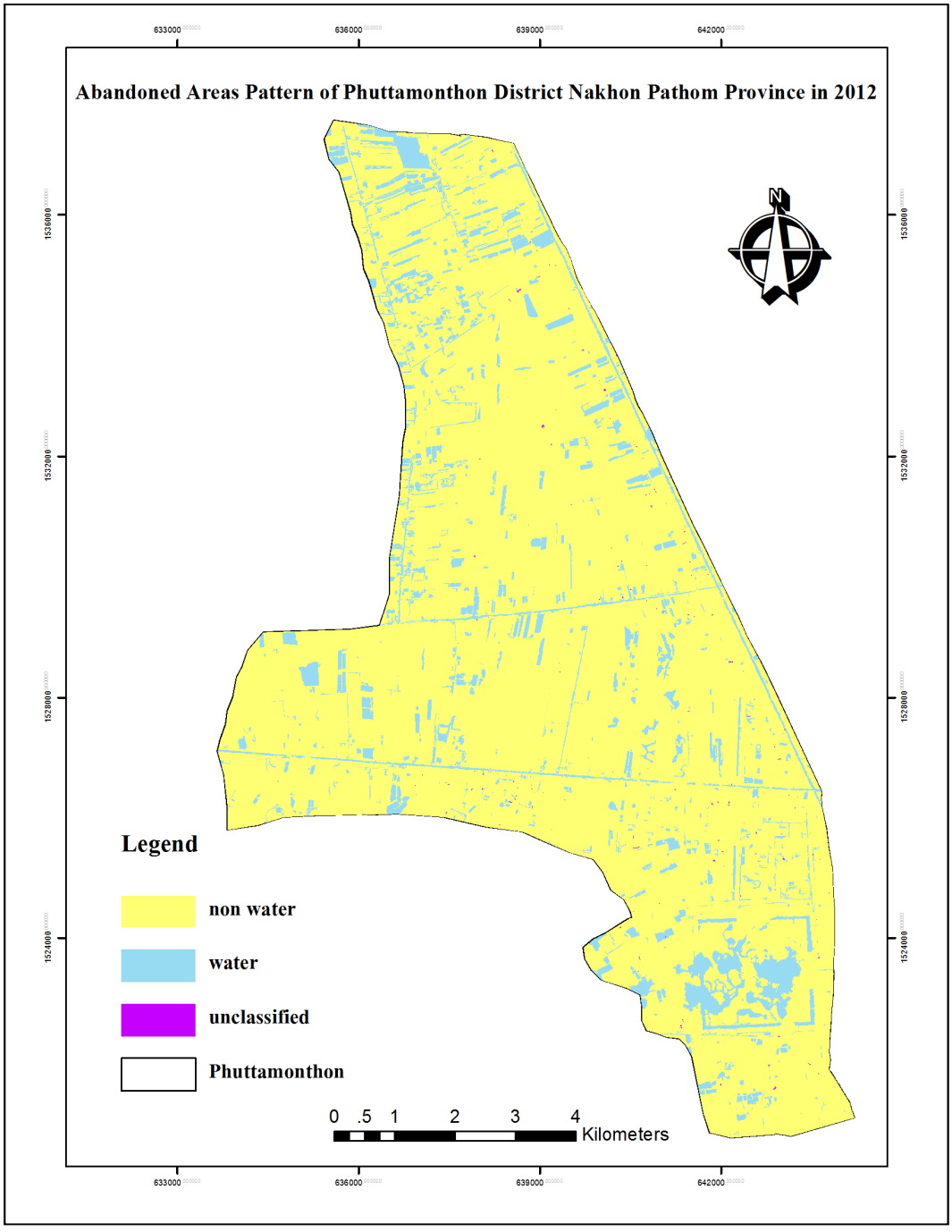


Figure 4-5 Result of classification of satellite image Thaichote Step 1.

Step 2, separate areas non water to parts that are vegetation and non vegetation. When considering wave based reflection of areas covering with vegetation and non vegetation covering with others except plants and method using samples for the nearest neighboring classification of using land , two types comparing each other. When histogram of these two types is compared, Brightness (BI) is different. Therefore, specify condition, BI, of areas covering with vegetation less than 60 and BI of areas covering with non vegetation is more than 60. NDVI is also used in classification by specifying NDVI of areas covering with vegetation more than or equal to 0.2, whereas; NDVI of areas covering with non vegetation is less than 0.2. Then, classify these data. Results from this step are areas covering with vegetation, areas covering with others except plants, and other types of land utilization, not classifying. There are 29,857 objects in total.

