

Evaluation of Land Use Change in the District Dharmasraya

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Abstract— Since Dharmasraya Regency, West Sumatra, Indonesia was established in 2004, has an impact on land-use change. Changes in land use can be analyzed quickly through the interpretation of satellite imagery. The methodology used is the analysis of spatial and temporal changes in land use on satellite images captured in 2004, 2009 and 2014. The result showed that there has been a decline in forest area since Dharmasraya 2004 until 2014. The forest area which was originally in 2004 area is 161.141 ha, in 2009 decreased to 109.056 ha, and in 2014 decreased again to 94.146 ha. This decrease occurred in forest and non-forest areas (areas other use). In 2014, the forest area is available on the forest area is only 22.8%, less than the minimum limit of 30% in a region. A decrease in forest area is partly due to land clearing for plantations and other uses. Instead of the results of this study also showed that, an increase in area plantation/mixed-garden. In 2004 the area plantation/mixed-garden is 115.831 ha. In 2009 increased to 148.149 ha (27.9%) and in 2014 increased to 168.730 ha (13.89%). In 2014, the area plantation/mixed-garden in the non-forest area is 142.481 ha (84.4%) and the forest area is 26.249 ha (15.6%). Supervision required to cope with the increased use of protected areas. This area has been used for plantation / mixed-garden covering an area of 1.127 ha, 816 ha of open land and dry land 17 ha. This area should be restored function into protected forest.

Keywords— Land use change; image interpretation; forest and non-forest area

I. INTRODUCTION

Dharmasraya district, West Sumatra, Indonesia, established since 2004. The construction of this area is growing rapidly, this is shown by the economic growth in 2013 reached 6.65%. Plantation sector's contribution to Gross Domestic Product (GDP) which is the highest among other sectors, namely 30.83%. [1]. This economic growth has an impact on deforestation. To anticipate the damage to the forest, necessary to control and supervision by the Government, the public and stakeholders. For the purposes of controlling and monitoring data should be available quickly and significantly with coverage. To observe the dynamics of rapid changes in land use cannot be done manually in the field. It is necessary to utilize remote sensing technology and geographic information systems to observe spatially and temporally, more quickly, accurately and efficiently.

To observe the spatial and temporal changes in land use quickly, can be done using remote sensing technology and geographic information systems [2],[3],[4],[5]. Remote sensing is the science and art of obtaining information about

an object or phenomenon by analyzing data obtained by using the tool without direct contact with the object, area or phenomenon to be studied [6]. Satellite imagery is one of the results of remote sensing activities. Image interpretation can be done visually or digitally. The principle of visual object recognition in images depends on the characteristics seen on satellite imagery.

Image interpretation can be performed using a geographic information system (GIS). The use of GIS has evolved into a wide range of knowledge that can be integrated with spatial information. Among them is to analyze changes in land use / land cover using satellite imagery spatial data. The Superiority of satellite images from other image is that it can provide spatial data with different levels of sharpness and resolution time dimension. Therefore, the analysis of changes in land use / land cover more appropriate use of satellite imagery data. [4] [6].

Analysis of changes in land use / land cover can be done by creating a matrix of land use change / land cover based on the results of GIS analysis is observed or studied. Matrix of land cover changes can be seen major changes that occur every year.

II. MATERIAL AND METHOD

A. Study Area

Dharmasraya district is one of the counties that are in West Sumatra is Indonesia, the area is 302.599 hectares. Geographically, the study area is located on 0°47 '07' South latitude – 1°41'56 'south latitude and 101°09' 21 " East Longitude - 101°54 '27' east longitude [1].

