

SPATIAL ANALYSIS OF FARMERS ATTITUDE IN DEFENDING AGRICULTURAL LAND AT SLEMAN REGENCY- INDONESIA



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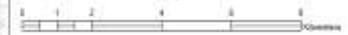
** Faculty of Agriculture Gadjah Mada University

32ND INTERNATIONAL GEOGRAPHICAL CONGRESS IN COLOGNE
26-30 AUGUST 2012

Research Location

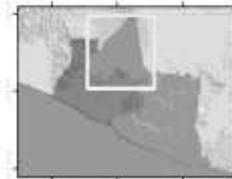


THE MAP ADMINISTRATIVE BOUNDARIES REGENCY OF SLEMAN



Projection: Transverse Mercator
 Old System: Geographic
 Datum: WGS 1984

Region of the location



**MAGELANG REGENCY
CENTRAL JAVA PROVINCE**

**KLATEN REGENCY
CENTRAL JAVA PROVINCE**

YOGYAKARTA CITY

LEGEND:

CAPITALS OF ADMINISTRATION :

- Capital District
- Districts Capital
- Rural / Village

ADMINISTRATIVE BOUNDARIES :

- Provincial Boundary
- Regency / City Boundary
- District Boundary
- Rural/Village Boundary

TRANSPORTATIONS :

- Arterial Road
- Collector Road
- Another Road
- Railway

WATERS :

- River

ADMINISTRATIONS:

	Berbah		Ngegak
	Cangkriyan		Ngeplok
	Depok		Pasen
	Gamping		Prambanan
	Godaan		Seyegan
	Kalasan		Sleman
	Minggir		Tanpoh
	Mali		Turi
	Moyudan		

Source of Data:
 1. Indonesia Topographic Map scale 1:25,000
 2. Recording Landsat TM Images of 1982 and
 4. Aerial Image Processing in 2009

Background

- The phenomenon of the conversion of land currently has become the attention, this especially happens in Java – Indonesia.
- Development of physical infrastructure and facilities continue to increase so does the rise in non economic activities in agriculture.
- Increased population mainly in the urban areas will give effect to fulfillment needs of the land.
- Based on the research results of the World Bank in 2000, shows that at the beginning of the 21st century more than half of Indonesia's population will live in urban areas.
- Urbanization in the DIY in 1990 amounted to 44, 64% rose to 59, 42% in 2005. Likewise occurred in Sleman Regency of 51, 48% in 1990, up about 30% in 2005
- That condition if not immediately anticipated will cause problems in the area of urban social issues, economy and environment.

Urbanization Rate in Indonesia (1990-2020)

Year	Population			Percentage of City Population (%)
	Total	City	Village	
1990	180.383.700	51.932.467	128.451.233	28,79
1995	195.755.600	63.679.181	132.076.303	32,53
2000	210.263.800	76.662.181	133.601.619	36,46
2005	223.183.300	90.344.600	132.838.700	40,48
2010	235.110.800	104.577.284	130.533.516	44,48
2015	245.388.200	118.792.228	126.595.772	48,41
2020	253.667.600	132.465.221	121.202.379	52,22

Level of Urbanization in The Province of Yogyakarta

Location	Year	Total Population	City Population	Percentage of City Population
Sleman Regency	1990	723742	372584	51,48
	2000	564377	401623	71,16
	2005	433539	816283	82,59
Yogyakarta Province	1990	2686478	1199230	44,64
	2000	2783478	1461513	52,51
	2005	3337095	1973631	59,42

Area of Agricultural Land Use Changes in Sleman Regency 1987-2006

Year	Type							
	Agriculture (Wetland+ Dryland) (ha)	%	Yard & Housing (ha)	%	Others (ha)	%	Total (ha)	%
1987	31782	55,29	17549	30,53	8151	14,18	57482	100
1990	31155	54,19	18152	31,58	8175	14,23	57482	100
1995	30846	53,65	18234	31,73	8402	14,62	57482	100
2000	29877	51,97	18772	32,66	8833	15,37	57482	100
2006	25486	44,33	23121	40,23	8875	15,44	57482	100

