ERIA-DP-2017-02

ERIA Discussion Paper Series

Peat Policy and Its Implications on Value Chains of Indonesian Palm Oil*

Budi Indra SETIAWAN†
Ministry of Agriculture, Republic of Indonesia
Falatehan FAROBY
Bogor Agricultural University

May 2017

Abstract: *Palm oil and its derivative products are strategic commodities that play an important role in the economic development of Indonesia which, along with Malaysia, is a major exporter to the global markets. Global as well as national demands on crude palm oil are increasing, not only as food but also as raw material for biodiesel. To increase production, the extensification of oil palm plantations in Indonesia is still the preferred option. Since there are limited fertile mineral soils, marginal land such as peatlands have become targeted areas to open new plantations. Due to recurring fire and haze problems, while attempting to restore degraded peatlands, the government issued By Law No. 57 in 2016 to protect and manage the peat ecosystem (Peat Policy). This peat policy, which mainly aims to prevent environmental degradation, would to some extent reduce planting areas and impact on production, stretching to the supply and value chain of palm oil and its derivative products. This study assessed how the peat policy affected the planting areas; production; economic value; growers, especially the farmers; and export quantity and value. We applied numerical approaches followed by simulations of certain scenarios. Compared to 2015 figures, the peat policy would reduce the palm oil plantation area by 10%–18% and production by 12%–15%, with the potential to reduce: 1) economic values by 12%–15%; 2) the number of farmers by 12%–15%; 3) exported palm oil by 21%–24% and export value by 22%–24%; and 4) the cost of fresh fruit bunch by 6%–8%. These reductions will severely affect the economic development of the country and threaten the welfare of the farmers. The government and practitioners should therefore make policy choices that are conducive to the sustainable development of oil palm plantation in the peatlands, i.e. how to promote intensification programs to increase productivity and to manage sustainable production.*

Keywords: Peatland, peat policy, palm oil, value chain
JEL Classification: F10, F18, N55 and O13.

* This study was partly funded by the Economic Research Institute for ASEAN and East Asia, and presented at the 9th Asian Society of Agricultural Economists (ASAE) International Conference on the Transformation in Agricultural and Food Economy in Asia, Bangkok, 11–13 January 2017.
† Corresponding email: budindra@ipb.ac.id

1. Introduction

Palm oil and its derivative products are strategic commodities that play an important role in the economic development of Indonesia which, along with Malaysia, is a major exporter to the global markets. Global as well as national demands on crude palm oil (CPO) are increasing, not only as food but also as raw material for biodiesel. To increase production, the extensification of oil palm plantations has been the preferred option. Due to limited fertile mineral land since the early 2000s, marginal land such as peatlands have been targeted to open new plantations. However, along with increasing production, environmental problems have been increasing to a level that has reached intolerable impacts on neighbouring countries. Land and forest fires that spread haze are terrifying threats that occur almost every year, especially days before and during the dry season.

Due to recurring fire and haze problems, while attempting to restore degraded peatlands, the government issued By Law No. 57 in 2016 (PP 57/2016) to protect and manage the peat ecosystem (Peat Policy). With the issuance of PP 57/2016, about 30% or more of the Peat Hydrological Unit (PHU[1]) should be conserved. This means that a company operating in a peatland is obliged to set aside an area for conservation (Chapter 9, Verse 3). In addition, the company is also obliged to set aside an area having a peat depth of more than three metres for conservation (Chapter 9, Verse 4(a)). These two restrictions could potentially reduce plantation areas and CPO production. Furthermore, the company should manage the water table in the peatland so as not to exceed a depth of 0.4 metre from the peat surface (a criterion to judge destructed peat) (Chapter 23, Verse 3[a]). This restriction would decrease or even cease productivity because (Kalsim et. al., 2016) the root zone becomes limited, too wet, and lacks oxygen or has bad aeration. To implement PP 57/2016, planters in peatlands need to provide accurate maps which should be based on a basic map that is scaled at least 1:50,000 and, if necessary, to reshape its plots to suit the biophysical condition of the peatlands to improve water management.

[1] Peatland bordered by two adjacent rivers and/or a sea line.