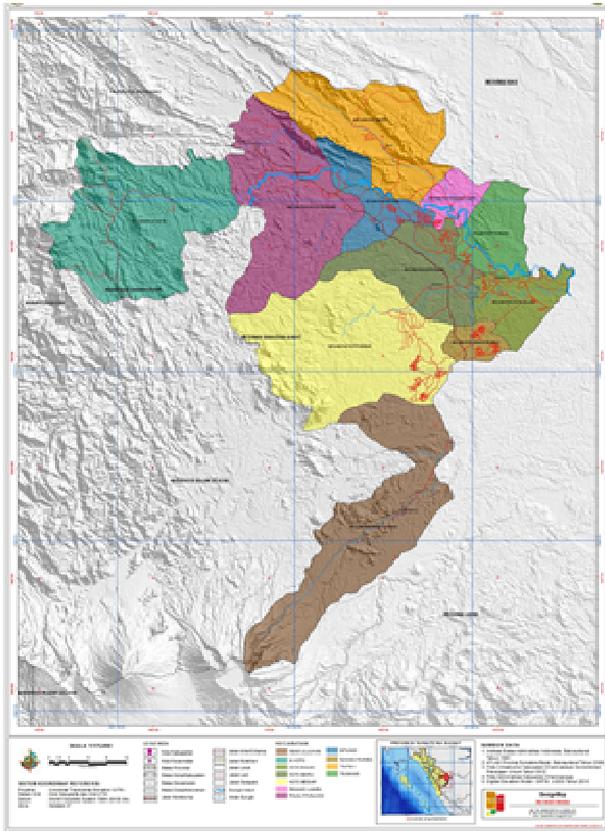


Fig. 1. Map of study sites in the District Dharmasraya

B. Data Sources and Processing

The data used is a satellite image of Landsat 5 TM (2004), Landsat 7 TM (2009) and Landsat TM 8 (2014) in the form of raster [7]. Visual map of the earth in the form of a vector [8]. Map of administrative boundaries in the form of a vector [9]. Map of forest area in the form of a vector [10].

Satellite image processing using ArcGIS software version 10.1. Geometric correction of satellite imagery aims to improve satellite imagery to match the coordinates of the actual position of the earth. Geometry correction process is done by creating control points (GCP) on satellite imagery with the same point on Earth at some point with reference to the road and the river, for example, at the junction of the road and the river.

After geometric correction on the satellite image, then continued with radiometric correction using ER Mapper 7.0 software. Radiometric correction function to minimize errors caused satellite detectors influence or the influence of atmospheric interference.

C. Satellite Image Interpretation

Satellite image interpretation process is the analysis and identification of objects using ArcGIS 10.1 software. This process is done by interpreting the image such as color or the color, shape, size, roughness, pattern, shadow, websites, associations and convergence of evidence. Interpretation and image classification is done by using the supervised classification (supervised classification) with Maximum Likelihood method using a combination of composite band for vegetation analysis of land use. Classification of land use / land cover based on the National Standardization Agency [11] using 6 classes of the dominant land use in Dharmasraya a scale of 1: 50.000, namely; forests, plantations or mixed garden, open land, settlements, fields, and the dry land.

The forest is an ecosystem unity in form of landscape biological resources, dominated by trees in their natural environment, one and the other can not be separated. What is meant by forest in this class is the dry forest, the forest grow and thrive in dry land habitat which may include lowland forests, hills, mountains, high plains or tropical forests. Plantation or mixed garden is a land used for agricultural activities without a change of the plant for two years. Open land is a land without land cover both natural, semi-natural or artificial. Settlements are areas or land used as a living environment or residential environment, and activities that support the activities orangKelas fields, rice paddies, the other is the dry land agriculture with the cultivation of temporary or nomadic, including rice paddies, ponds, and others. Dryland is an area of dry land that had been overgrown with a variety of heterogeneous and homogeneous natural vegetation with rare kerapatan level up to the meeting. Regions dominated by low vegetation (natural).

Land use analysis results are validated through field inspections. Then proceed with the digitization process for making land use maps of 2004, 2009, and 2014

D. Analysis of Land Use Change

Land use change analysis done by the analysis of data sources, spatial and temporal. Analysis of the data source is done by comparing the analysis of data from digitization, from Dharmasraya In figures [1]' [12]-[18], and the Provincial Forestry Office of West Sumatra [19].

Spatial analysis is done by comparing the total area of land use class in Dharmasraya in the same year. Subsequently be overlaid with forest areas designated by the Minister of Forestry [20] to evaluate changes in the land use class forest and non-forest areas (areas other uses). Temporal analysis is done by evaluating or comparing the change in land use classes in 2004, 2009 and 2014.

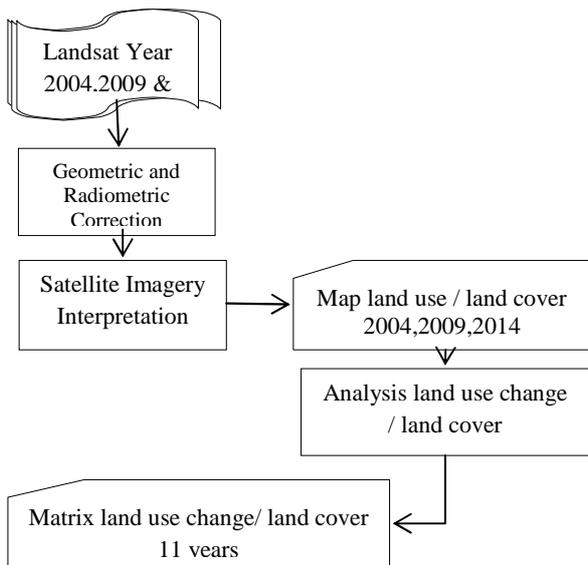


Fig. 2. Stages of data processing and analysis of land use change

III. RESULT AND ANALYSIS

A. Result

Interpretation of land use classes are grouped into the forest, plantation / mixed garden, open land, settlement, farm / field and dry land. Then the results of land use map is overlaid with forest and non-forest areas (areas other usage / APL) based on the Ministry of Forestry Republic of Indonesia Number: SK.304 / Menhut-II / 2011 [10],[20].

