**One Pagers**

# Indonesia 2050 Pathway Calculator Phase II

A cooperation between Ministry of Energy and Mineral Resources Indonesia with Department of Energy & Climate Change United Kingdom

## Land Use Sector

# *Reforestation of Critical Land*

According to Wicke et al (2011), Indonesia's critical land area tended to increase in three decades from 1975 to 2005. This indicates that most land the expansion for agriculture, oil palm, and other uses were likely done by forest conversion. If Indonesia's land demand for growth in the future can be met by utilizing critical land rather than opening a new forest area, the amount of avoided emissions would be enormous. Critical land is the land that has undergone physical, chemical or biological damage as a result of excessive land use beyond its carrying capacity. According to Ministry of Forestry, the area of critical and highly critical land in 2011 were around 27.3 million ha.

***Level 1***

Level 1 assumes the extractive land use practice and climate change trigger a 10% increase of critical land area in 2050 compared to the base year 2011.

***Level 2***

Level 2 assumes no significant change of critical land area until 2050. The actions taken to improve the system is only able to offset the damage that occurs due to mismanagement and climate change.

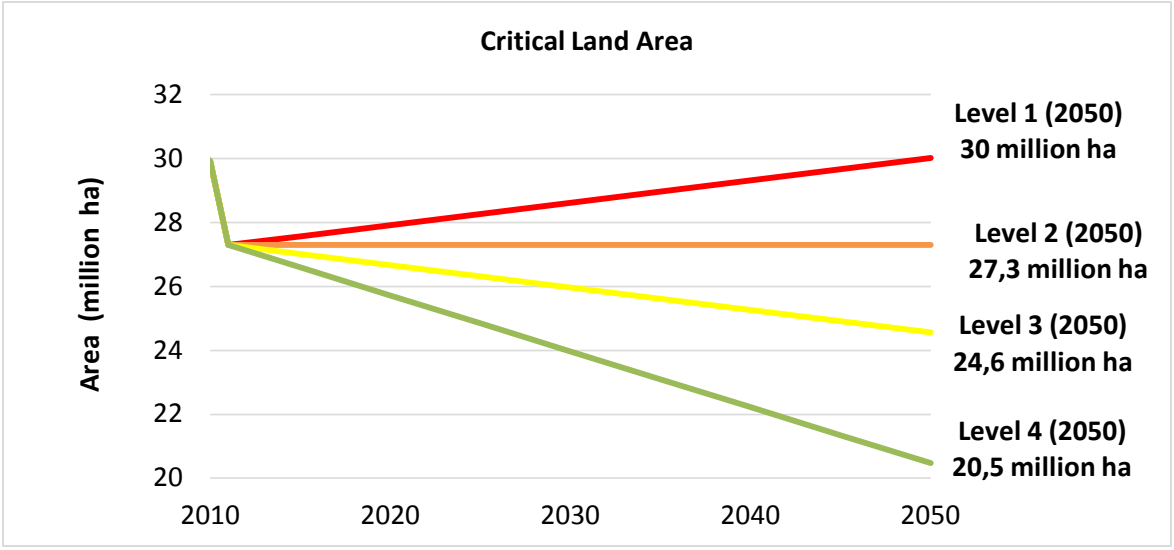
***Level 3***

Level 3 assumes land reforestation reduces the critical land area by 10% in 2050 compared to the base year 2011. It can be achieved by acquiring support from local community through land rehabilitation programs that facilitate community empowerment such as agro-forestry.

***Level 4***

Level 4 assumes the achievement of 25% critical land area reduction by 2050 compared to the base year 2011. It can be achieved when land rehabilitation program is actually empowering local people. Through a comprehensive agro-forestry assistance system, land rehabilitation programs will contribute to the availability of food, water, and community energy.

