History of land status, land use and land cover types of four private oil palm plantations in West Kalimantan Province, Indonesia

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Abstract. Oil palm plantations are still believed to be the principal reason of primary forests’ damages in Southeast Asia. To verify this accusation, a survey of four private oil palm plantations was carried out in West Kalimantan Province of Indonesia, to identify the history of land status, land cover types and land use prior to the conversion to these plantations. The research was conducted using overlay maps of Business Permit with Consensus-based Forest Land Use Planning/Provincial Spatial Plan maps and permits, interpretation of Landsat images of 3 years prior and 2 years after the establishment of the plantations. Interviews with various formal and informal community leaders were also conducted. Results indicated that the original land cover types of all of the research areas (100%) were not forest when the plantations were established. Most (59.50%), were formerly community lands, while 40.50% were concession areas belonging to other companies. These results corresponded with the Landsat imagery interpretations, which showed the land cover types 1 year before the conversion were mostly shrubs (59.62%), while the remaining were secondary swamp forest (18.35%), bare land (16.46%) and swamp shrubs (5.58%). This research confirmed that the four oil palm plantations, were not responsible for deforestation.

1. Introduction
For nearly three decades, driven by the high economic returns, the total areas of Indonesian oil palm plantations have tripled [1-3]. The 1990s saw a rise in Indonesian oil palm plantation development and following 2008, Indonesia took control of the global demands for palm oil by becoming the largest palm oil producer in the world, with 48% of the total worldwide volume of palm oil productions [4]. All the same, these successes were followed by negative accusations that have become a polemic in the public arena that Indonesia’s oil palm plantations have originated from primary forests and/or secondary forest clearance, and thus have contributed to deforestation [5-8].

Reference [9] and [10] state that more than 50% of Indonesian plantations is developed from forest areas, that have resulted in a reduced biodiversity [11-16], and water quantity and quality [10] and [17], as well as increased greenhouse gas emissions [18] and [19] and social conflicts [20-22]. On the contrary, a study by [23] revealed that the status of the lands of their research sites prior to the conversion into oil palm plantations, were production forest and convertible production forest. Such conclusions were also highlighted by [24] who found that almost all of the oil palm plantations in Indonesia have been developed from convertible production forest. This was complemented by studies by [25] and [26].
in six provinces in Indonesia, which indicate that the previous land status of the areas of study were not state forests. Similarly, [27] state that oil palm plantations can be developed on what was previously agricultural lands. Furthermore, according to the Government Regulation No. 104/2015 on the Procedures for Changing the Designation and Function of Forest Areas, changes on the designation can be done partially through the exchange of forest areas or the release of forest areas into other land uses.

Deforestation, unfortunately, is something that must be taken seriously as it often made into the target of global policy initiatives [28-30]. Results of the European Unions parliamentary vote that accused oil palm plantations as the major driver of deforestation, is currently causing a decline in the world palm oil prices, which not only affected the palm oil production of oil palm companies, but has also reduced the welfare of smallholder oil palm farmers (Head of Village Cooperative (KUD) Rajawali Sintang, July 27th, 2019 and the indigenous Dayak communities, members of the KUD Usaha Bersama Sintang, August 7th, 2019, personal communication).

The term deforestation itself, is considered by [19], as an unclear and inconsistent term, since the Industrial Forest Plantation or shifting cultivation by the community can also be termed deforestation. This is caused by the unclear land status before converted to the plantation [31] or by the differences in perceptions between stakeholders [32]. Knowledge on the prior land status and history of land uses are therefore crucial to be understood in order to find legal evidences of the changes in land functions. In addition, understanding the history of previous land uses is also one of the key factors for achieving sustainable oil palm plantations [32]. Land status and land use history will determine the type of land cover. Therefore, it is critical to conduct a research on the historical analysis of land status, land uses and land cover types of oil palm plantations.