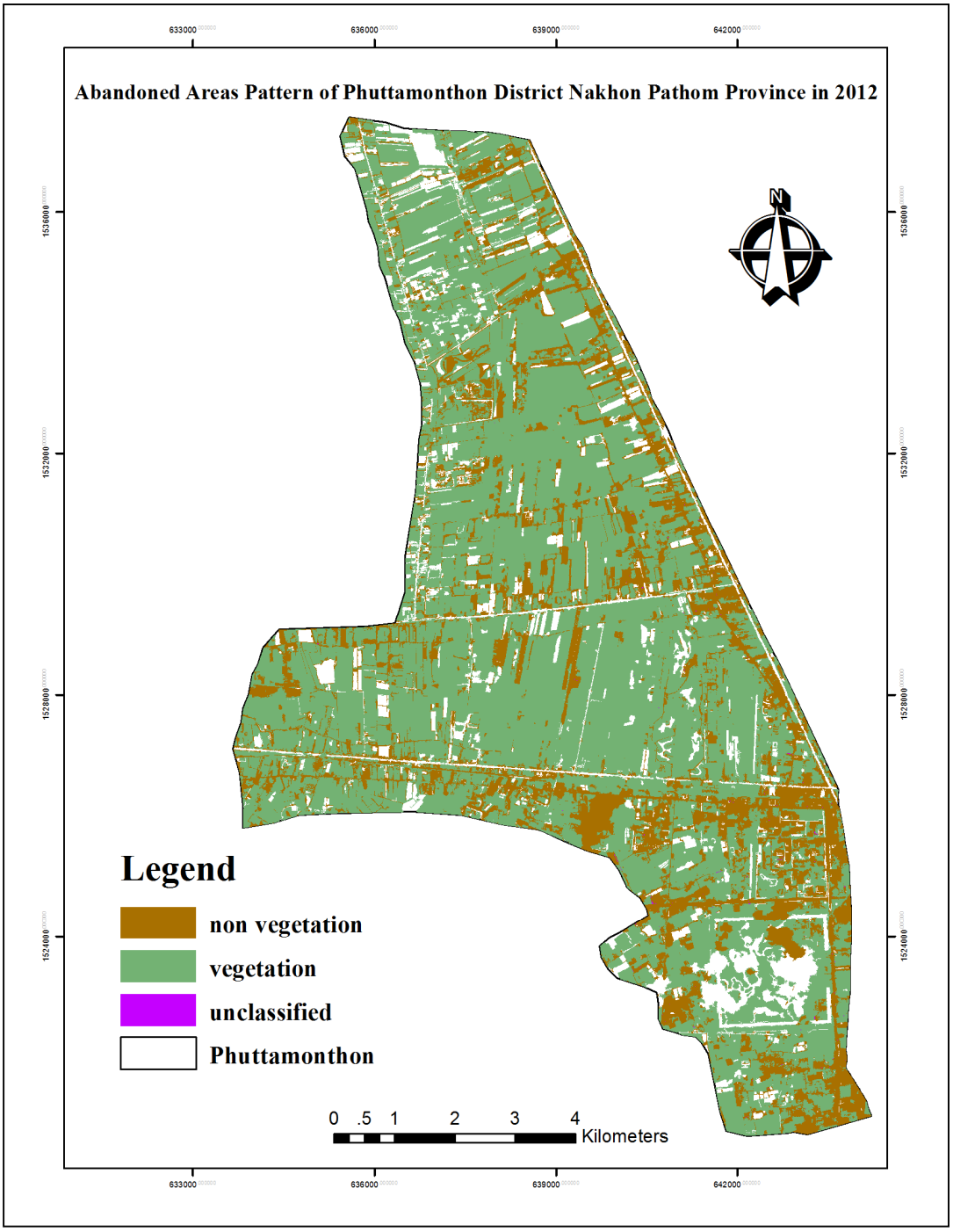


Figure 4-6 Result of classification of Thaichote satellite image step 2

Step 3; classify areas covering with vegetation by separating paddy field from vegetation areas. When considering reflection of paddy field and non paddy field, wave based reflection NDVI – colored is more different than other bands. Thus, select wave NDVI – colored to separate paddy field and non paddy field.by specifying condition, wave length, NDVI – colored, reflection of paddy field is more than 0.27 parts. For non paddy field, specify condition, not using paddy field. Then, do data classification. Results are to separate paddy field from non paddy field but there is still combination of paddy field and non paddy field so these data are classified repeatedly. There are 20,330 objects in total.