Population relationships with Wetland in the Province

Yogyakarta Special Region

Regency/City	Wetland Area (ha)		Population		Growth per year (%)		Percentage of land area to Total Population (%)		
	1987	2007	1987	2007	wetland	Populati on	1987	2007	Change
Kulon Progo	10944	10215	374445	417456	-0,34	0,55	2.92	2.45	-0.48
Bantul	17725	15804	685527	896994	-0,57	1,35	2.59	1.76	-0.82
Gunung Kidul	8002	7964	685210	704469	-0,02	0,14	1.17	1.13	-0.04
Sleman	26463	23062	730889	1026767	-0,68	1,71	3.62	2.25	-1.37
Yogyakarta	397	98	432410	451118	-6,75	0,21	0.09	0.02	-0.07

Research Method

This research is a research survey, by combining the primary and secondary data analysis in research

Primary data by using a questionnaire as tool with interviews 383 respondents

Secondary Data used for the determination of the area of land use data conversion with land use change of image of the Regency of Sleman, Landsat ETM imagery Alos in 1992 and 2009

The land conversion measurement was based on satellite image overlay of Landsat TM, Landsat ETM+ and Alos, recorded in 1992 and 2009.

The subject area for this study on farmers attitude in preserving their land in Sleman Regency was determined based on the size of the converted land

Determination of the area of study based on conversion of land on each of the polygons in Sleman Regency is divided into 3 based on the formula of Sturges:

$$\frac{a-b}{k}$$

Description:

a = area of the highest land conversion

b = area of the lowest land conversion

k = the number of classes

419000 mT 426000 433000 440000 447000

LANDSAT TM IMAGERY MAP COMPOSITE BANDS 321 SLEMAN REGENCY YOGYAKARTA



1:130,000

Sistem Proyeksi : Transverse Mercator
Datum : WGS84
Zone : 49 S

Legend

-  : District Office
-  : Sub District Office
-  : Artery roads
-  : Collector roads
-  : Railroad
-  : river

Source;
1. Landsat TM Imagery year 1992
2. Indonesia Base Map scale 1 : 25.000

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Location

Magelang Regency

Boyolali Regency

Klaten Regency

Kulonprogo Regency

Yogyakarta

Bantul Regency

Gunung Kidul Regency

91620000 mU

9162000

91560000

9156000

91500000

9150000

91440000

9144000

91380000

9138000

419000 426000 433000 440000 447000

419000 mT 426000 433000 440000 447000

**ALOS IMAGERY MAP YEAR 2009
COMPOSITE BANDS 321
SLEMAN REGENCY YOGYAKARTA**



0 2,000 4,000 8,000
1:130,000

Sistem Proyeksi : Transverse Mercator
Datum : WGS84
Zone : 49 S

Legend

-  : District Office
-  : Sub District Office
-  : Artery roads
-  : Collector roads
-  : Railroad
-  : river

Source;
1. ALOS Imagery year 2009
2. Indonesia Base Map scale 1 : 25.000

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Magelang Regency

Boyolali Regency

Klaten Regency

Kulonprogo Regency

Yogyakarta

Bantul Regency

Bantul Regency

Gunung Kidul Regency

9162000 mU

9156000

9150000

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9138000

9162000

9156000

9150000

9144000

9138000

419000 426000 433000 440000 447000

Analysis

- Descriptive
- Statistical tests

1. Binary Logistic Regression Model

This analysis is used to predict whether farmers will convert agricultural land or maintaining agricultural activity. Selected category in this research is: 1 = farmers will convert the entire agricultural land, 0 = farmers are not going to convert agricultural land

$$Y_j = \alpha + X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 + X_8 + X_9 + X_{10} + u$$

Description:

Y_j = Probability decision whether farmers deciding in agricultural sector or
Converted agricultural land. (1 = farmers convert agricultural land, 0 = farmer
not convert agricultural land)

α = Constant

X_1 = Age (year)

X_2 = Level of education

X_3 = Number of family members

X_4 = Extensive land use

X_5 = Non Agricultural sector

X_6 = Income in the agricultural sector

X_7 = Income outside of the agricultural sector

X_8 = Land agricultural location

X_9 = Price of land

X_{10} = Long efforts in the agricultural sector

u = disturbance term

2. Seemingly Unrelated Regression

$$Y_{1,2,3} = B_0 + X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 + X_8 + X_9 + X_{10} + u$$

Description:

Y1 = Farmers will defend wet land

Y2 = Farmers will defend dry land

Y3 = Farmers will defend the farm yard

B₀ = Intercept

B₀ = Constant

X1 = Age (year)