Source:
http://www.republika.co.id/berita/nasional/umum/12/03/11/m0pzyz-33-juta-hektar-lahan-kritis-di-indonesia



# *Forestry Sector*

Based on the interpretation of satellite imagery of Decree Designation of Forest and Water Areas, TGHK (Agreed Forest Land Use Classification), as well as forest conversion as of December 2010, it was found that of 110.769 million ha area that were designated as nature reserves, protected forest, limited production forest, and production forests; 30.384 million ha has become a non-forest area. Meanwhile, 10.612 million ha of 22.745 million ha of HPK (natural forest conversion) still has a forest cover. It shows the emission reduction potential from forestry sector if the policies are directed to provide incentives in minimizing the IUPHHK-HA (natural forest concession) area, thus the area could be converted to protected forest. At the same time, a part of HPK area can be converted into IUPHHK-HTI (plantation forest concession) to ensure that the timber sector productivity is still able to compete in international market, which shows a shift towards more demand for pulp and paper rather than timber.

***Level 1***

Level 1 assumes the release of the moratorium has resulted in the increase of IUPHHK-HA and UPHHK-HTI area by 10% in 2050 to 25.8 and 11.3 million ha.

***Level 2***

Level 2 assumes IUPHHK-HA and UPHHK-HTI (Business Permit for Forest Timber Product Utilization in Industrial Plantation Area) area in 2050 does not change much compare to the area in 2011.

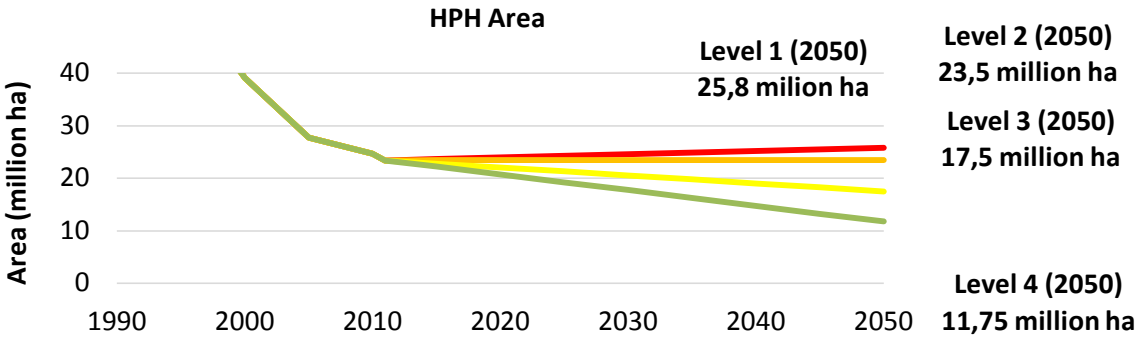
***Level 3***

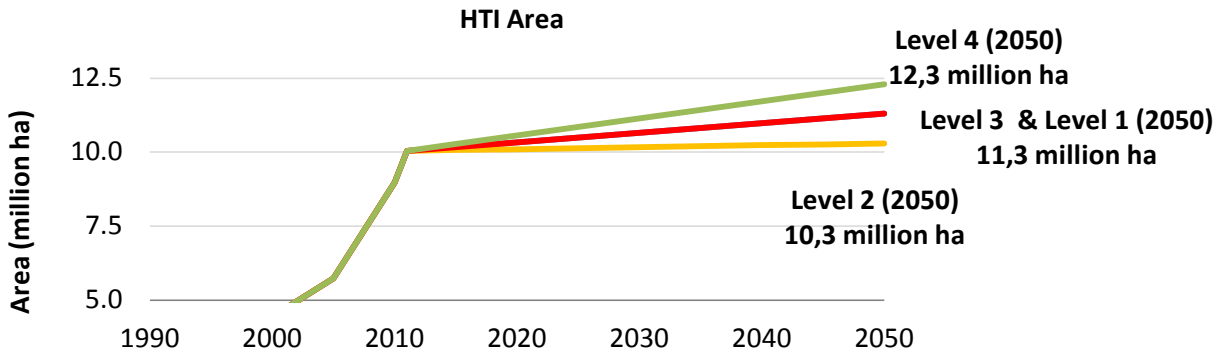
Level 3 assumes that Indonesia's forestry sector focuses on expanding 10% of IUPHHK-HTI area to 11.3 million ha and reducing 25% of IUPHHKHA area to 17.5 million ha.