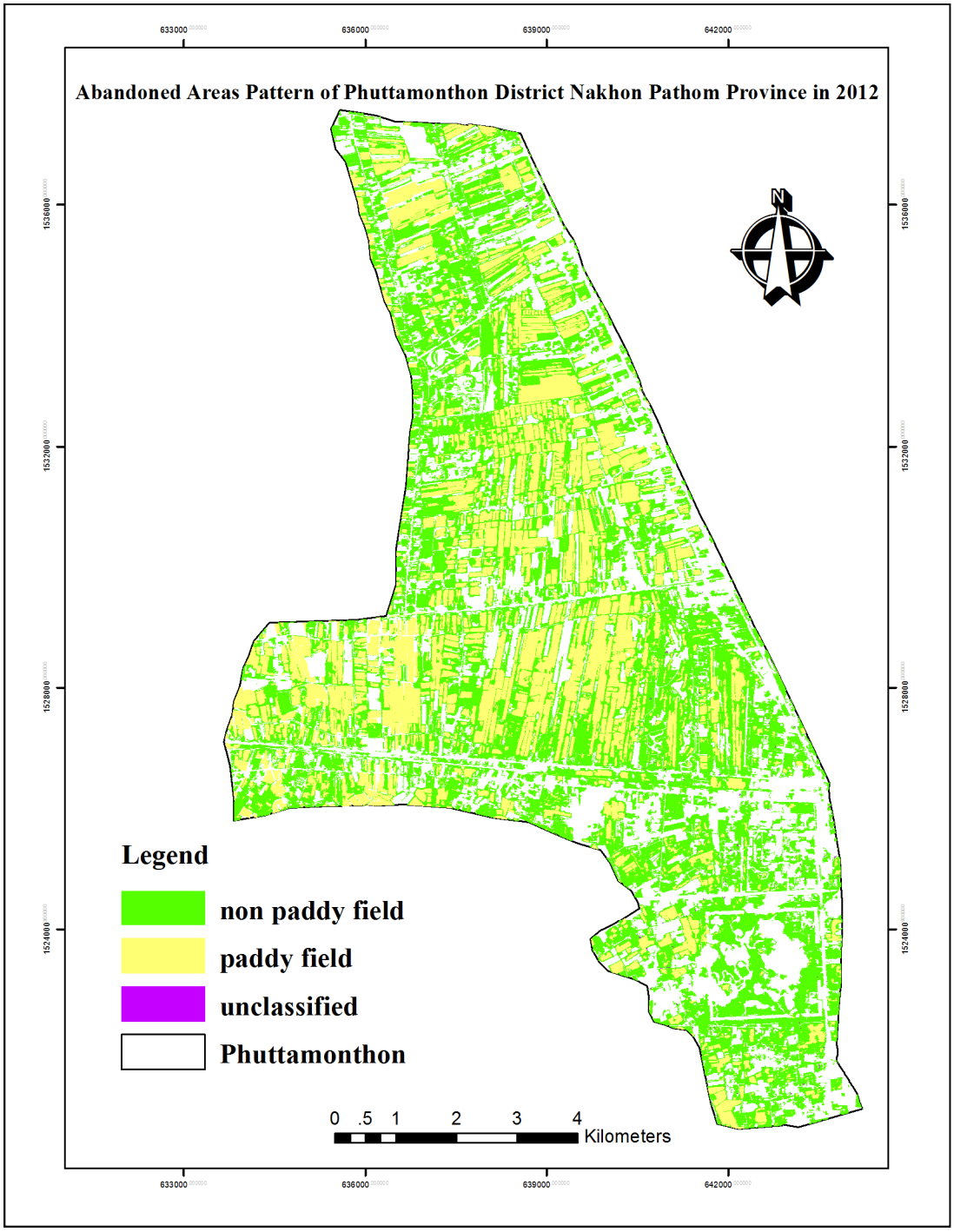


Figure 4-7 Result of classification of Thaichote satellite image step 3

Step 4, separate abandoned paddy field from paddy field and features of abandoned paddy field are similar to rice fields. When considering statistics of using land in two types from the method using samples for the nearest neighboring classification, Mean NIR and features of Histogram are not overlap, comparing reflection of each band. Thus, specify Mean NIR of paddy field more than 80, whereas; Mean NIR of abandoned paddy field is less than or equal to 80. Then, do data classification. Results are that paddy field and abandoned paddy field can be separated and there are 18,381 objects in total.

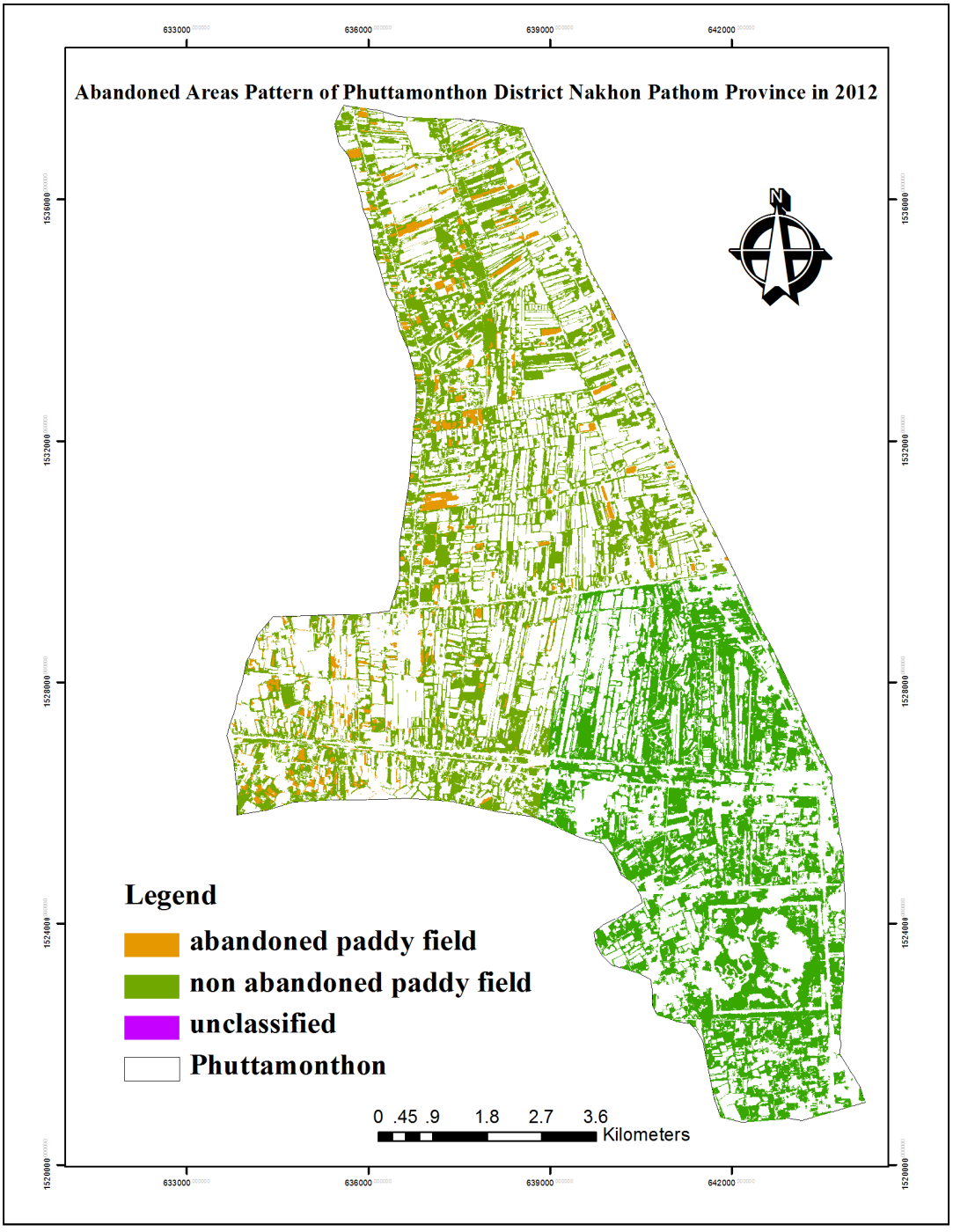


Figure 4-8 Result of classification of Thaichote satellite image step 4

Step 5 separate mixed orchard from non abandoned paddy field and features of mixed orchard are similar to non mixed orchard. When considering statistics of using land in two types from the method using samples for the nearest neighboring classification, Mean blue and features of Histogram are not overlap, comparing reflection of each band. Thus, specify Mean blue of paddy field more than 80, whereas; Mean blue of abandoned paddy field is less than or equal to 80. Then, do data classification. Results are that mixed orchard and non mixed orchard can be separated.