2. Materials and methods

The study was conducted on four oil palm companies within the Regency of Ketapang and Kubu Utara of West Kalimantan Province in April 2018 through: (1) analysing overlaid maps of the oil palm plantation studied with the 1984 Forest Land Use by Consensus (TGHK) map and the 2004 West Kalimantan Provincial Spatial Plan (RTRWP) maps; (2) studying the Business Rights (HGU) documents, including the Forestry Ministerial Decree on the Release of Forest Area and (3) interpreting Landsat images of bands 542, covering 3 years before and after the oil palm industries operated. In addition, field cross-checked and interviews were conducted with the National Land Agency, Plantation and Forestry Office and community figures. Literature studies were also conducted to obtain information related to the history of the previous land status and land use, development of land cover, specifically on: the company legality documents, legislation related to the procedures for obtaining the business permits, feasibility study reports of oil palm plantation companies, Provincial Spatial Plans (RTRW) documents, Forestry Ministerial Decree related to TGHK and release of forest area and company data from Provincial Plantation Service, and other related scientific publications.

Interviews were conducted to obtain in-depth information on (a) the process of obtaining permits; (b) land status and land use history of prospective concession areas; and (c) field activities from the process of land acquisition, land preparation for planting; (d) development of land cover of the plantation area. Resource persons (managers and community leaders) were determined using snowball technique through two stages: (1) selection of key informants (plantation owners/managers, company employees, local figures, village elders); (2) selection of advanced informants (based on previous sources' recommendations) to broaden description of information and trace variations of existing information, until the information provided were saturated/no new information was provided.

High resolution satellite imaging and GIS mapping helped in documenting the land use modifications that occurred prior to the development of the plantations. However, such changes might convey little visual information about the movement, even in cases where high resolution imagery is available. In such case, consultations with the elders were necessary to obtain a broad apprehension of the historical land use and land status based on recollected memories. In-depth interviews were also conducted with the Provincial Forestry Service, Provincial Plantation Service, BPN, and other associated services.
3. Results and discussion

3.1. Plantation business permit process

Knowledge of the previous land status prior to the establishment of the plantation began with an understanding of the procedure for obtaining plantation permits. This was done to determine the legality of the establishment of the plantation business. According to [33] these documents can also be used to avoid future problems related to legal aspects such as other parties' demands, or for loan guarantees.

Regulation related to the plantation licensing followed Regulation No.98/Permentan/OT.140/9/2013 concerning the Guidelines for Licensing of Plantation Business. The permit for a large landholding comprised of principle permit, location permit, release of forest areas, Plantation Business Permit (IUP) and Business Right Permit (HGU) (Table 1). Once the location permit is obtained, the applicant could immediately work the land, despite no decision has been made for granting the HGU. Nevertheless, a location permit does not imply that the company could work the land forthwith, but in such case, there were no prohibitions from the government in order to avoid illegal cultivators and irresponsible parties [34].

| Company | Location Permit | Permits | Total Area (ha) | Status |
|---------|-----------------|---------|----------------|--------|
| BPK     | 1996            | HGU - No.18/HGU/BPN/96 | No data |        |
|         | 2000            | SPUP 448/Menhut-VII/2000 | No data |        |
| KGP     | 2005            | IUP – Reagent of Ketapang Decree No.176 of 15 June/2005 | 10,320.00 |        |
|         | 2007            | Extension and land revised information through Reagent of Ketapang Decree No. 433 of 2007 | 10,320.00 |        |
|         | 2013            | HGU - SK HGU No. 59/BPN RI/2013 | 9,332.80 |        |
| GKG     | 2006            | IUP - Reagent of Ketapang Decree No. No. 294 | 13,000.00 |        |
|         | 2010            | Extension of location permit (Reagent of Ketapang Decree No. 23) | 13,000.00 |        |
|         | 2013            | IUP No. 542.31/DISBUN-D/2013 | 9,471.00 |        |
|         | 2013            | HGU - SK HGU No. 67/BPN RI/2013 | 7,261.89 |        |
| CNG     | 1989            | IUP - Reagent of Ketapang Decree No. 38 of 6 Februari/2009 | 2,641.82 |        |
|         | 2013            | HGU - SK HGU No. 58/BPN RI/2013 | No data |        |
|         | GKG             | SIUP Kecil: No. 0.547/1.824.51 | No data |        |