***Level 4***

Level 3 assumes that Indonesia's forestry sector focuses on expanding 20% of IUPHHK-HTI area to 12,3 million ha and reducing 50% of IUPHHK-HA area to 11.75 million ha.

Source: http://www.hijauku.com/2013/03/21/2013-tahun-kritis-tata-kelola-hutan-indonesia/



# *Palm Oil Plantation Area*

Palm oil sector has grown rapidly in the last twenty years. Palm oil plantations increased from 2.024 million ha in 1995 to 8.992 million ha in 2011. The projected growth of national palm oil plantations is important in measuring the carbon emissions that would be resulted in the future by the process of land clearing for palm oil plantations.

***Level 1***

Level 1 assumes palm oil plantation area increases up to 20 million ha in 2050. Although it may sound very large, it most likely occurs if the growth rate of palm oil plantations area in the last two decades continues until 2050.

***Level 2***

Level 2 assumes palm oil plantation area will grow to 18 million ha in 2050. It could happen if the international market demand does not increase significantly or when national policies such as incentives for productivity intensification or limiting forest clearing for palm oil plantation are applied.

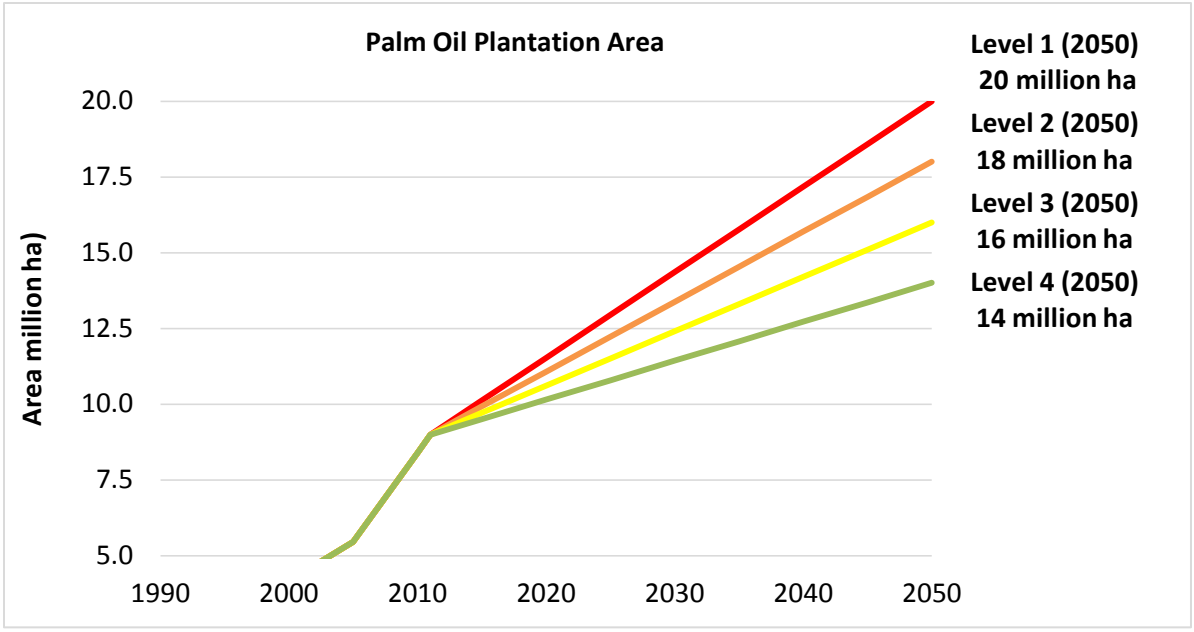
***Level 3***

Level 3 assumes palm oil plantation area grows to 16 million ha in 2050. This can be achieved if the policies of the new land clearing completely tightened along with a clear re-planting rotation requirement for all palm oil plantations.

***Level 4***

Level 4 assumes palm oil plantation area only increases up to 14 million ha in 2050. This can be achieved if the regulations on land clearing is really tightened, FMU (Forest Management Unit) programs are strengthened, as well as the policies and support for re-planting of plantation sector are distributed evenly.