Previously, a presidential instruction No. 8 in 2015 (INPRES 8/2015) was issued to halt new permits and prohibit the extensification on pristine forests and peatlands. This INPRES, which was supposed to end in 2017, was not effective to prevent the unwise management of peatlands in which some argued as the reason behind the occurrence of massive forest fires in 2015. Falatehan and Setiawan (fouthcoming) have analysed and simulated the impacts of INPRES to the value chains of CPO. Based on the following three scenarios: 1) no expansion (0 hectare/year); 2) under INPRES with possibly less extension (100,000 hectares/year); and 3) under normal condition (500,000 hectares/year), in the period of 2011–2015, there would be no significant changes (<0.01%) for all value chains except for one variable which would increase CPO production by 1.52% and 0.30% each without halting and under INPRES. These changes are very small and shows that INPRES is not effective and gives no significant implications.

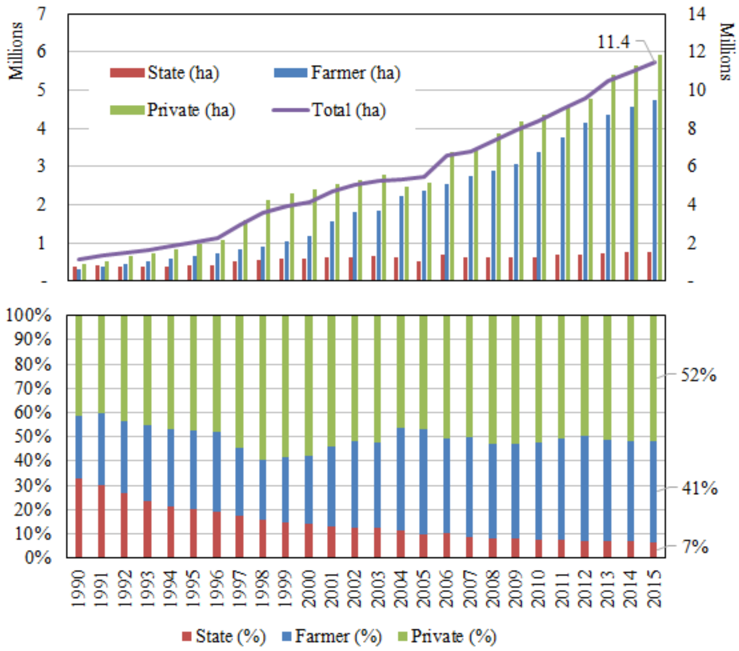
Recently, Government Regulation No. 57 (PP 57/2016) was issued to strengthen a previously controversial regulation (PP 71/2014) concerning the protection and management of the peat ecosystem. Many parties agree that PP 57/2016 will ease further trends and even restore peatland degradation. However, other parties who cultivate peatlands would become unsecured because this harsher instruction on peatland management would jeopardise production. This study aims to detail how far PP 57/2016 would impact the plantation area and CPO production, and its impacts to value chains and planters, especially the farmers and Indonesian CPO export industry.

2. Plantation Area

Oil palm and its derivative products are strategic commodities that take important roles in Indonesia’s economic development. Palm oil plantations (

Figure **1**) are steadily extending with an average rate of 420,000 hectares every year since the 1990s and has reached more than 11.4 million hectares in 2015.

Figure 1. Area of Oil Palm Plantation in Indonesia (1990–2015)