Grounded along the outcomes of consultations and literature surveys, Table 1 indicated that all of the oil palm plantations being studied have obtained their permission to establish and develop oil palm plantation in the form of IUP and HGU. According to [33], plantation business permits are permits to prepare planting plans and conduct socialisation to the community, hence the granting of HGU documents indicated that the company have retained their other licensing documents. A HGU document would be granted once the company obtained permission letters such as a location permit decree, IUP decree and other necessary documents. These suggested that all plantations obtained their business permits in accordance with legal licensing processes.

3.2. Historical changes in land status

Data was collected in the morning (06.00-08.00) and in the afternoon (16.00-18.00) with 3 replications. Specifically, for mammals, data were also obtained by using camera traps (which are installed for 3 x 24 hours). The status of the HGU land area that are used as plantation areas, can be in the form of state or privately owned land. The said state areas can be in the form of forest area or non-forest area. If the
land granted by the HGU is state-owned, in this case is a forest area, then the granting of the HGU can only be done after the revocation of its status as a forest area. Likewise, if there are other rights applied to the land, then the granting of the HGU can only be done once the previous assigned rights had been released. This is in accordance with the provisions as regulated in Article 4 of Government Regulation (PP) No. 40/1996 on HGU, Building Use Rights and Land Use Rights.

The results of the overlaid of the 1984 TGHK map with the West Kalimantan 2004 RTRWP map showed that the previous land status of the locations of oil palm plantations based on TGHK comprised of permanent production forest (HP), limited production forest (HPT), convertible production forest (HPK) and other land uses (APL) (Table 2).

| Private Estate | Year of Business Permit | 1984 TGHK | Minister of Forestry Decree | 2004 West Kalimantan Provincial Spatial Plan |
|---------------|-------------------------|-----------|----------------------------|---------------------------------------------|
| BPK           | 1996                    | HP        | APL                        | APL                                         |
|               |                         | 5,964.20  | 6,934.81                   | 6,934.81                                    |
|               |                         | APL       | 970.61                     |                                             |
| KGP           | 2007                    | HP        | APL                        | APL                                         |
|               |                         | 1,304.41  | 9,397.76                   | 9,397.76                                    |
|               |                         | APL       | 8,093.35                   |                                             |
| GKG           | 2013                    | HPT       | APL                        | APL                                         |
|               |                         | 380.88    | 13,469.68                  | 13,469.68                                   |
|               |                         | HPK       | 8,413.67                   |                                             |
|               |                         | APL       | 4,675.13                   |                                             |
| CNG           | 2009                    | HPT       | APL                        | APL                                         |
|               |                         | 2,282.59  | 3,454.65                   | 3,454.65                                    |
|               |                         | APL       | 1,172.06                   |                                             |

Table 2 indicated that based on the TGHK, some of the areas were formerly production forests, both permanent and limited as well as small portions belonged to the category of HPK. TGHK map shows the division of forest area based on its function, while the RTRW map shows the division into protected areas and cultivation areas. Based on the regulation, APL is defined as non-state-owned area, while HP, HPT and HPK are state-owned forests, suggesting the need to carry out forest release activities in accordance to the PP No. 60 of 2012 (replacing PP No. 10 of 2010 concerning Procedures for Changing the Designation and Function of Forest Areas). According to PP No. 104/2015 concerning the Changes in Function of Forest Areas, changes to the designation of forest areas can be partially carried out through swapping forest areas or releasing forest areas. Forest areas that could be released are Convertible Production Forests (HPK), which are forest areas that are spatially reserved for the use of development outside forestry. Whereas forest areas with HP and HPT status must undergo exchange of forest areas. Changes in forest functions basically implied a changed of land status from forest areas to non-forest areas.