Source: http://www.antaranews.com/berita/434987/gppi-cpo-indonesia-terbanyak-kantongi-sertifikat-rspo



# *Palm Oil Plantation Productivity*

Palm oil has become the primary commodity to meet the needs of food sector. Palm oil has the potential to become a major raw material for the production of biofuel, especially biodiesel and bioavtur. Palm oil plantations are developed under the ownership of State Owned Enterprises, private and smallholders. Currently, the average productivity of palm oil plantations nationwide is 3.5 tons/ha. By improving the productivity of palm oil, there is a potential reduction in the need of land clearing.

***Level 1***

Level 1 assumes the productivity of palm oil plantations in 2050 is equal to the base year (2011), which is 3.5 ton/ha. This may happen when the palm oil plantation management at the national level did not experience significant improvement. Without policies that encourage national productivity improvement in a purposeful manner, national palm oil productivity will not change much.

***Level 2***

Level 2 assumes the productivity of palm oil plantations in 2050 has increased up to 4.2 tons/ha. This can be achieved through a number of policies that support the improvement of smallholder's plantation management such as counseling and replantation support.

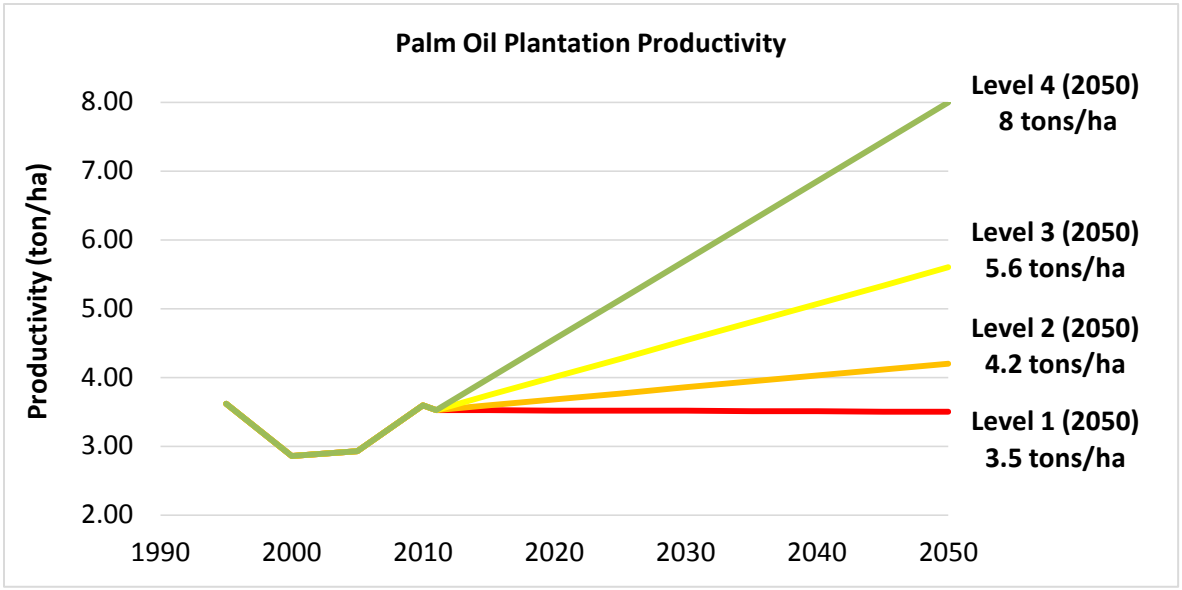
***Level 3***

Level 3 assumes the productivity of palm oil plantations in 2050 has increased up to 5,6 tons/ha. This can be achieved through clear supports from government towards palm oil sector such as the support on incentives and replantation to smallholder (PR) and state large plantations (PBN).

***Level 4***

Level 4 assumes the productivity of palm oil plantations in 2050 has increased to 8 tons/ha by providing greater assistance on agricultural inputs to PR and PBN, infrastructure support for transportation access and fresh fruit bunch processing.