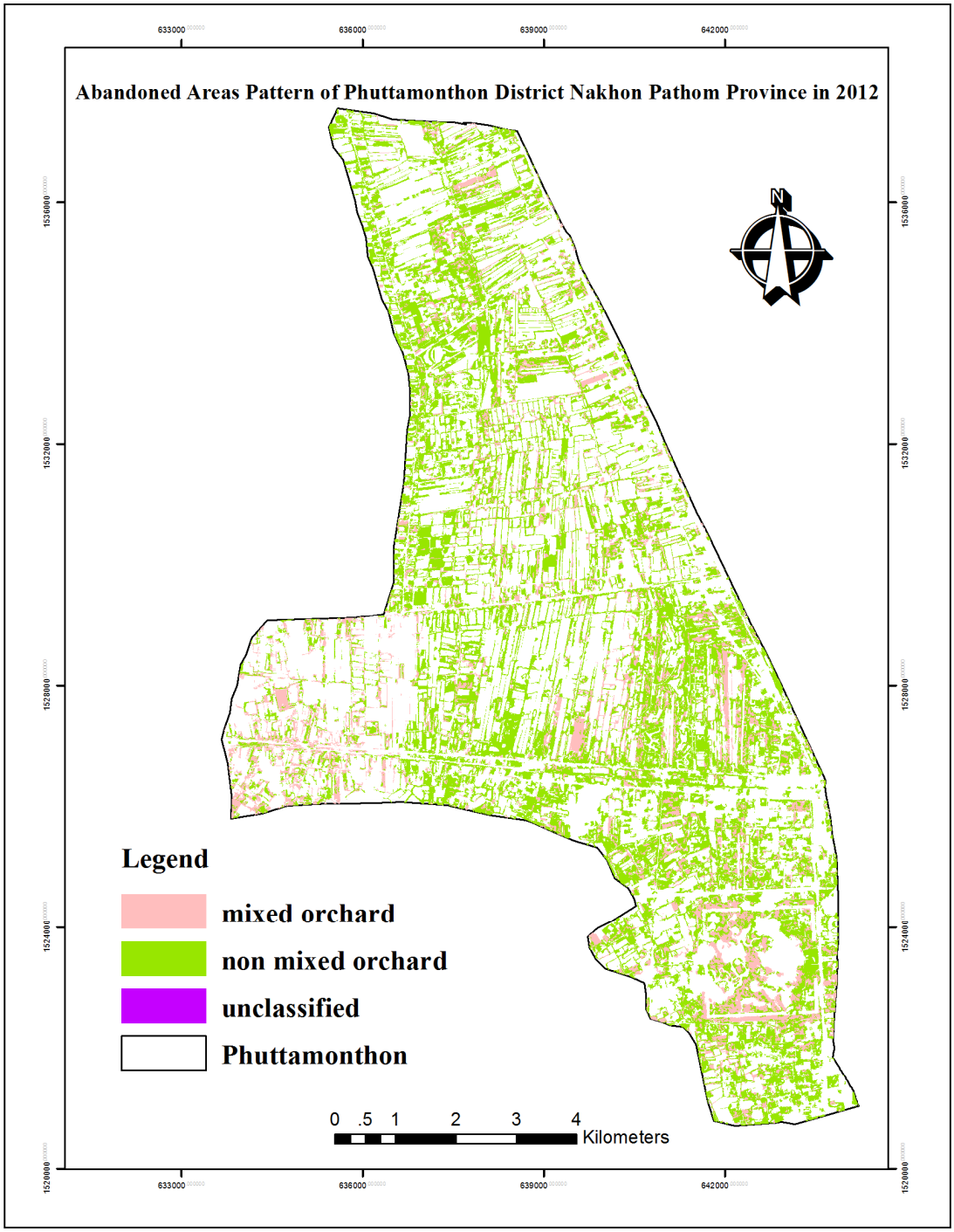


Figure 4-9 Result of classification of Thaichote satellite image step 5

Step 6 separate truck crop from non mixed orchard and features of truck crop are similar to non truck crop. When considering statistics of using land in two types from the method using samples for the nearest neighboring classification, GLCM Homogeneity and features of Histogram are not overlap, comparing reflection of each band. Thus, specify GLCM Homogeneity of non truck crop more than 0.1, whereas; Mean blue of truck crop is less than or equal to 0.1. Then, do data classification. Results are that truck crop and non truck crop can be separated.