Prior to the conversion to PT CNG oil palm plantation, the land status was previously APL, but there were 70 ha out of the total location permit area of 3,454.17, which at the time of the review by Forest Gazettement Agency (BPKH) was designated as a protected area. Based on this, the area of APL was only 3,384 ha. The protection forest area is not used as a plantation area even though it is included in the location permit. Similarly, is the case with PT KGP whose concession area is categorised as APL based on the map of the Provincial and Ketapang RTRW and designation of the 2000 area and waters by the Minister of Forestry and Plantation Decree No. 259, there is no release of forest area.

Similar results were also shown by PT. GKG and PT. BPK, the two PTs also had non-forest area status before they were made into oil palm plantations. At present based on the results of an area map overlay with a forest area map and a West Kalimantan RTRWP map, both PBS areas are APL status. Thus, based on the historical description of the origin of the land status in all PBS observed in the West
Kalimantan region, it is known that when the oil palm plantation business licence and HGU certificate were issued, the status of the land of all the private oil palm plantation companies was not a forest area.

Based on the Minister of Forestry's Decree and West Kalimantan's RTRWP, Table 2 indicated that at the time of obtaining the business permits, all oil palm plantations under study were already categorised as APL hence were NOT state-owned forest areas. Consequently, these results confirmed that the plantations were not established at the expanse of primary forest, or in other words, could not be categorised as deforestation.

3.3. Land use history

Landsat imagery analysis was used to determine land cover types before conversion into plantations. Results indicated that all four companies have land use history as APL as follows: PT BPK was previously a dry field; PT KGP shifting cultivation land, GKG forest-dry field-rubber-shrubs (1950-2007), and in 2007 was previously a mining company (PT. Harita), and PT CNG shifting cultivation land. These results were in accordance with the results of the interpretation of Landsat imagery before the establishment of companies (Table 3).

Most of the areas of PT. KGP and PT. CNG belonged to the local communities who have already occupied the area before the establishment of the plantations. According to the Head of Randai Village, indigenous leader (Temanggung) of the Batu Payung II Village, and members of the community, the land where they lived now were once forest areas, but then used by the local Dayak communities for shifting cultivation (Table 3). The Dayaks claimed that they incised natural rubber from the 1950s to planting it in the 1960s. In the 1970s, the community began cutting down trees because timber buyers entered the Village of Randai. The trees that dominated the time of illegal logging around the 1990s until before 2002 included Shorea, Dipterocarps as well as fruit trees such as durian, langsat, mangosteen and rambutan. Shorea and dipterocarps are species specific of tropical rain forests. During that time, there was a large-scale pest outbreak, which caused people to be reluctant to plant rice. After there were no more trees to be logged, the local indigenous communities cleared the lands with slash and burn system. In 1997/1999 and 2001/2002 there were large fires, which caused post-fire land to be covered with shrubs. In 2005, the company entered the village, and offered the lands that had been cultivated by the community to be converted into an oil palm plantation using an imas-tumbang system (land clearance for stands below 8 cm in diameter (imas) and between 8-29 cm (tumbang)) [35], with a payment of 500,000 IDR/ha. Thus, according to the community, the lands that they cleared for oil palm plantations were not state lands.

The history of land use of PT. GKG, according to the Customary Council of Banjarsari Village of Cempedak Hamlet, PT GKG's lands were previously community-owned lands, where the community had already occupied the area before the commenced of PT GKG. Initially the land was forested with vegetation comprised of large diameter trees, such as shorea, mahogany, ramin, ironwood, rattan, and durian. The community then cleared the land for shifting cultivation by planting sweet potatoes, rice and vegetables. In the 1950s, people began to carve natural rubber, and began planting rubber in the 1960s. The land was also used as a mining site of PT Harita, which was then returned to the community after the mining activity was terminated. In 2007, the company entered the village area, and similar to the PT KKG, offered their land to be cleared for oil palm plantations with an average price of IDR 2 million/ha using an imas system. This indicated that at the time, there were no more large diameter trees, since an imas system is applied to stands with less than 8 cm in diameter.
Table 3. Land cover development prior to the oil palm plantation establishment.