Based on the results of interpretation/digitization class overlay land use and forest area, then evaluated the spatial and temporal for 2004, 2009 and 2014. The map can be seen in Figure 2.

Data interpretation/ digitization compared to the Central Bureau of Statistics Dharmasraya [12]-[18] and data forested areas of West Sumatra [10],[20].

In Table 2, in general it can be seen that, the availability of secondary data is not complete between 2004 and 2014. This can be seen, from 2004 to 2007 there was no secondary data sourced from the forest areas Book Dharmasraya In Figures. This data is only available in 2008 until 2014. From Table 2, it can also be seen that the total area of Dharmasraya according to according Dharmasraya In Figures 2008-2012 was 296.113 ha and according Dharmasraya In the figure in 2013 was 296.119 hectares. While the results of the measurement map Spatial Planning (Governor of West Sumatra, 2012) is 301.115 ha and the overlay is 299.131 ha. These differences are possible because the boundaries of a district on the field is not yet clear.

Furthermore, from Table I, it can also be seen that the total forest area Dharmasraya according to according Dharmasraya In Figures in 2013 was 92.155 hectares. While the results of the measurement map Spatial Planning [10] is 92.208 ha and the overlay is 100.169 ha. These differences occur because the boundaries are not clear field as well as on the measurement results of the overlay, the body of water is not separated.

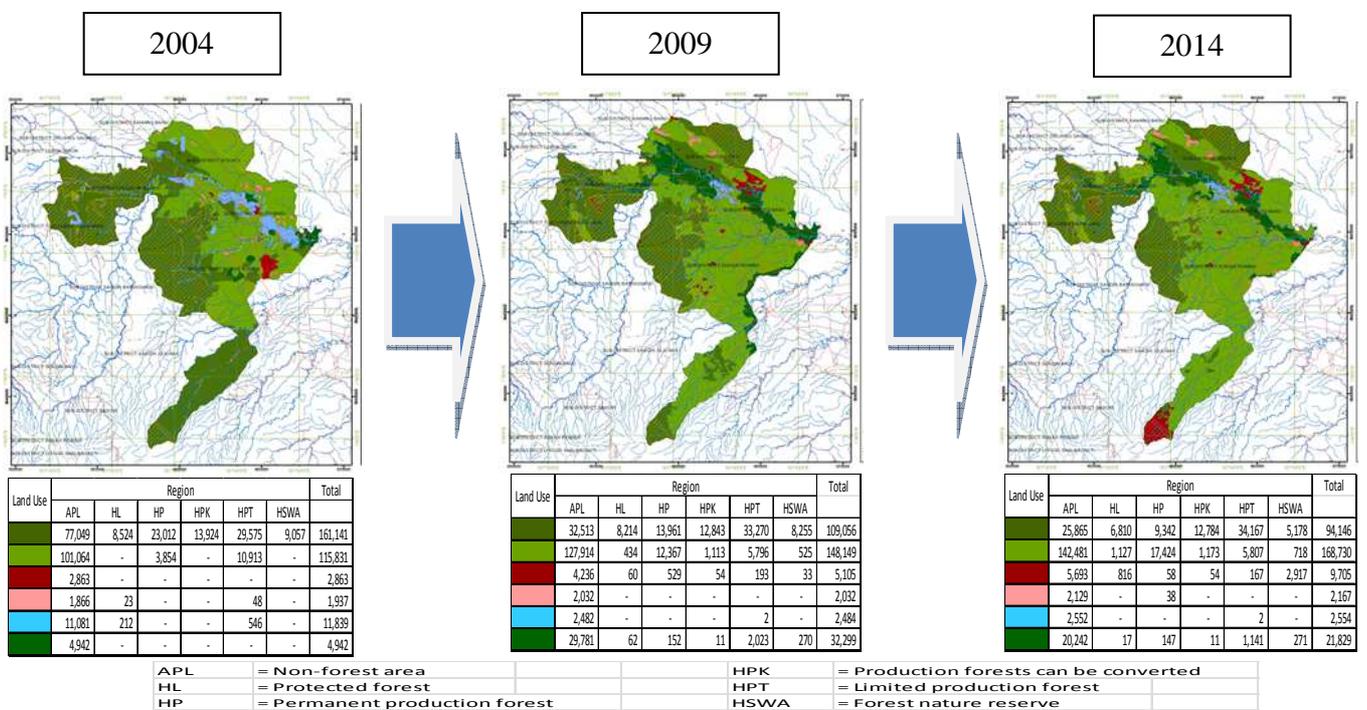


Fig. 3. Map of the results of digitization of land use change in 2004, 2009, 2014