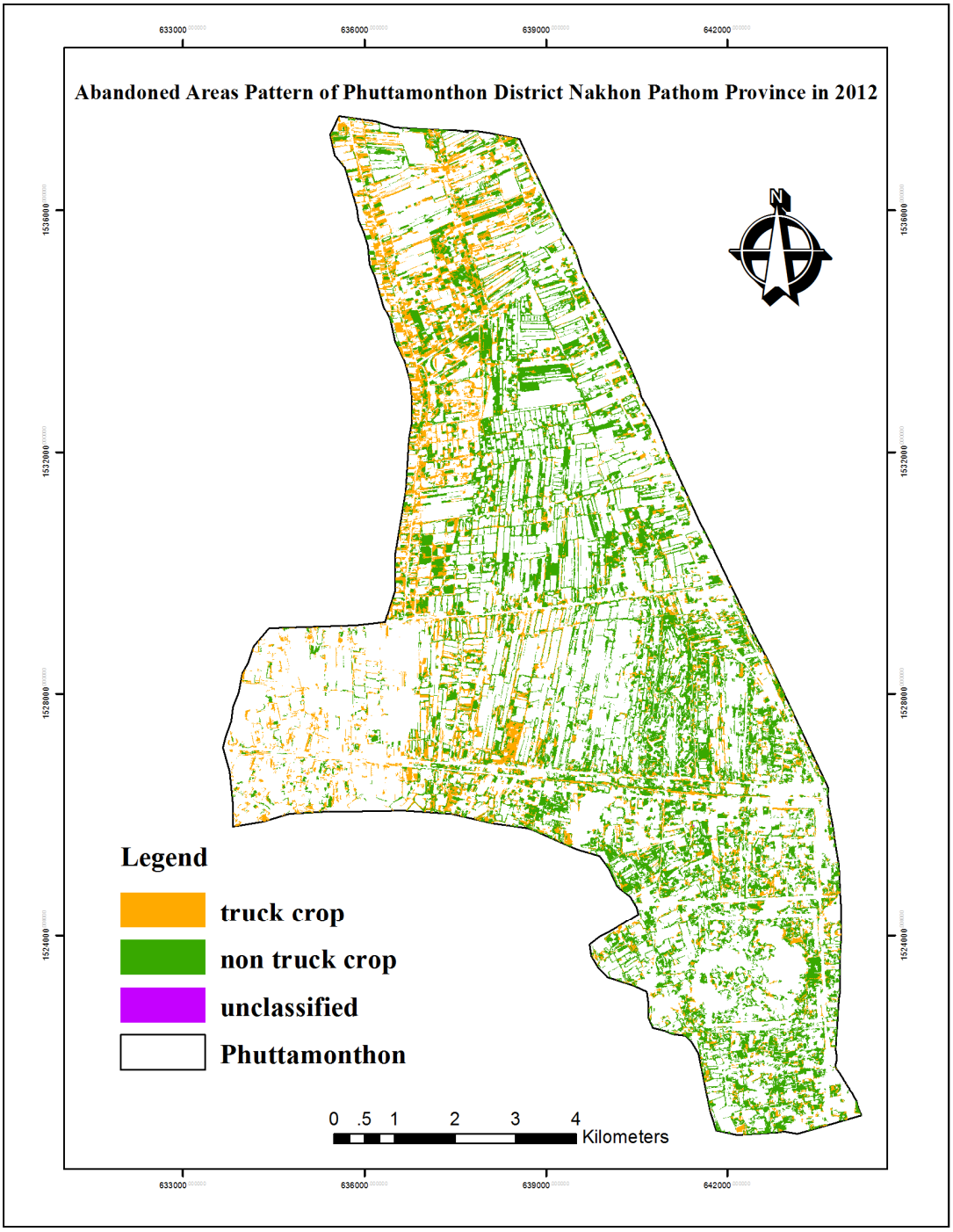


Figure 4-10 Result of classification of Thaichote satellite image step 6

Step 7, separate rangeland and marsh or swamp from non truck crop. When considering statistics of using land non truck crop from the method using samples for the nearest neighboring classification, NDWI and features of Histogram are not overlap, comparing reflection of each band. Specify NDWI of swamp or marsh less than 1 and NDWI of rangeland less than 1, Then, do data classification. Results are that rangeland and marsh or swamp can be separated from non truck crop.