X2 = Level of education

X3 = Number of family members

X4 = Extensive land use

X5 = Non Agricultural sector

X6 = Income in the agricultural sector

X7 = Income outside of the agricultural sector

X8 = Land agricultural location

X9 = Price of land

X10 = Long efforts in the agricultural sector

u = disturbance term

LAND USE MAP IN SLEMAN REGENCY YEAR 1992

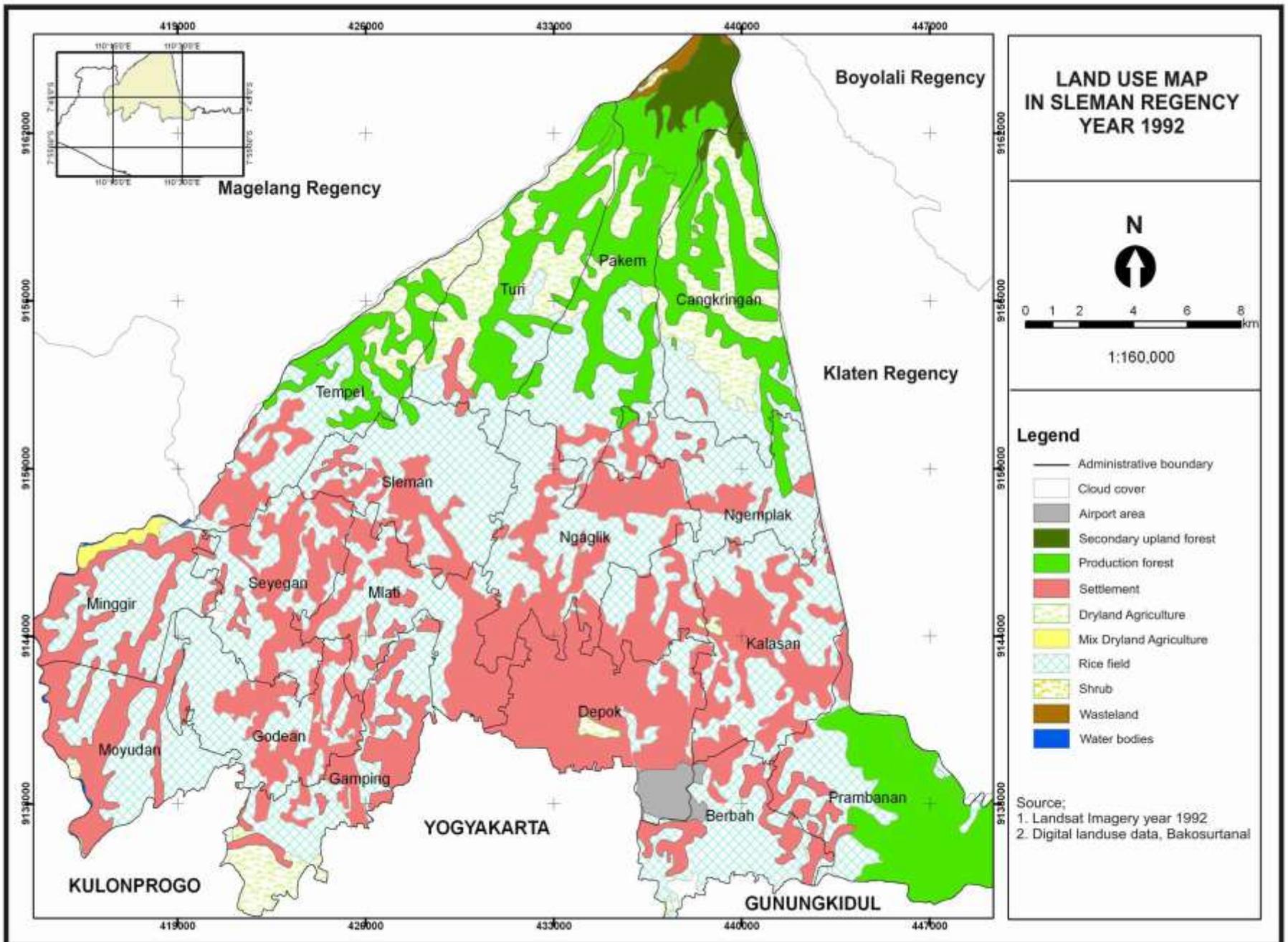


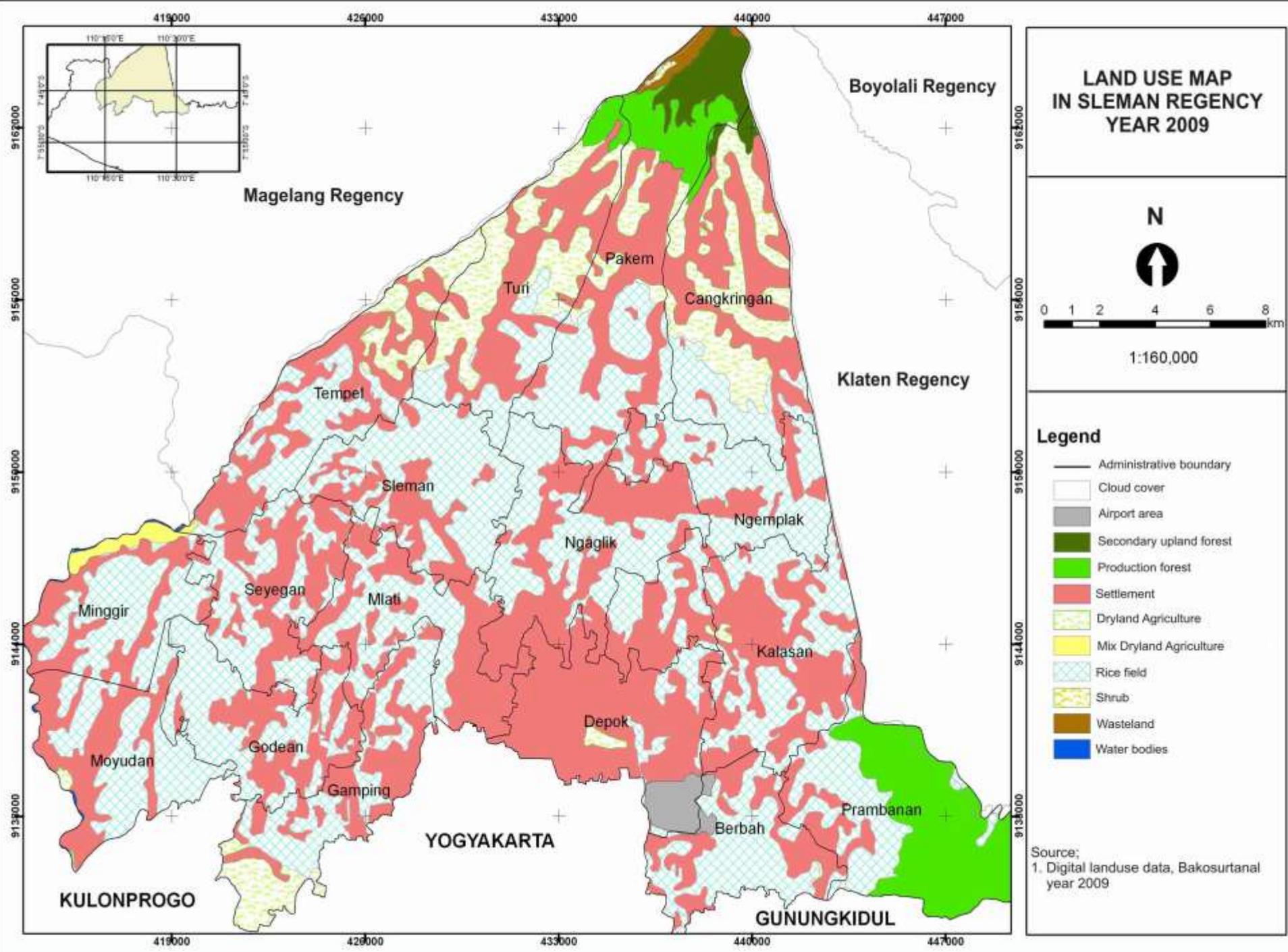
1:160,000

Legend

- Administrative boundary
- Cloud cover
- Airport area
- Secondary upland forest
- Production forest
- Settlement
- Dryland Agriculture
- Mix Dryland Agriculture
- Rice field
- Shrub
- Wasteland
- Water bodies