Source:
http://www.republika.co.id/berita/ekonomi/makro/15/02/23/nk7t6j-pabrik-sawit-bisa-perangi-perubahan-iklim-caranya



# *Food Demand/Daily Average Calories Consumption*

According to BPS (2014), the average consumption of Indonesian population in the past 15 years is ranging from 1800 to 2000 calories. However, Alexandratos and Bruinsma (2012) shows that there is a trend of increased consumption of calories worldwide (p. 23). This growth of calorie demand occurs along with the population growth of Indonesia, which will inevitably affect the amount of area required for agriculture.

### *Level 1*

Level 1 assumes that the food consumption level of Indonesia in 2050 will pursue the level of consumption in the developed countries which is 3250 kcal/person/day. This can only happen when there is a drastic change in the pattern of consumption of Indonesian people.

### *Level 2*

Level 2 assumes that the food consumption level of Indonesian in 2050 will reach the level of consumption of the East Asian countries today which is 2750 kcal/person/day. This may happen considering the significant increase of consumption growth in rapidly developing countries such as China and Brazil.

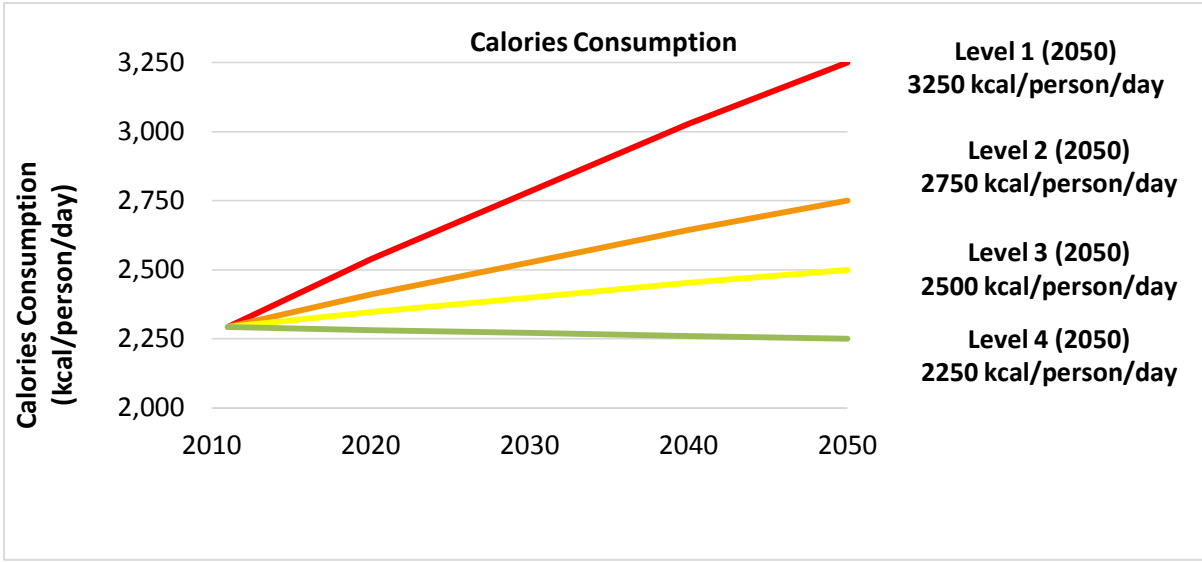
### *Level 3*

Level 3 assumes that the food consumption level of Indonesian in 2050 will increase to 2500 kcal/person/day. This scenario is likely to occur when economic growth and access to food in Indonesia continues to grow at the current growth rate .

### *Level 4*

Level 4 assumes that the food consumption level of Indonesian in 2050 will only reach 2250 kcal/person/day. It is still possible to happen if the Indonesia's economic growth in the future will not significantly influence the pattern of Indonesian food consumption.