TABLE I
DATA FORESTS AND NON-FOREST AREAS (AREA OTHER USE) IN THE DHARMASRAYA DISTRICT (2004-2014)

Regional	Data Source	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
APL	Digitization	198,865	nd	nd	nd	nd	198,958	nd	nd	nd	nd	198,962
	DDA	-	nd	nd	nd	196,594	196,594	192,023	192,023	203,963	203,964	tad
	RTRW	-	nd	nd	nd	nd	nd	nd	nd	208,907	208,907	tad
HL	Digitasi	8,759	nd	nd	nd	tad	8,770	tad	tad	tad	tad	8,770
	DDA	-	nd	nd	nd	7,256	7,256	6,923	6,923	11,986	11,987	nd
	RTRW	-	nd	nd	nd	nd	nd	nd	nd	11,962	11,962	nd
HP	Digitasi	26,866	nd	nd	nd	nd	27,009	nd	nd	nd	nd	27,009
	DDA	-	nd	nd	nd	24,215	24,215	38,245	38,245	26,770	26,771	nd
	RTRW	-	nd	nd	nd	nd	nd	nd	nd	26,692	26,692	nd
HPK	Digitasi	13,924	nd	nd	nd	nd	14,021	nd	nd	nd	nd	14,022
	DDA	-	nd	nd	nd	12,907	12,907	12,960	12,960	16,761	16,762	nd
	RTRW	-	nd	nd	nd	nd	nd	nd	nd	16,914	16,914	nd
HPT	Digitasi	41,082	nd	nd	nd	nd	41,284	nd	nd	nd	nd	41,284
	DDA	-	nd	nd	nd	45,266	45,266	40,266	40,266	31,224	31,225	nd
	RTRW	-	nd	nd	nd	nd	nd	nd	nd	31,089	31,089	nd
HSWA	Digitasi	9,057	nd	nd	nd	nd	9,083	nd	nd	nd	nd	9,084
	DDA	-	nd	nd	nd	9,875	9,875	5,696	5,696	5,409	5,410	nd
	RTRW	-	nd	nd	nd	nd	nd	nd	nd	5,550	5,550	nd
Total	Digitasi	298,553	nd	nd	nd	nd	299,125	nd	nd	nd	nd	299,131
	DDA	-	nd	nd	nd	296,113	296,113	296,113	296,113	296,113	296,119	nd
	RTRW	-	nd	nd	nd	nd	nd	nd	nd	301,115	301,115	nd
Keterangan	: DDA	= Dharmasraya in Figures										
	: RTRW	= Regional Spatial Plan										
	: APL	= Non-forest area			HPK	= Production forests can be converted						
	: HL	= Protected forest			HPT	= Limited production forest						
	: HP	= Permanent production forest			HSWA	= Forest nature reserve						
	: nd	= no data available										

B. Analysis

1) Changes in Land-Use Forest in Forest Regions

Results of interpretation and digitization of forest land use in Dharmasraya can be seen in Table II, Table III and Figure 4. Overall utilization decreased forest land. In 2004 the area of forest land either area of forest and non-forest area is 161 141 ha. In 2009 increased to 109 056 ha in 2014 and increased again to 94.146 ha. According to the Indonesian Government Regulation (President of the Republic of Indonesia, 2008), to realize the function of protected areas in a region of the island with an area of minimum least 30% (thirty percent) of the area of the island in accordance with the conditions of its ecosystem.

TABLE II.
COMPARISON OF FOREST AREA IN THE DISTRICT DHARMASRAYA IN 2004, 2009 AND 2014

No	Region	2004		2009		2014	
				Forest			
		Ha	%	Ha	%	Ha	%
1	Non Forest Area (APL)	77,049	25.8%	32,513	29.8%	25,865	27.5%
2	Forest Area	84,092	28.2%	76,543	25.6%	68,281	22.8%
3	Total Forest	161,141	54.0%	109,056	36.5%	94,146	31.5%
4	Total Region	298,553	-	299,125	-	299,131	-

The total area of forest land use in 2004 (161.141 ha) compared with the total area Dharmasraya (298.553 ha) is 54.0%. This data is greater than the government limit is 30%. But if further investigation the total forest area in the forest area (84.092 ha) compared with the total area Dharmasraya (298.553 ha) of data obtained 28.2%. This data is smaller than the government limit.