Source;
1. Landsat Imagery year 1992
2. Digital landuse data, Bakosurtanal





LAND USE CHANGES MAP IN SLEMAN REGENCY YEAR 1992 - 2009

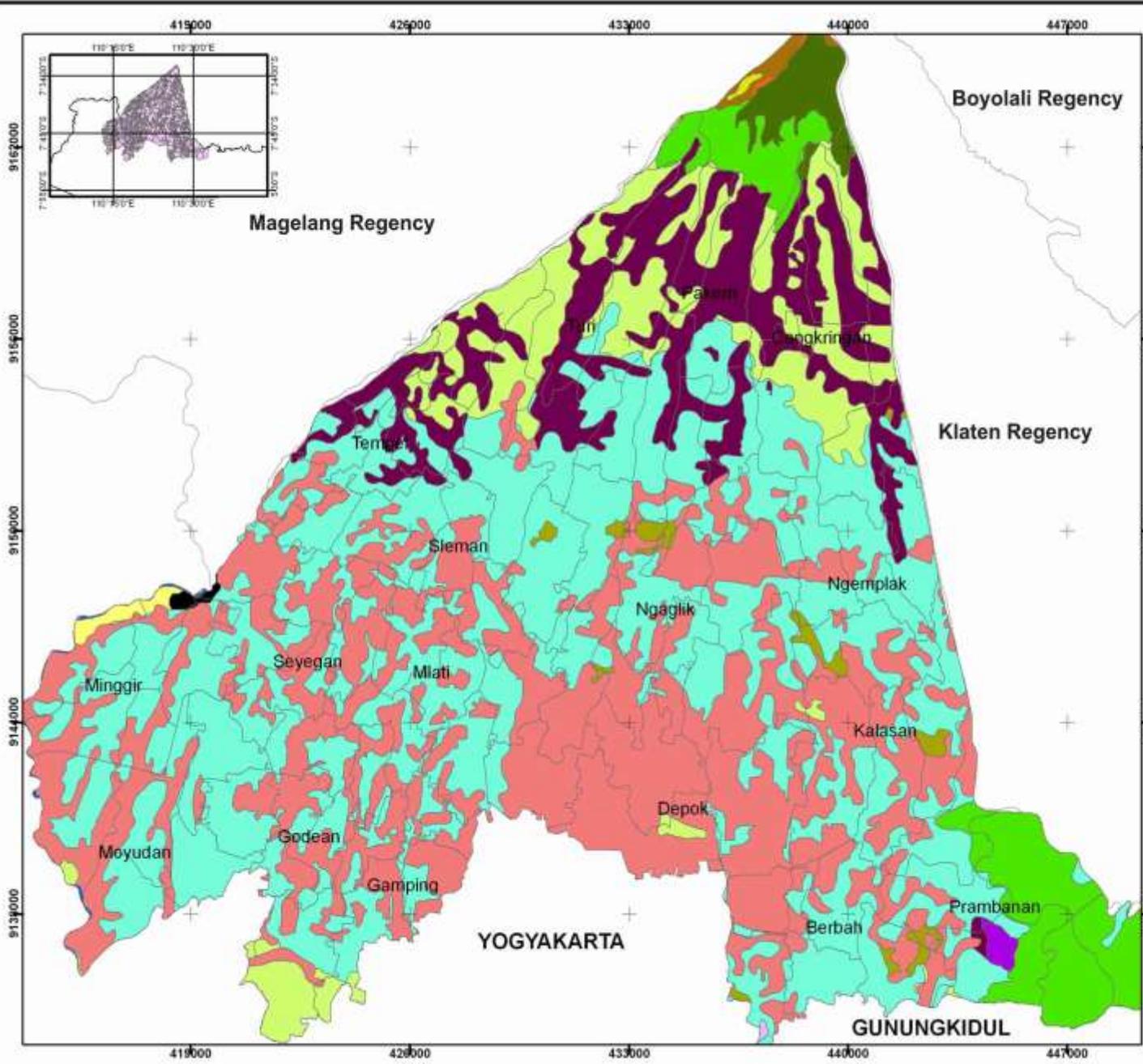


1:160,000

Legenda

- Administrative boundary
- Secondary upland forest
- Secondary upland forest - Wasteland
- Production forest
- Production Forest - Built Up area
- Production Forest - rice field
- Built up area
- Mix Dryland Agriculture
- Dryland Agriculture - Built up area
- Dryland Agriculture
- Rice field - built up areas
- Rice field - Mix dryland agriculture
- Rice field
- Shrub
- Wasteland
- Water bodies