| Private estate | Landsat image | Total land area based on land cover (ha) | SSF | OS | OSS | YS |
|----------------|---------------|----------------------------------------|-----|----|-----|----|
| BPK            | 1993          | 4,893.53                               | 1,021.62 |   |   |   |
|                | 1994          | 5,316.64                               | 1,080.84 |   |   |   |
|                | 1995          | 5,313.82                               | 1,083.66 |   |   |   |
|                | 1996          | 4,712.42                               | 1,067.76 |   |   |   |
|                | 1997          | 2,472.84                               | 568.16 |   |   |   |
|                | 2003          | -                                      | 4,871.62 |   |   |   |
|                | 2004          | -                                      | 4,867.48 |   |   |   |
| KGP            | 2005          | -                                      | 4,988.59 |   |   |   |
|                | 2006          | -                                      | 4,878.29 |   |   |   |
|                | 2007          | -                                      | 4,854.93 |   |   |   |
|                | 2004          | -                                      | 752.74 |   |   | 9,514.91 |
|                | 2005          | -                                      | 1,150.35 |   |   | 8,866.25 |
| GKG            | 2006          | -                                      | 930.05 |   |   | 9,498.54 |
|                | 2007          | -                                      | 1,684.15 |   |   | 9,956.51 |
|                | 2008          | -                                      | 1,310.92 |   |   | 7,953.48 |
|                | 2007          | -                                      | 1,530.26 |   |   |   |
|                | 2008          | -                                      | 1,340.64 |   |   |   |
| CNG            | 2009          | -                                      | 730.47 |   |   |   |
|                | 2010          | -                                      | 385.35 |   |   |   |
|                | 2011          | -                                      | 506.18 |   |   |   |
| Private estate | Landsat image | Total land area based on land cover (ha) | YOB | P  | M   | BL |
|----------------|---------------|----------------------------------------|-----|----|-----|----|
| BPK            | 1993          | 513.11                                 | -    | -  | 24.22 |   |
|                | 1994          | 513.11                                 | -    | -  | 24.22 |   |
|                | 1995          | 532.10                                 | -    | -  | 5.23  |   |
|                | 1996          | 550.83                                 | -    | -  | 603.80 |   |
|                | 1997          | 437.19                                 | -    | -  | 3,456.62 |   |
|                | 2003          | 2,433.45                               | -    | -  | 2,092.69 |   |
|                | 2004          | 2,660.86                               | -    | -  | 1,869.42 |   |
| KGP            | 2005          | 4,020.93                               | -    | -  | 388.24 |   |
|                | 2006          | 2,745.97                               | -    | -  | 1,773.5 |   |
|                | 2007          | 3,946.57                               | -    | -  | 596.26 |   |
|                | 2004          | -                                      | -    | -  | 3,202.01 |   |
|                | 2005          | -                                      | -    | -  | 3,453.06 |   |
| GKG            | 2006          | -                                      | -    | -  | 3,041.06 |   |
|                | 2007          | -                                      | -    | 130.38 | 1,698.64 |   |
|                | 2008          | -                                      | 1,294.55 | 345.52 | 2,565.21 |   |
|                | 2007          | 1,568.66                               | -    | -  | 355.73 |   |
|                | 2008          | 967.04                                 | -    | -  | 1,048.52 |   |
| CNG            | 2009          | 304.42                                 | -    | -  | 2,419.76 |   |
|                | 2010          | 2,956.82                               | -    | -  | 112.48 |   |
|                | 2011          | 2,632.15                               | -    | -  | 316.32 |   |

Note: SST= secondary swamp forest; OS=old shrub; OSS=old swamp shrub; YS=young shrub; YOB=young shrub and swamp bush; P=plantation; M=mining; BL=bare land
The community claimed that the cleared lands were owned by them and not state-owned. Members of the community whose lands became part of PT GKG, then received a plasma right of one plot (2 ha). The statement of the Customary Council was in line with the statement from the company. According to PT GKG staff, the land status of the company was previously APL, based on the Map of the Designation of Areas and Waters of West Kalimantan Province, with relatively flat topography and land covered mostly by secondary forests, shrubs, and bushes, while around the settlements were mixed gardens (rubber, vegetable fields rice, etc.). The results of interviews with the community and staff of PT. GKG was in line with the results of Landsat imagery interpretation, where prior to the establishment of PT. GKG oil palm plantation, the area depicted dominated of young shrubs and bare lands.