Furthermore, the total area of forest land use in 2009 (109.056 ha) compared with the total area Dharmasraya

(299.125 ha) of data obtained 36.5%. This data is still larger than government limits. But if the total forest area in the forest area (76.543 ha) compared with the total area Dharmasraya (299.125 ha) is 25.6%. This data is smaller than the limits set by the Government.

Furthermore, the total area of forest land use in 2014 (94.146 ha) compared with the total area Dharmasraya (299.131 ha) is 31.5%. This data is still larger than government limits. But if the total forest area in the forest area (68.281 ha) compared with the total area Dharmasraya (299.131 ha) is 22.83%. This comparison is smaller than 30% the limits set by the Government.

From the total area of forest functions, only a limited area of forest function product (HPT) which are relatively slight increase in 2004 is 29.575 ha, in 2009, is 33.270 ha, and in 2014 is 34.167 ha.

Based on the above data it can be concluded that the condition of the forest in the district of Dharmasraya already entered through the minimum area of forest to function protected areas established by the Government. From the above data, extensive use of forest land is likely to go down since Dharmasraya established on January 7, 2004 until 2014.

2) Changes in Land-Use Plantation/Mixed Garden in Forest Regions

Results of interpretation and digitization of land use plantation / mixed garden in Dharmasraya can be seen in Table IV and Figure 5. Overall use of plantation / mixed garden increased. In 2004, the plantation area / mixed garden, in the forest regions and not the forest region is 115.831 ha. In 2009, increased to 148.149 ha and in 2014 increased to 168.730 ha. This is evidenced by the plantation sector's

contribution to Gross Domestic Product (GDP) which is the highest among other sectors, namely 30.83% [1].

In the non-forest regions (APL), an increase in plantations/mixed gardens from 2004 - 2014. In 2004 the area is 101.064 ha, in 2009 increased to 127.914 ha and in 2014 increased to 142.481 ha.

TABLE. III
AREA LAND-USE OF FOREST IN 2004, 2009 AND 2014, IN DHARMASRAYA
(RESULT OF DIGITIZATION)

No	Regions	2004	2009	2014
		Forests		
		Ha	Ha	Ha
1	Non-Forest Area (APL)	77,049	32,513	25,865
2	Protected forest(HL)	8,524	8,214	6,810
3	Permanent production forest (HP)	23,012	13,961	9,342
4	Production forests can be converted (HPK)	13,924	12,843	12,784
5	Limited production forest (HPT)	29,575	33,270	34,167
6	Forest nature reserve (HSPA)	9,057	8,255	5,178
	Total	161,141	109,056	94,146

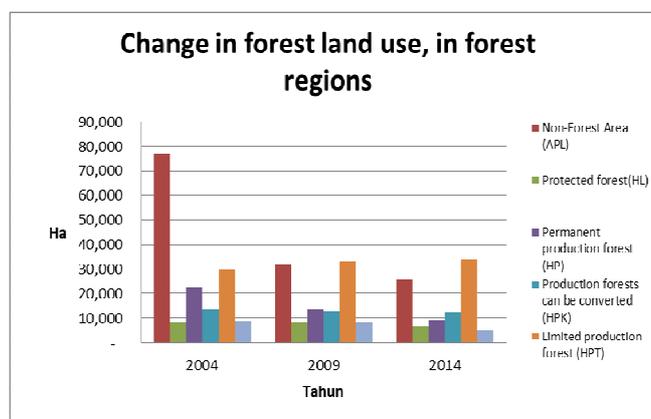


Fig. 4 . The graph area of forest land use in 2004, 2009 and 2014, in Dharmasraya (result of digitization)

In the area of permanent production forest (HP), an increase in plantations/mixed gardens from 2004 - 2014. In 2004 the area is 3.854 ha, in 2009 increased to 12.367 ha in 2014 and increased again to 17.424 ha (10.3%). This region according to according to the Government of the Republic of Indonesia [21] is set for the principal function of producing forest products. Not intended for plantation. Therefore, permanent production forest area should be the government's attention in order to further improve the supervisory and return to the permanent production forest functions.

In the area of production forest conversion (HPK), an increase in plantations/mixed-gardens from 2004 - 2014. In 2004 there was no plantation / mixed garden, in 2009 increased to 1.113 ha, and in 2014 increased to 1.173 ha , The region according to the Minister of Forestry of the Republic of Indonesia [22] is a forest area in the space reserved to be used for development outside forestry. This area could be converted from forest to other uses for existing ones.