Source:
 1. Landsat Imagery year 1992, 2002
 2. Digital landuse data, Bakosurtanal year 2000, 2003, 2006, 2009



Agricultural Land Conversion in Sleman Regency

1992 – 2009

District	Year (ha)			Growth of Land Conversion 1992-2009 (%)
	1992 – 2001	2001 - 2009	1992 - 2009	
1. Berbah	242,05	74,60	316,65	0.05
2. Cangkringan	54,21	172,88	227,09	0.18
3. Depok	326,24	212,58	538,83	0.09
4. Gamping	379,65	85,47	465,13	0.04
5. Godean	122,65	305,04	427,69	0.24
6. Kalasan	79,06	238,54	317,60	0.27
7. Minggir	109,09	163,94	273,03	0.17
8. Mlati	238,58	178,45	417,03	0.10
9. Moyudan	47,69	183,96	231,64	0.01
10. Ngaglik	77,89	231,62	309,51	0.26
11. Ngemplak	75,99	118,75	194,74	0.17
12. Pakem	54,14	148,67	202,81	0.25
13. Prambanan	146,12	142,09	288,22	0.12
14. Seyegan	131,82	45,49	177,31	0.05
15. Sleman	84,00	80,14	164,14	0.12
16. Tempel	126,37	194,44	320,81	0.17
17. Turi	143,05	184,67	184,72	0.04

Source : Data Process

Result

- Based overlay Landsat and Alos images of the year 1992 and 2009 indicated that out of 17 districts in Sleman, there were four districts which belonged to the category of high-conversion of agricultural lands, four districts belonged to the category of moderate and the other nine to the category of low conversion.
 - four districts which belonged to the category of high-conversion of agricultural lands (zone one) comprises the Districts of Depok, Mlati, Gamping and Godean
 - four districts belonged to the category of medium (zone two), which is the area with a medium conversion of agricultural land, comprises the Districts of Tempel, Ngaglik, Kalasan and Berbah.
 - Areas with low agricultural land conversion are included in the third zone, made up of Districts of Sleman, Pakem, Prambanan, Moyudan, Seyegan, Minggir, Turi, Ngemplak and Cangkringan

Classification of Agricultural Land Conversion in Sleman

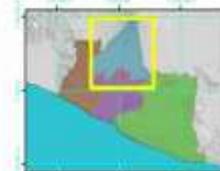
Regency 1992-2009

No.	Zone	District	Sub District
1.	Zone 1(High Land Conversion)	Gamping	Nogotirto
		Depok	Caturtunggal
		Mlati	Sinduadi
		Godean	Sidoarum
2.	Zone 2 (Medium Land Conversion)	Tempel	Merdikorejo
		Ngaglik	Sardonoharjo
		Kalasan	Purwomartani
		Berbah	Sendangtirto
3.	Zone 3 (Low land Conversion)	Sleman	Tridadi
		Pakem	Pakembinangun
		Prambanan	Sambirejo
		Moyudan	Sumberarum
		Seyegan	Margoluwih
		Minggir	Sendangsari
		Turi	Donokerto
		Ngemplak	Wedomartani
		Cangkringan	Umbulharjo

DISTRIBUTION MAP OF AGRICULTURAL LAND CONVERSION ZONE IN SLEMAN REGENCY



Projection: Transverse Mercator
 GCS System: Geographical Grid
 Horizontal Datum: WGS 1984



Legend

Administrative Capital

- : District
- : Sub - District
- : Village

Administrative boundary

- : Province boundary
- : District boundary
- : Sub district boundary
- : Village boundary