Source: http://lighthouse-indonesia.com/tummy-talk-blog-d137-langsing-tanpa-pantang-nasi, http://www.molto.co.id/super-mom/ini-lho-manfaatnya-menghitung-kalori-makanan-1412022.html



# *Agricultural Land Area*

According to Agency for Agricultural Research and Development Center (2011), agricultural land area in Indonesia in 2011 was 39.79 million hectares. However, approximately 14.37 million hectares of the area can be categorized as unused (idle). Historical data shows that changes often occur but there is a bit of a trend where the total land area decreases but the utilization of unused land slightly increases. Therefore, it is important to project land use change trend in the future, thus we can model the food availability and security also land cover change in Indonesia.

***Level 1***

Level 1 assumes the effective area for agriculture in Indonesia will increase 20% by 2050 compared to 2011. This may occur when there is an increase in the use of idle land as the need for food and jobs also increased as the impact of population growth in Indonesia.

***Level 2***

Level 2 assumes the effective area for agriculture in Indonesia will increase 10% by 2050 compared to 2011. This may occur when the design of existing policies promote agricultural extensification.

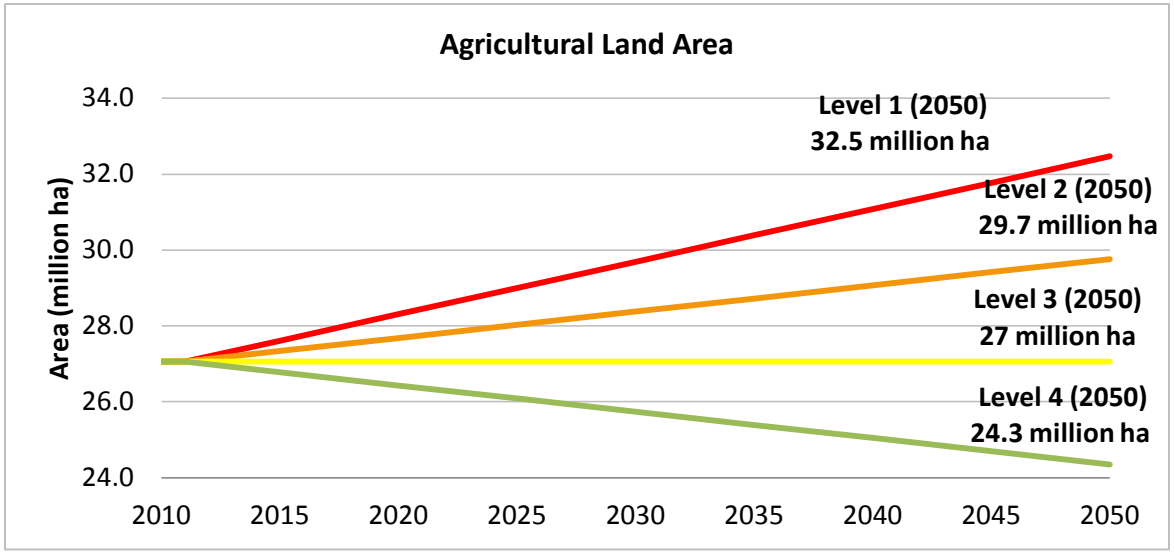
***Level 3***

Level 3 assumes the effective area for agriculture in Indonesia in 2050 will be similar to that of 2011. This can be achieved if policies in the future are developed to optimize the use of existing area .

***Level 4***

Level 4 assumes the effective area for agriculture in Indonesia will decrease 10% by 2050 compared to 2011. This can be achieved if policies are structured to support the land use optimization and reduce the demand for agricultural land. Improvement of zoning system and establishment of consistent spatial planning regulation (RTRW) would support this scenario

Source: http://blog.umy.ac.id/belitungmylove/2011/10/11/3/



# *Agricultural Productivity*

According to the Agency for Agricultural Research and Development Center (2011), agricultural productivity in Indonesia now covers a wide range of crops ranging from rice, corn, soybean, up to cassava. Furthermore, to simplify the user view, agricultural productivity will be presented as an index of all productivity figures of existing agricultural crops.

***Level 1***

Level 1 assumes agricultural productivity in 2050 decreases 10% compared to 2011. This can happen when there is no serious policy to reduce the vulnerability of the agricultural sector of Indonesia against the impacts of climate change.