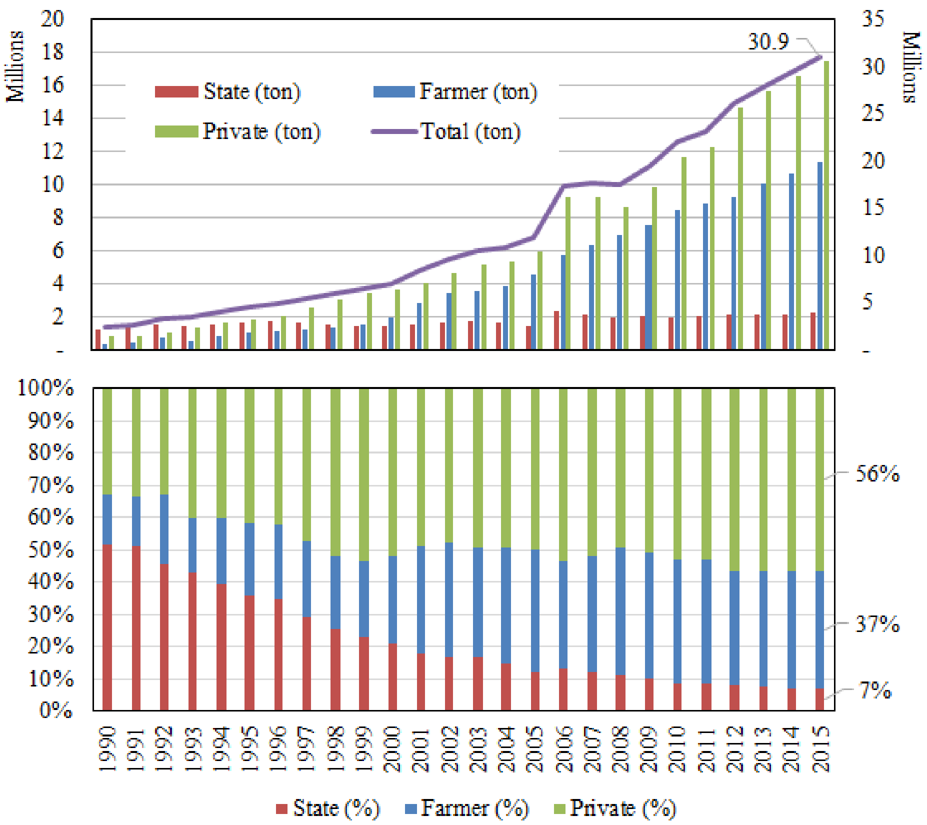
Source: Dirjenbun (2015)

Palm oil growers can be distinguished into three big categories as follows: Smallholder (Farmer), State-Owned Company (State) and Private Corporation (Private). On average, the Private category extends its planted area at a rate of 215,000 hectares per year. This is followed by the Farmer category at 185,000 hectares per year, then the State category with only 15,000 hectares per year. From the total planted areas in 2015, the Private, Farmer, and State categories hold 52%, 41%, and 7%, respectively. Plantation extension can be divided into three periods. Before 2004 where most of the palm oil were planted in mineral soil; around 2004–2006 which was a transition period with very slow extension rate because of the limited mineral soil; and after 2006 where the extension has moved to marginal peatlands.

3. CPO Production

CPO production in Indonesia in 2015 reached 31 million tons. The Farmer category held 37%, State 7%, and Private 56%. The total asset value of CPO was equivalent to US$13.5 billion distributed among Farmer (55%), State (7%), and Private (44%). The production development of COP (Figure 2) can be distinguished into three periods: before 2005, between 2005 and 2006, and from 2006.

Figure 2. CPO Production (1990–2015)

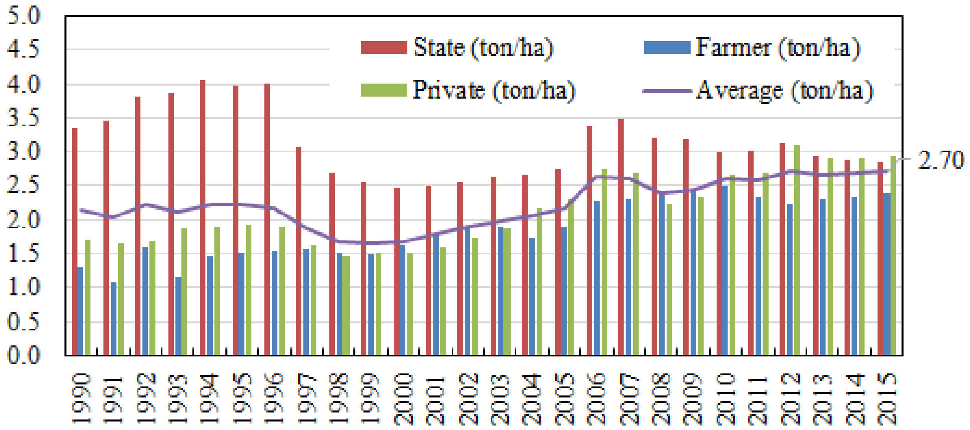


Source: Dirjenbun (2015)