Accessibility

- : Artery road
- : Collector road
- : Others road
- : Railroad

Waters

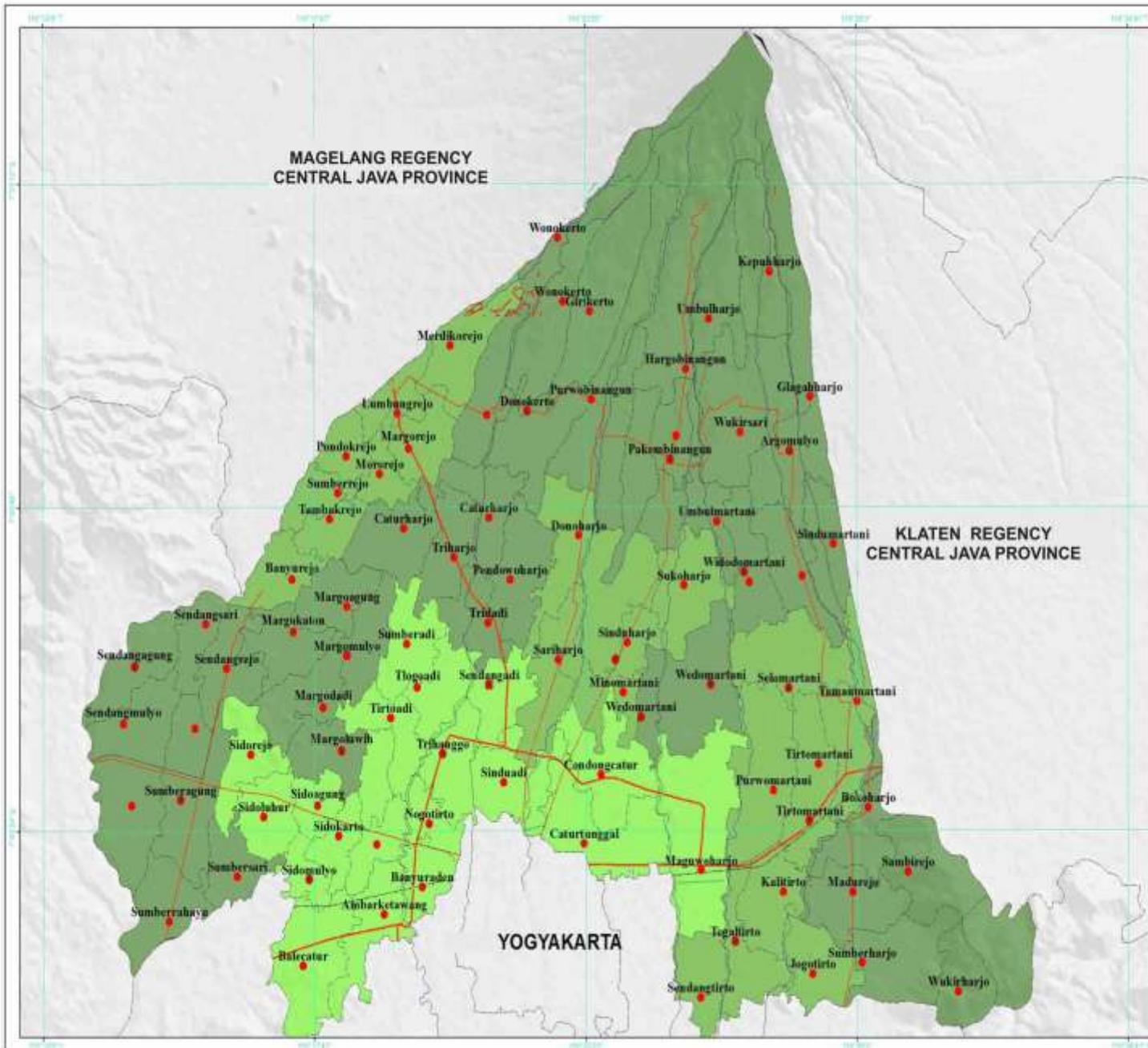
- : River

Zone

- : City frame zone
- : Urban - village frame zone
- : village - urban frame zone

Source:
 1. Landsat TM Imagery year 1992
 2. ALOS Imagery year 2009
 3. Indonesia Base Map scale 1 : 25.000

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Results Estimation Binary Logistic Model of The farmers to defending in
Agricultural Land