***Level 2***

Level 2 assumes agricultural productivity in 2050 has not changed compared to 2011. This is very likely to occur if all existing policies can only offset the negative impact of climate change in the agriculture sector of Indonesia.

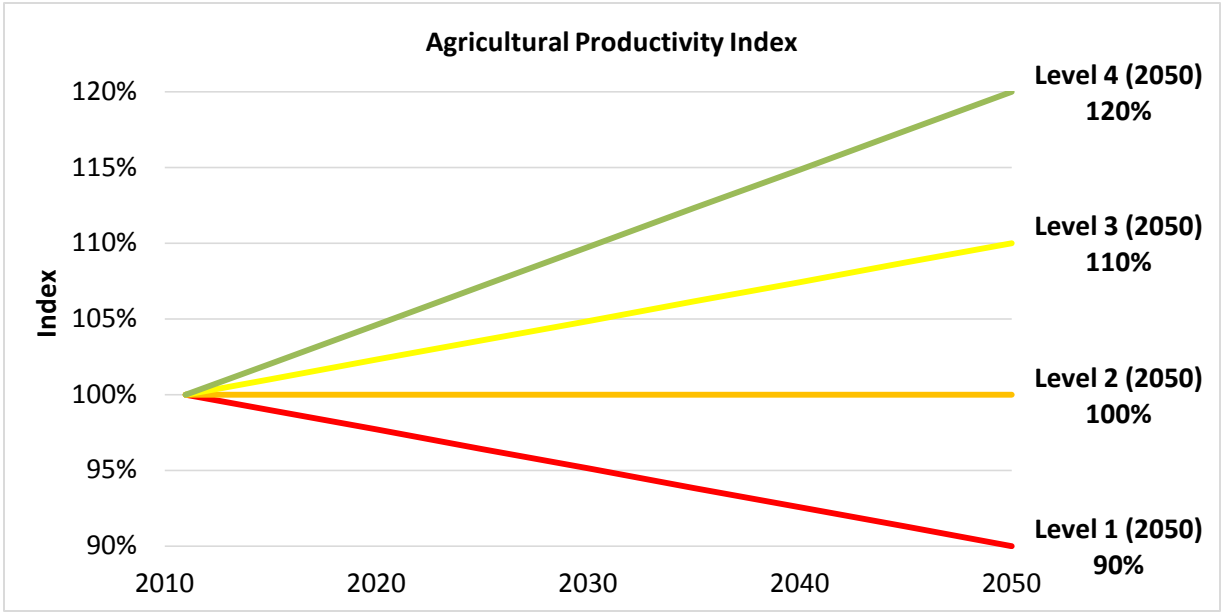
***Level 3***

Level 3 assumes Indonesia's agricultural productivity increases 10% in 2050 compared to 2011. The productivity level can be achieved through the design of policies that encourage investment in research and development of agricultural productivity.

***Level 4***

Level 4 assumes the Indonesian agricultural productivity increases 20% in 2050 compared to 2011. This improvement can be achieved through the design of policies that encourage research and development as well as investment on processing infrastructure and fair distribution of agricultural products.

Source: http://nasional.inilah.com/read/detail/359111/panen-jagung-masuk-rekor-muri, http://deliksulut.com/2014/09/bupati-mitra-panen-perdana-kedelai-di-silian-raya/



# *Non-palm oil Plantations Area*

According to the Agency for Agricultural Research and Development Center (2011), the area of non-palm oil plantatio in 2011 was 11.63 million hectares. Historical data shows changes but there is a bit of a trend where the total land area decreases gradually. Nevertheless, there is still the possibility that the demand of plantations product will increase that causes the increase of plantation area in Indonesia.

***Level 1***

Level 1 assumes that the non-palm oil plantation area will increase 20% in 2050 compared to 2011. This may be due to an increase in demand for commodities and employment.

***Level 2***

Level 2 assumes that the non-palm oil plantation area will increase 10% in 2050 compared to 2011. This may occur when the design of existing policies encourage the expansion of plantation area in Indonesia.