4. Land Productivity

On a national scale, land productivity varied between 1.65–2.72 tons crude palm oil per hectare at an average of 2.32 tons per hectare (Figure 3). The Farmer category produces 1.07–5.2 tons per hectare with an average of 1.87 tons per hectare. The State category produces 2.48–4.07 tons per hectare with an average of 3.13 tons per hectare and the Private category produces 1.46–3.09 tons per hectare with an average of 2.14 tons per hectare. The State category is more productive than the two other categories because most of its plantations are in mineral soil land which is more fertile than the peatlands, wetlands, and other marginal lands cultivated by the two other categories.

Figure 3. Land Productivity of CPO (1990–2015)



Source: Analised from Dirjenbun (2015)

Using two linear equations, each having three variable inputs: Farmer's Land Area (A_F), State's Land Area (A_S), and Private's Land Area (A_P), the national CPO production (P_{CPO}) can be represented by the following Composite Model.

$P_{CPO}=\alpha_i A_F + \beta_i A_S + \gamma_i A_P$ ....(1)

Where,

α_1=2.19; β_1=2.48; γ_1=1.65; R^2=0.96; RMSE=148.777 for the periods of $1990 \leq t \leq 2005$;

α_2=2.50; β_2=2.61; γ_2=2.72; R^2=0.98; RMSE=275.754 for the periods of $2006 \leq t \leq 2015$.

Based on this model, the optimal productivity for the Farmer category is about 2.50 tons per hectare; 2.61 tons per hectare for the State category, and 2.72 tons per hectare for the Private category. It is not surprising that the Private category's productivity is higher than the others because it is more intensive in cultivation and proactive in applying national and international standards such as ISPO[2] and RSPO[3]. Based on business as usual or without any limitation on land extension, in 2020, CPO production will reach 37 million tons with a total plantation area of 14 million hectares, where 2.8 million hectares of additional land are peatlands. This land addition is not from newly opened peatlands but from the existing degraded peatlands which totals to four million hectares (Agus et al., 2015). While the total area of peatlands in the country amounted to 15 million hectares (BBSDLP, 2011).

5. Fresh Fruit Bunch (FFB) and CPO Prices

As shown in Figure 4, the price of CPO in the global market and its export price fluctuate with time. They both have the same pattern of price that has a proportional correlation which can be expressed with the following equation:

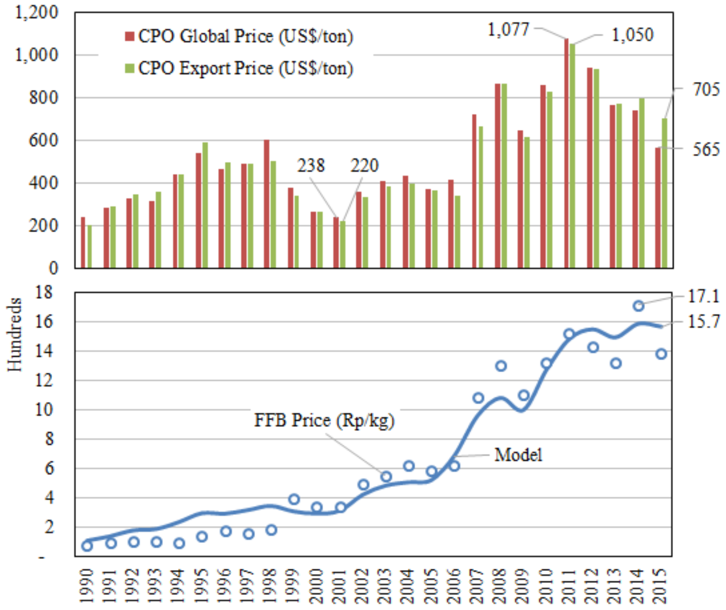
$H_E=0.99\ H_G$ ....(2)
With $R^2=0.96$.

Where, H_E is export price and H_G is global price.