Variable	Zone 1		Zone 2		Zone 3	
	COEFFICIENT	P-Value	COEFFICIENT	P-Value	COEFFICIENT	P-Value
1.Age	0.00069802	0.793	0.0026480	0.259	-0.0003643	0.686
2.Education	0.011780	0.043	0.0044454	0.530	0.0035368	0.200
3.Number of ART	0.18461*	0.000	0.22648*	0.000	0.11901*	0.000
4.Extensive Land use	0.00010330	0.462	0.00025774	0.176	0.00070997*	0.000
5.Dummy non Peasant	0.19929*	0.001	0.038299	0.507	0.0021959	0.930
6.Peasant Income	-0.00032949*	0.013	-0.00032377*	0.008	-0.00011593*	0.070
7.Income non Peasant	0.00030982*	0.030	0.00027440*	0.039	0.00099882*	0.000
8.Dummy Location Land Farm	-0.013773	0.891	0.082685	0.407	0.0069338**	0.912
9.Land Prices	0.00024780**	0.093	0.0010276*	0.033	0.00031867*	0.028
10.Time of Peasant Labor	-0.0047005	0.226	-0.013930*	0.012	-0.0035982**	0.098
Constant	-0.065073	0.739	0.26673	0.207	-0.070162	0.585

- The test results show that in general the farmers still want to keep and preserve their agricultural land, either rice fields, dry lands, or yards
- The results of the analysis are using the binary logistic model show that the factors significantly affecting the attitudes of farmers in preserving their agricultural land:
 - In zone one are variables of the number of household members, non farming activities, income from agricultural activities, land price and the number of years of farming experience
 - In zone two, variables that have a significant effect are the number of household members, income from agricultural activities, income from non-agricultural activities, land price, and the number of years of farming experience
 - In zone three, the significant variables are the number of household members, land size, income from agricultural activities, income from non-agricultural activities, land location, land price and the number of years of farming experience.

- The results of the estimation of the second model, which is the SUR model (Seemingly Unrelated Regression), showed that there were variations of factors that affected the attitudes of farmers in preserving their agricultural lands (rice field, dry land, and yard) in zone 1,2 and 3.[SUR.doc](#)
 - In zone one are variable of number of household members, income from agricultural activities, income from non-agricultural activities, land location and land price have a positive effect on the attitudes of farmers in preserving the rice field
 - In zone two, the number of household members and income from non-agricultural activities significantly have a positive effect.
 - In zone three, land area, non-farm income and land prices significantly affected the

- The attitudes of farmers in terms of preserving their dry lands suggest:
 - In zone one, the number of household members and their number of years of farming experience are variables which have a significant effect
 - In zone two, they are income from non-agricultural activities and the number of years of farming experience
 - In zone three, the variables which significantly have a positive effect are variables of education, number of household members, land size, income from non-agricultural activities and land price. Meanwhile, variable of income from agricultural activities has a negative effect.

- Variables of agricultural land area and farmers' income have a significant effect on the attitudes of farmers in preserving their yards in zone one, two and three.
- The total lands area the farmers possess, in this case the total area of yards in zone one, two, and three, has a significant positive effect on their attitudes in preserving their lands
- Income from agricultural activities has a significant effect in zone one, two and three, meaning that the higher the income from agricultural activities, the less likely the farmers will convert their yards
- In zone one, variables that significantly affect the farmers in maintaining their yards are educations, location of land area and farm income

- In zone two, they are the number of household members, income from non-agricultural activities, land price, and the number of years of farming experience
- In zone three, the variables which have a significant effect are the number of household members, income from non-agricultural activities, land prices and land location.

CONCLUSION

- Variation of farmland conversion in Sleman
 - Districts that high levels of conversion of agricultural land is Depok district, Mlati, Godean and Gamping
 - Region with the conversion rate is the District Ngaglik, Tempel, and Kalasan Berbah
 - District that is a region with a low conversion of agricultural land consists of nine districts, including District, Sleman, Moyudan, Minggir, Seyegan, Prambanan, Ngemplak, Pakem, Turi and Cangkringan

- The results of estimation of the attitude of farmers to maintain agricultural land through binary logistic models
 - In zone one a variable number of household members, dummy non-farm employment, farm income, non-farm income and land prices are significantly affected
 - In the area of zone two variables that significantly affect the number of household members, farm income, non farm income, the price of farmland and old
 - Zone three the number of significant variables on the attitude of many farmers over the number of household members, farmland, farm income, non farm income, dummy field sites, the price of farmland and old
- The results of the estimation model SUR (Seemingly Unrelated Regression) showed that the variation of factors that influence the attitudes of farmers to maintain agricultural land (paddy fields, dry lands and yards) in the area of zone one, two and zone three

Field Photo

- [Photo\foto lapangan.doc](#)
- [Photo\foto lapangan zone 2.doc](#)
- [Photo\foto lapangan zone 3doc.doc](#)

THANK YOU