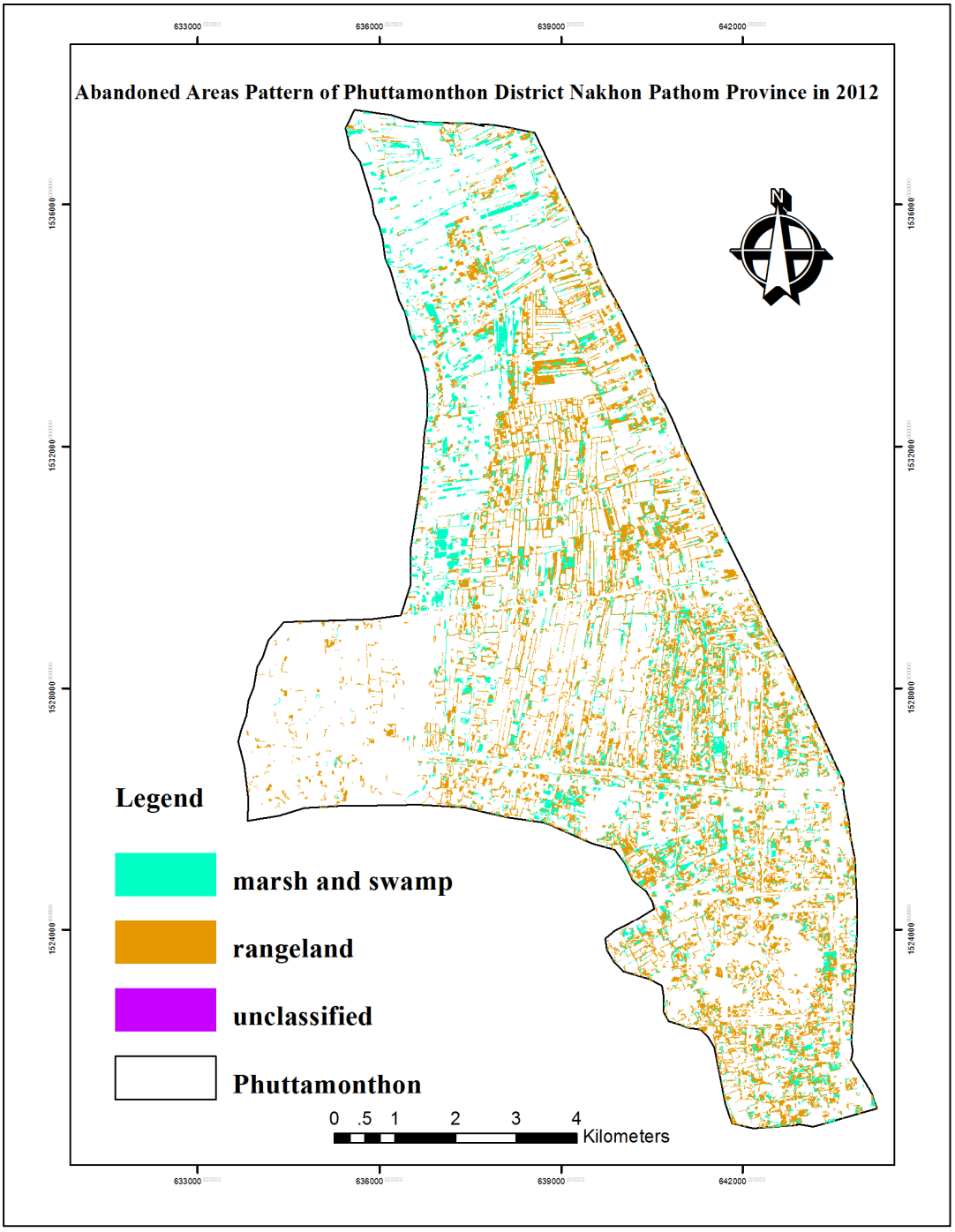


Figure 4-11 Result of classification of Thaichote satellite image step 7

Step 8, separate open space or bare soil, building and construction and road from non vegetation areas covering others except plants. When considering statistics of using land in 2 types from using samples for the nearest neighboring classification, Brightness, BI, differs from other bands and features of Histogram are not overlap. Specify BI of open space or bare soil more than 100 and NDVI more than 0.5, NDVI of building and construction, and road less than 0.05, and Mean NIR less than 100. Then do data classification. Results are that open space or bare soil, building and construction, and road can be separated from areas covering non vegetation areas.