The maximum price attained in 2011was above US$1,000 per ton but it decreased sharply with time toward 2015. If this trend continues, then in five years it will reach the lowest value that has been attained in 2001 which was about US$200 per ton.

[2] http://ispo.or.id/. Visited on 18/11/2016
[3] http://www.rspo.org/about. Visited on 18/11/2016

Figure 4. Fluctuation of CPO Price



Source: Analysed from Dirjenbun (2015)

The price of FFB that was received by the Farmer category (Figure 4) also fluctuated with time but it increased from 1999 then it became steadier from 2011 to 2015. In general, FFB price was relatively stable compared to the export and global prices. The FFB price, to the same extent, is seemingly influenced by the global price. By using the Cobb Douglas[4] model, with variable inputs of global price (H_D) and national CPO production (P_{CPO}), FFB price (H_{FFB}) can be estimated by the following equation:

$H_{FFB}=\alpha\ (H_G^{\beta} P_{CPO}^{\gamma})$ ....(3)

Where, $\alpha=5.1\ 10^{-5}$; $\beta=0.467$; $\gamma=0.824$; $R^2=0.957$ and RMSE=22.23

The model shows that from 2011, the FFB price became stable at around Rp1.600 per kilogram. Compared to the price in 2015, under the implementation of PP 57/2016, the economic values held by the Farmer category would reduce from Rp15.6 billion to around Rp13.3–13.7 billion; the State category from US$1.1 billion to US$0.92–0.95

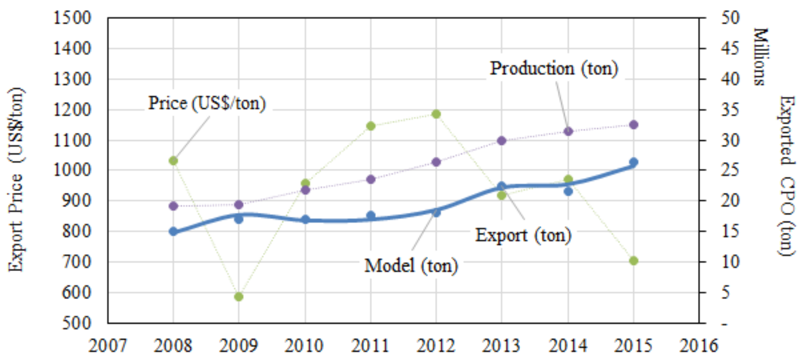
[4] http://economicpoint.com/production-function/cobb-douglas. Visited on 18/11/2016

billion; and the Private category from US$10.8 billion to US$9.2–9.5 billion with a reduction rate of 12%–15%.

6. Exported CPO

Indonesian CPO export[5] is rising along with production increase (Figure 5). About 60%–88% of the total CPO production was exported and it reached 26.4 million tons valued at US$18.6 billion. The export price fluctuated with time and it reached the highest value above US$1,100 per ton around 2011–2012. Then, it decreased continually, reaching below US$700 per ton in 2015. It is predicted to reach US$600 per ton in the following years as it is also influenced by the petroleum price.

Figure 5. CPO Production Export



Source: Analysed from Dirjenbun (2015).

Figure 5 also shows a model (line) for CPO export (E_{CPO}) based on two variable inputs which are national CPO production (P_{CPO}) and export price (H_E) using another Cobb Jacob model as follows:

$$E_{CPO}=\alpha(P_{CPO})^{\beta}(1/H_E)^{\gamma} \qquad (4)$$

[5] http://www.indonesia-investments.com/id/bisnis/komoditas/minyak-sawit/item166. Diakses 12/11/2016.

Where, α=118.668, β=0.824 and γ=0.300 with R^2=0.972 and RMSE=272.537

If under PP 57/2016, the national CPO production decreases to 24.2–25.0 million tons. With the assumption that the export price is US$700 per ton, then the exported CPO would be around 20.1–20.7 million tons or equivalent to US$14.1–14.5 billion. In this case, there would be a reduction of about 19%–21% compared to that in 2015. By using Equation 3 (Figure 5). FFB price would be around Rp1.275–1.310 per kilogram or cheaper by around 6%–9% from its price in 2015. This means that there would be less income earned by the Farmer category.