4. Conclusions
Review of historical land status before PT. BPK, KGP, GKG and CNG were operational, comprised of former community-owned lands and categorised as other land uses (APL/not state-owned). The historical reviews also indicated that the previous land uses were community-owned dry fields, agriculture lands, shifting cultivation land, shrubs, and shifting cultivation land respectively. This information was supported by the results of the Landsat imagery interpretation one year prior to the granting of the business licences. In all four plantations, the land covers were dominated by bare lands, indicating a non-forest land cover, followed by old shrubs (3 plantations), young shrubs and young shrub and swamp bushes (3 plantations) in addition to secondary swamp forest (1 plantation), old swamp shrub (1 plantation), and a very small portion of the plantation (1 plantation) and mining areas (1 plantation). It can be concluded that at the time the oil palm plantations business licences and HGU certificates were issued, the land status of all the oil palm plantations under study (100%) were not forest areas. This confirmed that the four oil palm plantations were not responsible for deforestation.

References
[1] FAO 2013 FAO Statistical Yearbook 2013 Food and Agriculture Organization (Rome: The United Nations)
[2] Dirjenbun 2016 Tree Crop Estate of Indonesia. 2015-2017 Available from: http://ditjenbun.pertanian.go.id.[Accessed 15 August 2019]
[3] Info Sawit 2017 Ekspor Minyak Sawit Asal Indonesia Naik 24% [Indonesian Palm Oil Exports Up To 24%] Available from: http://www.infosawit.com/news/7082/agustus-ekspor-minyak-sawit-asal-indonesia-naik-24-[Accessed 31 August 2019]
[4] Feintrenie L, Chong W and Levang P 2010 Small-Scale For. 9 pp 379-96
[5] Vijay V, Pimm SL, Jenkins CN, and Smith SJ 2016 The impact of oil palm on recent deforestation and biodiversity loss PLoS ONE e0159668.
[6] Donald PF 2004 Conserv. Biol. 18 pp 17-37
[7] Dumbrell AJ and Hill JK 2005 Conserv. Biol. 125 pp 123–31
[8] Nawir AA and Rumboko L 2008 Sejarah dan Kondisi Deforestasi dan Degradasi Lahan Nawir, Rehabilitasi Hutan di Indonesia ed. AA Nawir et al (Bogor: Center for International Forestry Research) chapter 2 pp 13-36
[9] Koh LP and Wilcove DS 2008 Conserv. Lett. 1 pp 60-64
[10] Carlson KM, Curran LM, Ratnasari D, Pittman AM, Soares,BS, Asner GP, Trigg SN, Gaveau DA, Lawrence D and Rodrigues HO 2012 Proc. Nat Acad Sci (May 8 USA) vol 109 pp 7559–64
[11] Tscharntke T, Clough Y, Bhagwat S, Buchori D, Faust H, Hertel D, Hölscher D, Juhrbandt J,and Kessler M 2011 J. Appl. Ecol. 48 pp 619-629
[12] Stevensen PR and Aldana AM 2008. Int. J.Primateol. 29 pp 365-77
[13] Pacienza MLB and Prado J 2005 Plant Ecol. 180 pp 87-104.
[14] O’Dea N and Whittaker RJ 2007 Biodivers. Conserv. 16 pp 1131–1159.
[15] KobayashiT, Nakashizuka T, and Kitahara M 2009 Ecol. Res. 24 pp 57-64
[16] Srinivas A, Koh LP 2016 Glob. Ecol. Conserv. 7 pp 183-200
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