In the area of production forest (HPT), the general decline in plantations / gardens mixture from 2004 - 2014. In 2004 is 10.913 ha, in 2009 decreased to 5.796 ha and in 2014 increased to 5.807 ha. This region according to according to the Minister of Forestry of the Republic of Indonesia [22] is a forest area designated for limited production forest reserve

forests outside nature. This area is not intended for cultivation areas or other use. Therefore, the Government should improve the supervision and return to function.

At the nature reserve forest area (HSPA), an increase in plantations/mixed-gardens from 2004 - 2014. In 2004 there was no plantation/mixed-gardens. In 2009 increased to 525 hectares and in 2014 increased to 718 ha. This region according to according to the President of the Republic of Indonesia [22], forests with certain characteristics, which has the principal function as a preservation area of plant and animal diversity and the ecosystem, which also serves as an region life support systems. Therefore, the Government should improve the supervision and return to function.

TABLE. IV
AREA LAND-USE OF PLANTATION/MIXED-GARDEN IN 2004, 2009
AND 2014, IN DHARMASRAYA (RESULT OF DIGITIZATION)

No	Regions	2004	2009	2014
		Plantation/Mixed Garden		
		Ha	Ha	Ha
1	Non-Forest Area (APL)	101,064	127,914	142,481
2	Protected forest(HL)	-	434	1,127
3	Permanent production forest (HP)	3,854	12,367	17,424
4	Production forests can be converted (HPK)	-	1,113	1,173
5	Limited production forest (HPT)	10,913	5,796	5,807
6	Forest nature reserve (HSPA)	-	525	718
	Total	115,831	148,149	168,730

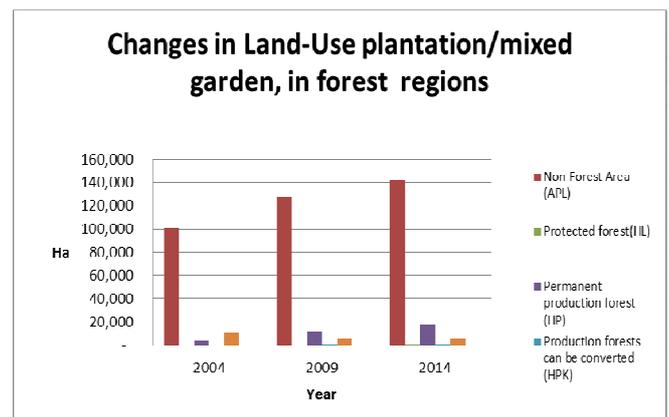


Fig. 5. The graph area of plantation/mixed-garden land use in 2004, 2009 and 2014, in Dharmasraya (result of digitization)

3) Changes in Land-Use Open Land in Forest Regions

Open land is a land without land cover both natural, semi-natural or artificial [11]. Results of interpretation and digitization of open land in the District Dharmasraya can be seen in Table V and Figure 6. Overall open land increased. In 2004 the land area are open to both the area of forest and non-forest area is 2.863 ha. In 2009 rose to 5.105 ha in 2014 and rose again to 9.705 Ha. This land is usually the mining land and land left abandoned and covered not the dominant crop.

In 2004, the open land only seen in the non-forest area(other use areas/APL), namely an area of 2,863 ha. In 2009 and 2014, in addition to non-forest areas (APL), have spread also to the forest area. The biggest improvement is in the forest nature reserve (HSPA) covering an area of 2,917 ha and the protected forest area covering an area of 816 ha. In the forest area, activities that occur menyebab open land

such as mining, is strictly forbidden. But this is still a lot going on in the district of Dharmasraya.

TABLE. V
AREA OF LAND-USE OPEN LAND IN 2004, 2009 AND 2014, IN DHARMASRAYA (RESULT OF DIGITIZATION)

No	Regions	2004	2009	2014
		Open Land		
		Ha	Ha	Ha
1	Non-Forest Area (APL)	2,863	4,236	5,693
2	Protected forest(HL)	-	60	816
3	Permanent production forest (HP)	-	529	58
4	Production forests can be converted (HPK)	-	54	54
5	Limited production forest (HPT)	-	193	167
6	Forest nature reserve (HSPA)	-	33	2,917
	Total	2,863	5,105	9,705