7. Implications of PP 57/2016

Out of the total 11.4 million hectares plantation area in 2015, about 80% lies in mineral soil land and the rest of the 20% (2.3 million hectares) are distributed and managed by the Farmer category (41%), State (7%), and Private (52%). If at least 30% of the 2.3 million hectares are to be conserved, then the total area would become 10.8 hectares. From our empirical data, in a certain PHU, peat depth is distributed unevenly with space and elevation (Setiawan and Rudiyanto, 2015). In general, a peatland area which has a peat depth of 3 metres or more distributes between 20%–80%. This means that the rest of plantation area would be in the range of 9.4 million–10.3 million hectares. If compared to the previous area of 11.4 million hectares, then the area reduction would be 10%–18% over which is managed by the Farmer category (3.8 million–4.3 million hectares), State (0.63 million–0.69 million hectares), and Private (4.9 million–5.3 million hectares).

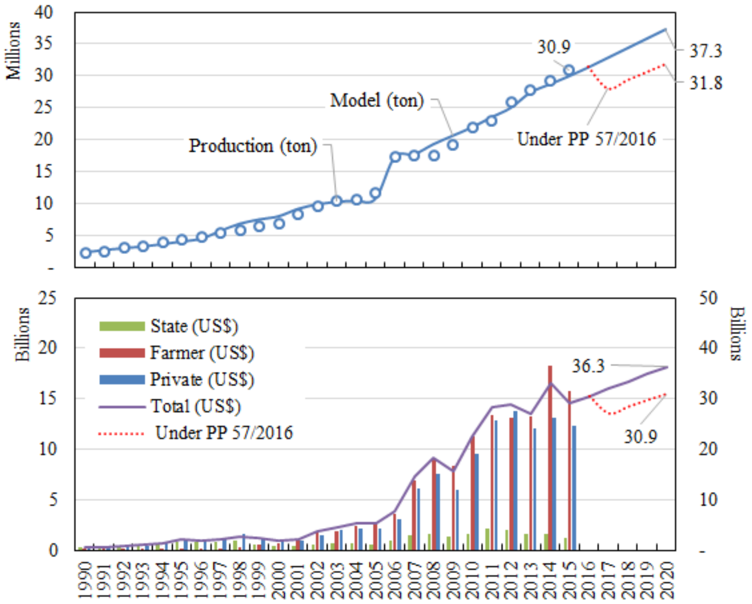
Setting the water table by at least 0.4 metre below the peatland surface will potentially reduce land productivity by 50%–70% depending on the peat type (Kalsim et al., 2015; Valentina et al., 2014). With the decreasing plantation areas mentioned before and land productivity, the national CPO production would be reduced to 27.1 million from 28.5 million tons after 30% of the land allocated for conservation. This would further be reduced to 24.5–26.1 million tons after 20%–80% of parts of the land having a peat depth of 3 metres or more are allocated for conservation. This would again be further reduced to 24.2 million–25.1 million tons after setting the water table to about 0.4 metre from the peatland surface. Thus, in total, there would be a reduction of CPO production between 12%–15%. The Farmer category would share CPO production between 9.6 million–9.9 million tons, State category between 1.6 million–1.7 million tons, and Private category between 13.0 million–13.5 million tons.

In 2015, about 4.95 million farmers were involved in oil palm plantation. In proportion with the reduction rate of economic value due to lesser production, around 590,000–740,000 farmers would lose their jobs and the remaining farmers that could work in the plantation would be 4.2–4.4 million. More massive layoffs would be experienced by the workforce in the Private category and this would create domino effects along the industrial lines from the upstream to the downstream up to the exporters. About 12% of direct workers would lose their jobs.

8. Implications to the Productions and Economic Values

Figure 6 show the implications of the reduction of plantation lands to the total national production (upper curves) and that to the economic values of CPO (lower curves). In 2015, the total productions of CPO have reached 30.9 million tons and if it is projected by the Equation 1 as business as usual scheme, the CPO production would reach 37.3 million tons which is equivalent to the economic values of US$36.3 billion. With the implementation of PP 56/2016, there would be significant drops up to 15% of production as well as the economic value of CPO. However, the CPO production would increase and reach 31.8 million tons which is equivalent to the economic values of US$30.9 billion if the overall land productivity could be maintained above 2.65 ton per hectare.