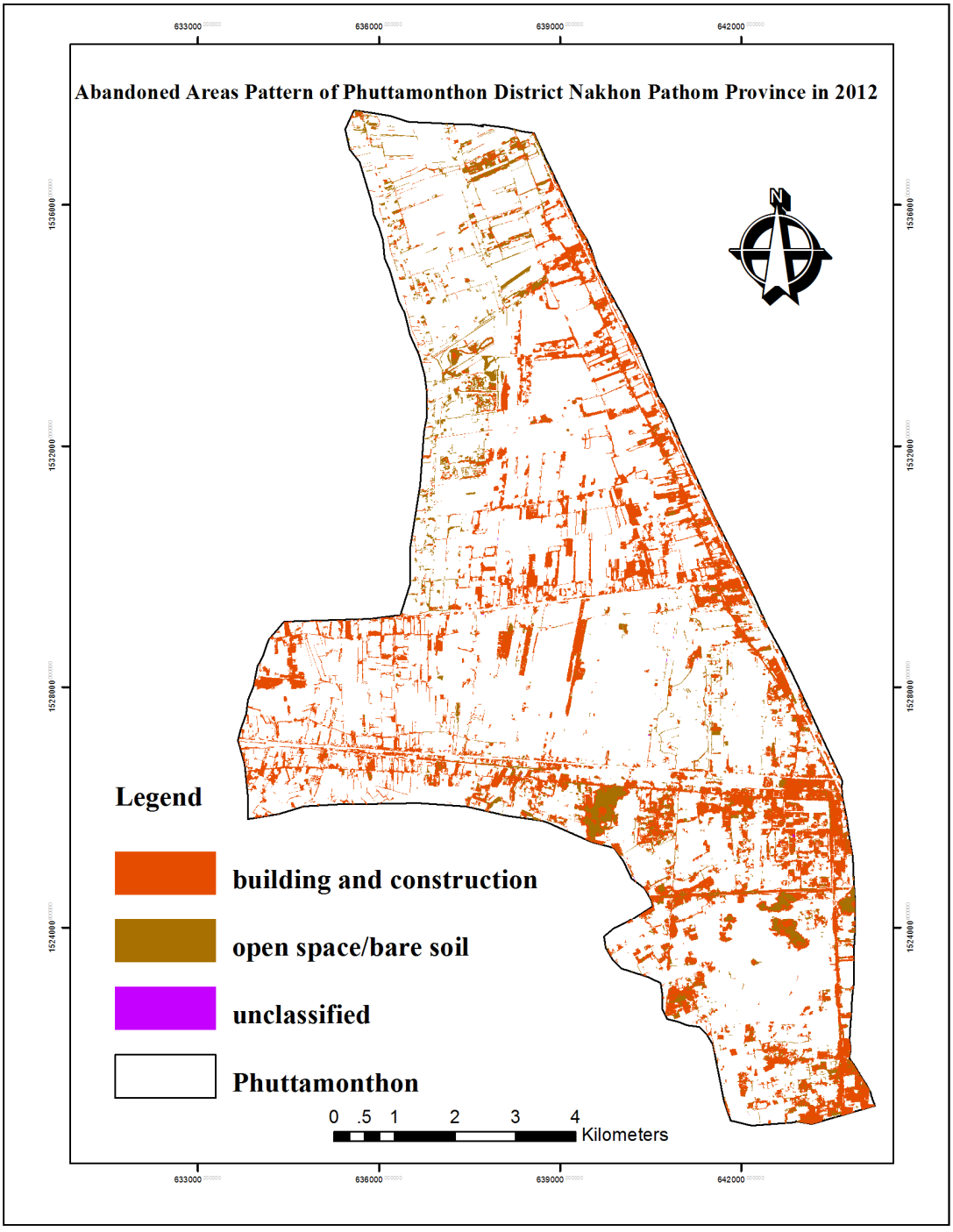


Figure 4-12 Result of classification of Thaichote satellite image step 8

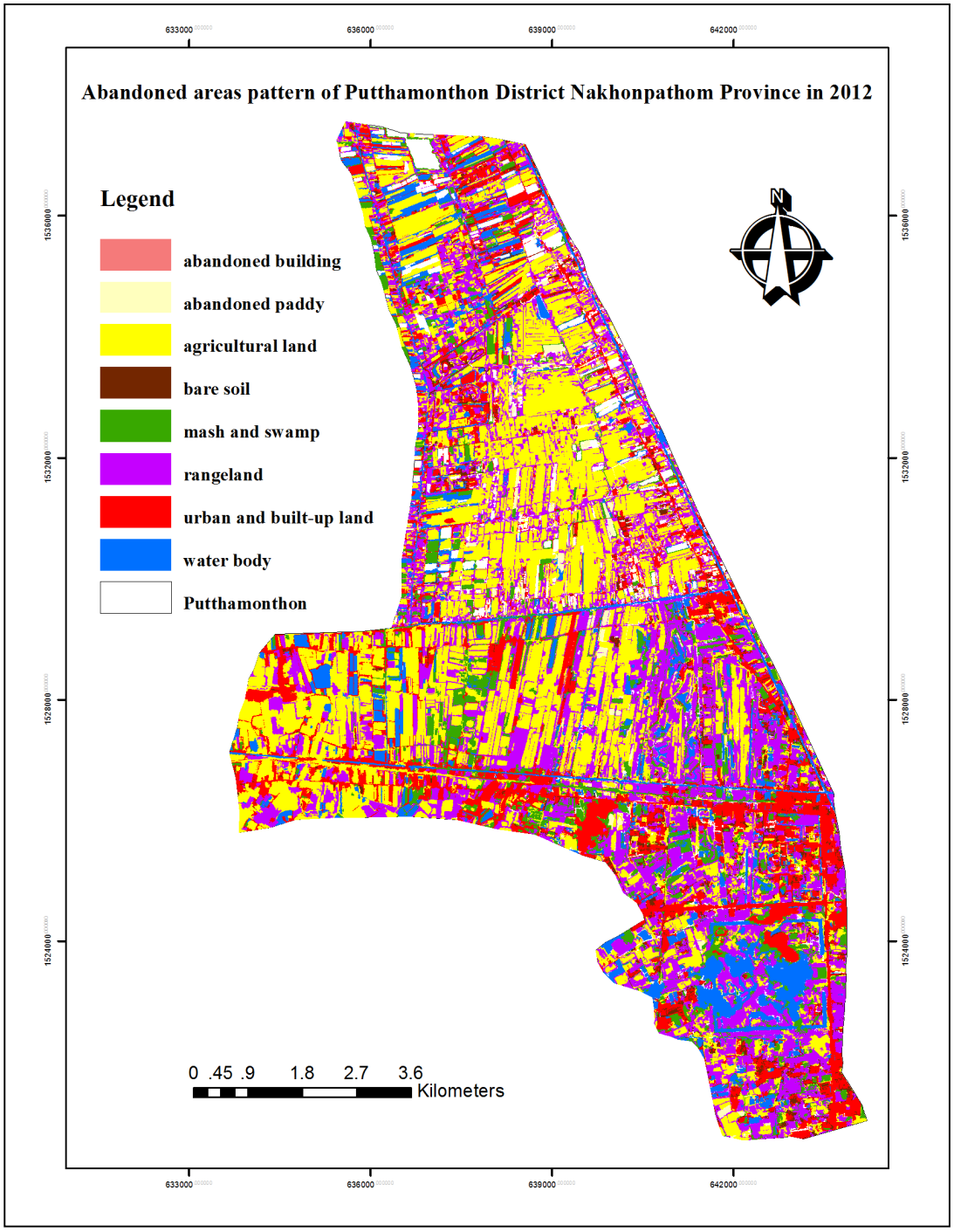


Figure 4-13 Result classification of satellite imagery Thaichote from object based.

Table 4-7 Results of classifications Thaichote satellite by object-oriented classification techniques.

Type of Abandoned Areas	2012	
	Area (km^2)	%
Abandoned paddy field	0.89	4.34
Rangeland	12.04	58.73
Marsh and Swamp	5.56	27.12
Open space/bare soil	1.99	9.71
Abandoned building	0.02	0.10
Total	20.50	100.00

Evaluating the accuracy of data classification by creating tables, the confusion (Confusion Matrix) as shown in Table 4-7.

Table 4-8 Shows the estimated accuracy of the classification of satellite imagery Thaichote in 2012 to 5 categories.

Abandoned area type	Abandoned paddy field	rangeland	Grass land	Marsh & swamp	Bare soil	Abandoned building	Total
Abandoned paddy field	265	0	0	118	0	0	383
Rangeland	0	44	8	197	19	0	268
Grass land	2	0	3	219	0	0	224
Marsh & swamp	13	15	112	2,835	11	46	3,032
Bare soil	0	14	8	7	502	0	531
Abandoned building	0	49	271	119	66	682	1,187
Total	280	122	402	3,495	598	728	5,625

Row: data from the sample (Training Area) column: Information obtained from the classification data

From Table 4 – 8, the total accuracy of data classification is (17 + 79 + 42 + 20 + 15 + 53 + 80 + 5) / 368 * 100 = 84.51%. This number is a good level because these areas are lowland having many canals, being flooding areas in the flooding period, and high diversity of land covers, unrefined pixels of image cannot eliminated completely.

4.3 Assessment of potential development abandoned areas corresponding environmental management.

4.3.1 Action on abandoned areas corresponding to environmental management.

Currently there is no law right to land ownership. Therefore, the purchase of land and then let the wilderness. Not serve including real estate, foreclosed and abandoned a lot. Therefore must be abandoned space exploration continues. Measures and guidelines to determine the proper waste management area.