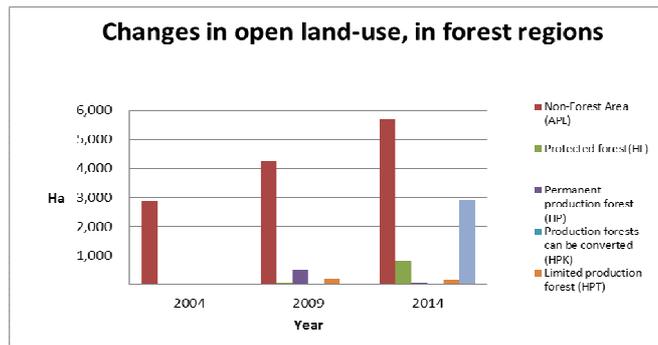


Fig. 6. The graph area of open land in 2004, 2009 and 2014, in Dharmasraya (result of digitization)

4) Changes in Land-Use of Settlement in Forest Regions

Settlement is an area of land or land used as a living environment or residential environment, and activities that support the activities of the [11]. Results of interpretation and digitization of land settlement in Dharmasraya can be seen in Table VI and Figure 7. Overall settlement land increased. In 2004, both the land settlement area of forest and non-forest area is 1.973 ha. In 2009 meningkat to be 2.032 ha and in 2014 increased to 2.167 Ha. Increased settlement is in line with the increasing economic and development Dharmasraya district.

TABLE. VI
AREA OF LAND-USE SETTLEMENT IN 2004, 2009 AND 2014, IN DHARMASRAYA (RESULT OF DIGITIZATION)

No	Regions	2004	2009	2014
		Settlement		
		Ha	Ha	Ha
1	Non-Forest Area (APL)	1,866	2,032	2,129
2	Protected forest(HL)	23	-	-
3	Permanent production forest (HP)	-	-	38
4	Production forests can be converted (HPK)	-	-	-
5	Limited production forest (HPT)	48	-	-
6	Forest nature reserve (HSPA)	-	-	-
	Total	1,937	2,032	2,167

5) Changes in Land-Use of Fields in Forest Regions

In this interpretation, which is intended to fields (other) are the fields, rice paddies, other. Further defenisinya is dryland farming with cultivation of temporary or nomadic, including rice paddies, ponds, and others [11]. Results of interpretation and digitization of land use fields (other) in Dharmasraya can be seen from Table VII and Figure 8. Overall fields (other) fluctuations from 2004 until 2014. In 2004 the field (other) in forest areas and non-Forest area is

11.839 ha. Among them there are the protected forest area (HL) 212 ha and the limited production forest (HPT) 546 Ha. On land use is dominated by rice paddies and fields. In 2009 decreased to 2.484 ha, caused many people to switch from the field / fields into plantations. In 2014 increased to 2.554 Ha. In general, people still maintain its activities in the plantation business.

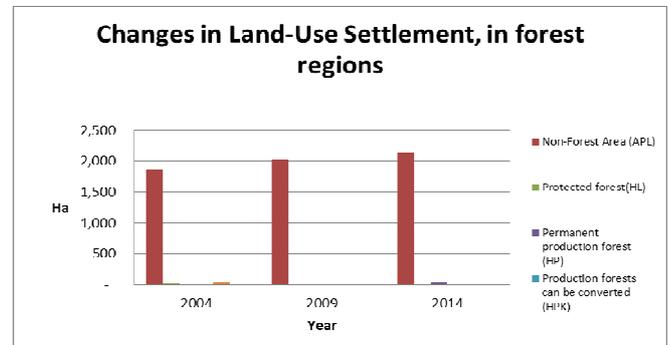


Fig. 7. The graph area of open land in 2004, 2009 and 2014, in Dharmasraya (result of digitization)

TABLE. VII
AREA OF LAND-USE FIELDS (OTHERS) IN 2004, 2009 AND 2014, IN DHARMASRAYA (RESULT OF DIGITIZATION)

No	Regions	2004	2009	2014
		Fields		
		Ha	Ha	Ha
1	Non-Forest Area (APL)	11,081	2,482	2,552
2	Protected forest(HL)	212	-	-
3	Permanent production forest (HP)	-	-	-
4	Production forests can be converted (HPK)	-	-	-
5	Limited production forest (HPT)	546	2	2
6	Forest nature reserve (HSPA)	-	-	-
	Total	11,839	2,484	2,554

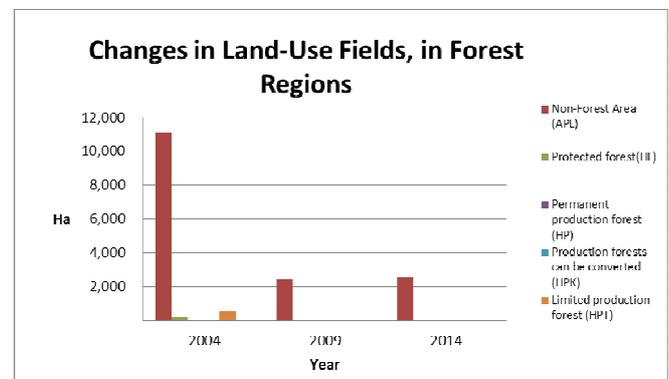


Fig. 8. The graph area of fields (others) in 2004, 2009 and 2014, in Dharmasraya (result of digitization)

6) Changes in Land-Use of dry lands in Forest Regions

Dryland is an area of dry land that had been overgrown with a variety of natural vegetation heterogeneous and homogeneous with a density that is rarely up to the tightly. Regions dominated by low vegetation (natural) [11].