Figure 6. Production and Economic Values of CPO



Source: Analysed from Dirjenbun (2015).

9. Concluding Remarks

As shown in Table 1, the implementation of PP 57/2016 would decrease: 1) plantation areas from 11.4 million hectares in 2015 to 9.4 million–0.3 million hectares (82%–90%); and 2) Indonesian CPO production from 28.5 million tons to 24.2 million–25.1 million tons (85%–88%). And as shown in Table 2, further implications would be the decreases of: 1) economic value from US$27.5 billion in 2015 to around US$23.4 billion–24.2 billion (85%–88%); 2) CPO export from 26.4 million tons to around 20.2 million–20.7 million tons (76%–78%); 3) export value from US$18.6 billion to around US$14.1 billion–14.5 billion (76%–78%); 4) FFB price from Rp1,388 per kilogram to around Rp1,272–1,310 per kilogram (92%–94%); and 5) Farmer numbers from 5 million to 4.2 million–4.4 million (85%–88%).

Further negative impacts could be expected to appear such as soaring prices of CPO derivative products and on the government bio-solar program in attempting to increase CPO mixed percentage and other CPO-based industries. The worst cases would be experienced by many farmers who could no longer cultivate their own land

and by the direct and indirect workers that were previously involved in CPO-based industries.

Table 1. Direct Implications of PP 56/2016

PARAMETERS	In 2015	Under PP 57/2016				
		Conserved	Peat Depth >3 m		Water Table ≤ 0.4 m	
		30%	Min	Max	Min	Max
Area (M-ha)						
Mineral land	9.2					
Peatland	2.3	1.6	0.2	1.1		
Total	11.4	10.8	9.4	10.3		
Percentage	100%	94%	82%	90%		
Production (M-ton)						
Mineral land	24.0					
Peatland	4.5	3.1	0.5	2.2	0.2	1.1
Total	28.5	27.1	24.5	26.2	24.2	25.1
Percentage	100%	95%	86%	92%	85%	88%

Table 2. Further Implications of PP 57/2016

PARAMETERS	In 2015	Under PP 57/2016			
		Min	Max	Min	Max
Economic Value (B-US$)	27.5	23.4	24.2	85%	88%
CPO Export (M-ton)	26.4	20.2	20.7	76%	79%
Export Value (B-US$)	18.6	14.1	14.5	76%	78%
FFB Price (Rp/kg)	1,388	1,275	1,310	92%	94%
Farmer Number (M-Person)	5.0	4.2	4.4	85%	88%

Source: Analysed results.

10.Policy Implications

To prepare for the economic contraction due to the implementation of PP 57/2016, the government should take immediate actions to: 1) ease tensions from farmers and workers who would lose their jobs; 2) promote tax incentive/reduction to maintain reasonable incomes gained by the planters and CPO industries; 3) absorb more CPO for the bio-solar program, especially when FFB and CPO export price are declining; and 4) disseminate methods and technologies for the farmers to process CPO into products having higher added values.

The government should also be able to convince the planters and society that the policy would achieve the sustainable development of the oil palm plantation in the longer term with no more threats from peatland fires and forest encroachments. Immediate steps that should be taken among others are: improving the spatial land arrangement, promoting proper peatland management, introducing intensification programs to elevate land productivity, and developing reliable environmental monitoring system, specially to detect extreme conditions of the peatlands.

The government also needs to draft immediate solutions to manage degraded peatlands that have become the source of annual fires. As recommended by Agus, et al. (2015), it would be worthwhile: 1) in the short term, to accelerate steps to rehabilitate unmanaged peatlands to be allocated for other purposes than the forest alone; and 2) in the longer term, to allocate other unmanaged peatlands outside those allocated for other purposes, for example, through land swap mechanisms, whether to be protected or developed. These mechanisms however would need thorough assessments to result in right policies equipped with supporting regulations.