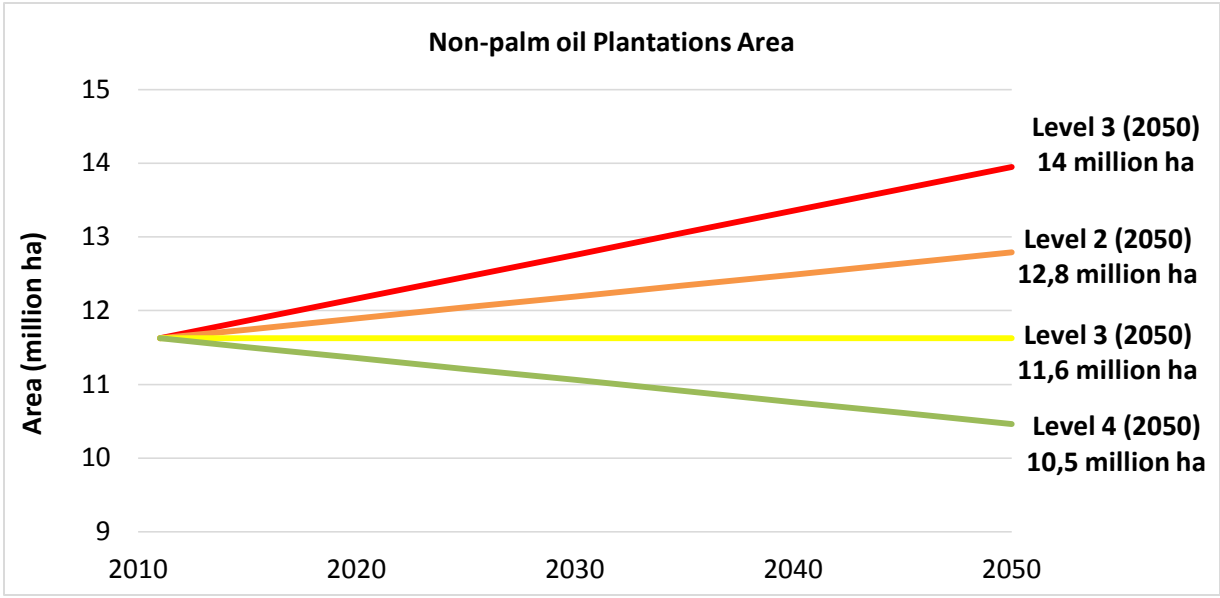
***Level 3***

Level 3 assumes that the non-palm oil plantations area remain constant from 2011 until 2050. This can be achieved if policies in the future are developed to optimize the use of existing land.

***Level 4***

Level 4 assumes that the non-palm oil plantations area will decrease 10% in 2050 compared to 2011. This can be achieved if policies are structured to support the optimization of land use and also reduce the demand for new land clearing. Consistent zoning system and spatial planning regulation (RTRW) would support this scenario.

Source: http://beritane.com/?attachment_id=67430



# *Plantation Productivity (other than palm oil)*

Menurut Agency for Agricultural Research and Development Center (2011), productivity of Indonesian plantation now covers a wide range of coconut plants, rubber, cocoa, up to cashews. Furthermore, to simplify the user view, agricultural productivity will be presented as an index of all the figures of existing plantation crop productivity.

***Level 1***

Level 1 assumes that the non-palm oil plantation productivity in 2050 decreases 10% compared to 2011 This can happen due to climate change impacts .

***Level 2***

Level 2 assumes that the non-palm oil plantation productivity in 2050 is at the same level as in 2011. This is very likely to occur if all existing policies can only offset the negative impact of climate change in plantation sector.

***Level 3***

Level 3 assumes that the non-palm oil plantation productivity in 2050 increases 10% compared to 2011. This level of productivity can be achieved through expansion of agricultural inputs distribution coverage, such as certified seeds and fertilizers from the research centers.

***Level 4***

Level 4 assumes that the non-palm oil plantation productivity in 2050 increases 20% compared to 2011. This can be achieved through improvement of agricultural technology application such as the use of certified seed and fertilizer as well as land and plantations management methods.

Source:
http://disbun.jabarprov.go.id/index.php/berita/detailberita/191