Results of interpretation and digitization in Dharmasraya district, dry land can be seen in Table VIII and Figure 9. Overall dryland fluctuations from 2004 until 2014. In 2004 the dry land area of the forest area is 4.942 hectares. In the 2009 increased to 32.299 ha, of which in the non-forest area of 29 781 ha and the forest area of 2,518 ha. These changes may be caused by clearing forests for plantations, resulting in image interpretation looks like a dry land. In 2014 decreased to 21.829 hectares, of which in the non-forest area

20.242 ha and 1.587 ha of the forest area. This dry land fluctuations occur due to changes in dry land into other uses quickly occur.

TABLE. VIII
AREA OF LAND-USE DRY LANDS IN 2004, 2009 AND 2014, IN DHARMASRAYA (RESULT OF DIGITIZATION)

No	Regions	2004	2009	2014
		Dry Land		
		Ha	Ha	Ha
1	Non-Forest Area (APL)	4,942	29,781	20,242
2	Protected forest(HL)	-	62	17
3	Permanent production forest (HP)	-	152	147
4	Production forests can be converted (HPK)	-	11	11
5	Limited production forest (HPT)	-	2,023	1,141
6	Forest nature reserve (HSWA)	-	270	271
	Total	4,942	32,299	21,829

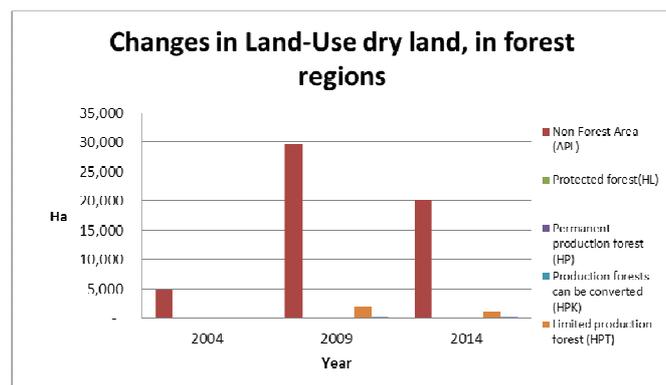


Fig. 9. The graph area of dry lands in 2004, 2009 and 2014, in Dharmasraya (result of digitization)

IV. CONCLUSIONS

There was a decrease in the use of forest land since Dharmasraya established in 2004, until 2014. The forest area which was originally in 2004 area is 161.141 ha, in 2009 decreased to 109 056 ha, and in 2014 decreased again to 94 146 ha. This decrease occurred in forest and non-forest areas (areas other use). In 2014, the forest area is available on the forest area is only 22.8%, less than the minimum limit of 30% in a region (the President of the Republic of Indonesia, 2008). Supervision required to cope with the increased use of protected areas. This area has been used for plantation / mixed-garden covering an area of 1.127 ha, 816 ha of open land and dry land 17 ha. This area should be restored function into protected forest.

An increase in plantation area Dharmasraya established since 2004 until 2014. In 2004 the plantation area/ mixed-garden is 115 831 ha. In 2009 increased to 148.149 ha (27.9%) and in 2014 increased to 168.730 ha (13.89%). In 2014, the plantation/mixed garden area in the non-forest area is 142.481 ha (84.4%) and the forest area is 26 249 ha (15.6%).

Overall settlement land increased. In 2004 the settlement land area, area of forest and non-forest area is 1,973 ha. In 2009 increased to 2,032 ha in 2014, increased again to 2,167 hectares. Increased settlement land is consistent with the growing economy Dharmasraya district.

Overall fields (other) fluctuations from 2004 until 2014. In 2004 the field (other), whether non-forest area and the forest area is 11 839 ha. Among them there are the protected forest area (HL) covering an area of 212 ha and the limited

production forest (HPT) covering an area of 546 hectares. On land use is dominated by paddy rice and fields. In 2009 decreased to 2.484 ha, caused many people to switch from paddy rice / fields into plantations. In 2014 increased to 2,554 Ha.

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