References

Agus, F., Wahyunto, H. Sosiawan, I.G.M. Subiksa, P. Setyanto, A. Dariah, Maswar, N.L. Nurida, H.S. Mamat, and I. Las (2015), Pengelolaan Berkelanjutan Lahan Gambut Terdegradasi: *Trade-Off* Keuntungan Ekonomi dan Aspek Lingkungan. Balai Besar Sumnber Daya Lahan Pertanian, Badan Penelitian dan Pengambangan Pertanian, Kementerian Pertanian.

BBSDLP [Indonesian Center for Agricultural Land Resources Research and Development] (2011), Peta Lahan Gambut Indonesia Skala 1:250.000. Edisi Desember 2011. Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian (Badan Penelitian Dan Pengembangan Pertanian Kementerian Pertanian. Jakarta.

Dirjenbun [General Directorate of Plantation in Minister of Agriculture] (2015), *Statistik Perkebunan Indonesia Komoditas Kelapa Sawit 2013–2015*. Direktorat Jenderal Perkebunan. Kementerian Pertanian. Jakarta.

Falatehan, A.F. and B. I. Setiawan (forthcoming), 'Impacts of External Shocks to the Palm Oil Value Chains in Indonesia. ERIA', in *Reducing the Vulnerability of Supply Chains and Production Network* (In press).

INPRES [Presidential Instruction] (2015), Instruksi Presiden Republik Indonesia, Nomor 8, Tahun 2015. Penundaan Pemberian Izin Baru dan PenyempurnaanTata Kelola Hutan Alam Primer dan Lahan Gambut. Presiden Republik Indonesia.

Kalsim, D.K., R. Roland, H. Mulia, Y. Asmara, H. Mubarak, I. Ismail and, B. Sahari (2016), Muka Airtanah, Hujan, dan Subsiden, Analisis Faktor Kunci untuk Pengelolaan Perkebunan Sawit di Lahan Gambut di Indonesia. Kongres Gambut Internasional ke 15. Kuching, Sarawak, Malaysia, 15–19 Agustus 2016.

PP [Government Regulation] (2014), Peraturan Pemerintah Nomor 71 Tahun 2014 tentang Perlindungan dan Pengelolaan Ekosistem Gambut. Presiden Republik Indonesia.

Setiawan, B.I. and Rudiyanto (2015), 'Verifications of Peat Thickness Distribution, Measurements of Peat Physical and Hydraulic Properties, and Determinations of Optimum Water Tables for Acacia Growth in IUPHHK-HTI PT', Mayangkara Tanaman Industri (MTI) and PT. Wana Subur Lestari (WSL), West Kalimantan.

Valentina, R., Wawan dan Idwar (2014), Pengaruh Tinggi Muka Air Tanah dan Ukuran Serat Tanah Gambut terhadap Perakaran dan Pertumbuhan Tanaman Akasia, *Jurnal Faperta*, Vol. 1. No. 2, Oktober 2014.

Winarna (2015), Pengaruh Kedalaman Muka Air Tanah dan Dosis Terak Baja terhadap Hidrofobisitas Tanah Gambut, Emisi Karbon, dan Produksi Kelapa Sawit. Disertasi. Program Studi Ilmu Tanah, Sekolah Pasca Sarjana, Institut Pertanian Bogor.

ERIA Discussion Paper Series

No.	Author(s)	Title	Year
2017-02	Budi Indra SETIAWAN and Falatehan FAROBY	Peat Policy and Its Implications on Value Chains of Indonesian Palm Oil	May 2017
2017-01	Vangimalla R. REDDY and Venkatachalam ANBUMOZHI	Managing Stranded Assets and Protecting Food Value Chain from Natural Disaster	May 2017

Previous year of ERIA Discussion Paper, can be downloaded at:
http://www.eria.org/publications/discussion_papers/FY2016/
http://www.eria.org/publications/discussion_papers/FY2015/
http://www.eria.org/publications/discussion_papers/FY2014/
http://www.eria.org/publications/discussion_papers/FY2013/
http://www.eria.org/publications/discussion_papers/FY2012/
http://www.eria.org/publications/discussion_papers/FY2011/
http://www.eria.org/publications/discussion_papers/FY2010/
http://www.eria.org/publications/discussion_papers/FY2009/
http://www.eria.org/publications/discussion_papers/FY2008/