The advantage of the benefits in the area is deserted improves both agriculture and industry. Cause the creation of additional revenue. The growth of the economy and reduce the invasion of the others. Which will impact on the economic and social conditions of the country. The effects of neglect not serve the area deserted. Will cause economic problems No increase in agricultural productivity Yield insufficient Economic damages Cause intrusion into the area abandoned. Problems hijacked arable land . It was a conflict in society.

1) Abandoned buildings and structures

Most are located in the town area. Abandoned buildings and structures abandoned houses are dilapidated lacking care. Living without and empty space is covered with grass and weeds. Vegetation covers around the area and near the place neglected. (Meadows and vegetable gardens) and is close to residential areas and paddy fields abandoned the groves.




2) Abandoned paddy field

A common feature is the lowlands In the past, both rice farming and sowing. But let abandoned in the rainy season, often with flood damage. In the dry season the weeds In particular, various grass species covering an area of abandoned farmland to grow a lot. Abandoned in consecutive years. Be observed clearly dense weed growth.

3) Grassland areas

A neglected area of urban development. This area used to be the most intact forest before. But was cleared to agricultural crops such as. Soil is often sandy soils Lack of fertile soil is shallow, gravelly mix. So leave it to an abandoned farm abandoned. On consecutive abandoned for many years, particularly grasses, weeds will grow thickly covered area. Area is permanent pasture. And links to the Grove Homes rice road and walk along the river.



4) Rangeland

Grove has a relatively flat terrain Sandy soils often lack the abundant shallow, gravelly soil mix . Heathlands cost Original forest had been before. But was cleared to agriculture. Cutting wood or lead to exploitation. And leave abandoned until the grass and other weeds. Areas covered when abandoned several decades. It is a small shrub. Or coppice wood growing up campsites and replace grass or other weeds. Mixed shrub layer be found explicitly in the streets. and mainly linked to natural grassland.



5) Marsh and swamp

Throughout the swamp or marshy with some summer water. In the dry season the water is dry. And grass or vegetation like reeds in the marsh as I grow Vines covered valley. Lowland areas that are often lower than other regions.


4.3.2 Laws and related regulations are used in abandoned area management.

1) The sixth article of land code legislates that since this notice of revolutionary council has been used; person who has right in land along title deeds or certificates of utilization. If that person abandons, does not do anything useful, or let land be uncultivated land over the prescribed time that are

(1) Land has title deeds over ten years continually.

(2) Land has certificates of utilization over five years continually that means having animus to give up his/her right in land, especially an abandoned piece not do anything useful or let a piece of land be an uncultivated piece. When Director General files a request to the court and the court steps to quash a right certificate in this land, this land is reverted to the state for operating along this land code in the next

2) Regulations of Ministry of Interior in 2522 about operating for land abandoned, not do anything useful, or let this land be uncultivated land to be land reverted to the state that specify practical ways in summary that are

(1) Assign related officials of province to survey and report that which land is abandoned, useless, or uncultivated land to Ministry of Inferior for acknowledging within January every year.

(2) Consider that which land people abandon, do not use for benefits, or let this land be uncultivated land. Examine land utilization in an important factor that people only fence their land or pay local administration tax but they waste their land. It means abandoning land, wasting land, or let land be uncultivated land. Meanwhile, land is used for benefits, consider this land following a criterion as issuing title deeds or certificates of utilization.

For land, welling, in villages or towns, although this land has not used for building dwelling yet but owners intend to possess their land for their living, it is regarded as being useful land in status.

(3) It is found that the duration of land abandoned is due following the sixth article.

- Assign province or Amphoe officials depending on cases make letters to land owners and interested person, such as lessee and mortgagee, for utilizing land within 3 months from receiving these letters.

- If the duration of utilizing land is overdue and this land is not used for benefits, province sets up a committee for investigating the fact and this committee makes opinions present Department of Lands. Then, Department of Lands contributes to government attorneys and government attorney accuses to court.

(4) Announcement of Ministry of Interior on 16 October 2540 about requesting land owner abandoning and wasting his/her land to hasten land utilization.

3) Measures operating following the sixth article of land code and regulation of Ministry of Interior.

Ministry of Inferior sends circulars to every province that every province surveys land abandoned, not used for benefits and reports annual results to Ministry of Inferior. These results are published in official document of Ministry of Inferior, MT 0728/W3637 on 19 December 2544.

4) Solutions of land abandoned, not used for benefits.

(1) Short term measures

- Make public relations for people to know about the sixth of land code in advantages and disadvantages of utilizing land or abandoning and wasting land.

- For registering right and juristic act that receives land, official records transferee words depending on cases that are

"Land in this title deeds, if this land is abandoned, not used for benefits or let it be uncultivated land over ten years continuously, this land might be squashed by the court to be governmental land." or "land in this certificate of land utilization, if this land is abandoned, not used for benefits or let it be uncultivated land over five years continuously, this land might be squashed by the court to be governmental land."

- Accelerate to improve soil getting troubles in abandoned land and transform land utilization suitable for soil competency.

- Accelerate to conserve water and soil for preventing soil collapse.

- Accelerate to do abandoned land data base throughout the country correctly, quickly, and this data base corresponds to the fact in the present for being data base of developing abandoned land.

- Promote to demonstrate abandoned land development for increasing efficiency of land utilization and accelerate to develop agricultural basic structures, such as agricultural water supplies.

(2) Long term measures

- In the present, draft parliament of land and construction tax, and this law is tax measure having a summarized criterion that is

If land owner utilizes in his/her land, he/she pay tax to the government less than land owner abandons his/her land to be uncultivated land. If this law is used, it is a solution of abandoning and wasting land. At this time, process of drafting this law is the step of Office of the Council of State due to regulation of tax measure. This law is to accelerate land owner to utilize his/her land, and also prevent land grab and waste this land.

- Request verified information of land utilization from Subdistrict Administrative Organization, the organization that verifies land utilization for collecting annual local administration tax.