Deep Decarbonizing AFOLU Sector in Indonesia

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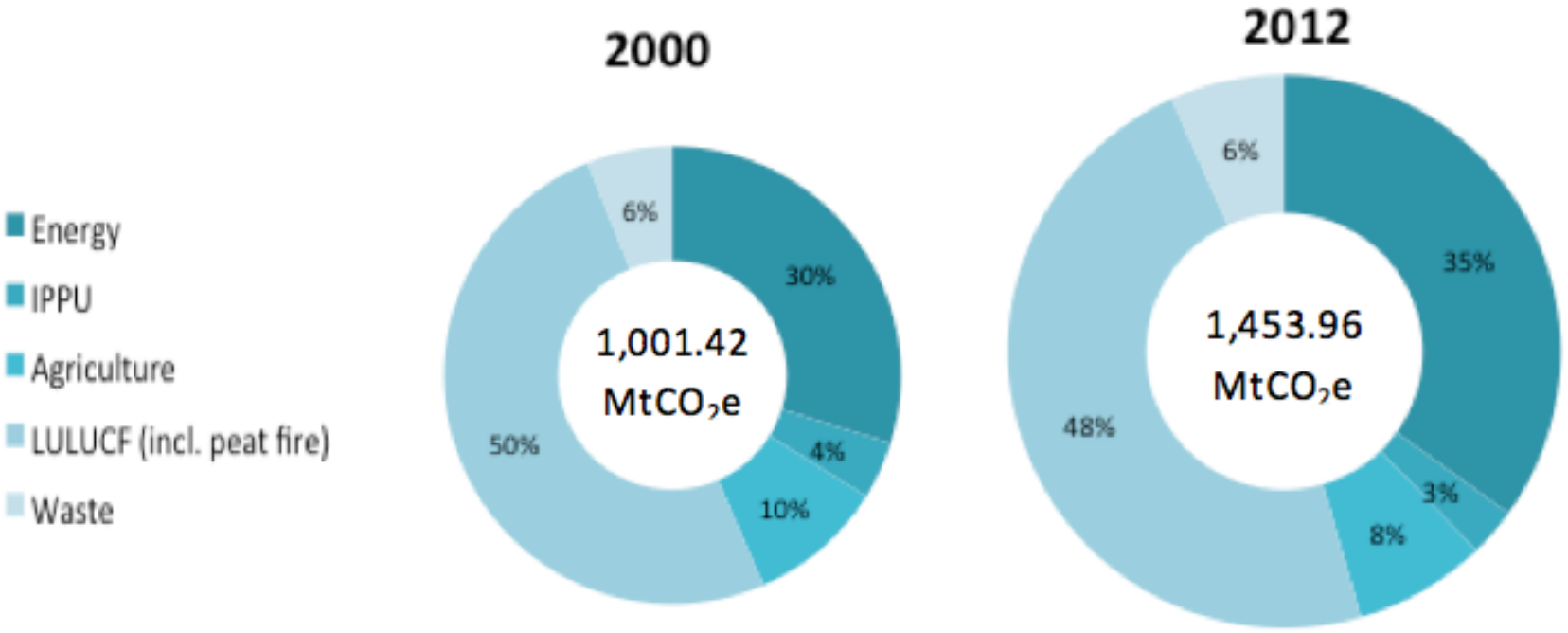
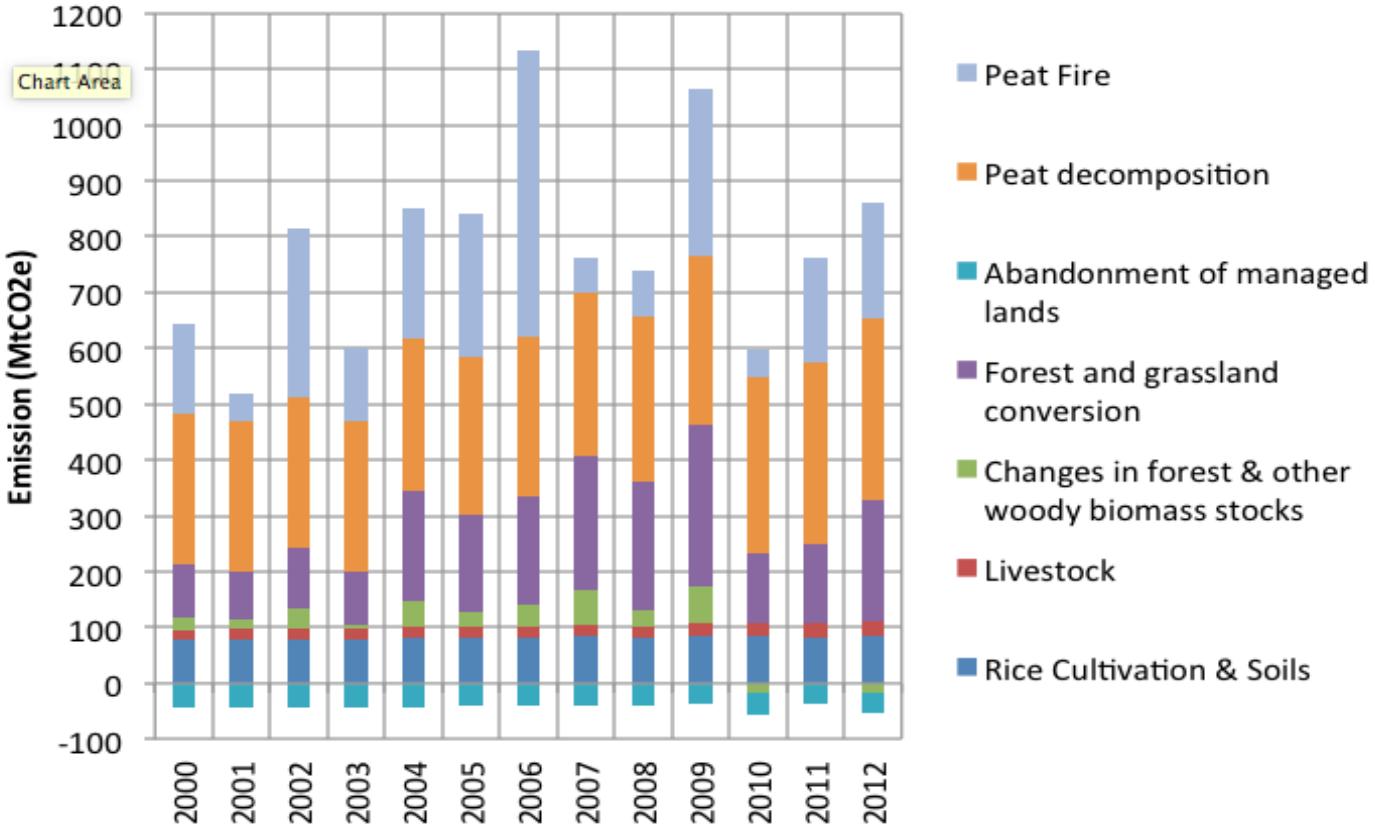
Indonesia's Emission



- Between 2000 and 2012, the GHG emission from Indonesia increased by about 45%
- LUCF and peat is dominant sources of GHG emissions in Indonesia and emission from energy increase quite rapidly and will soon become main source of Indonesia emission

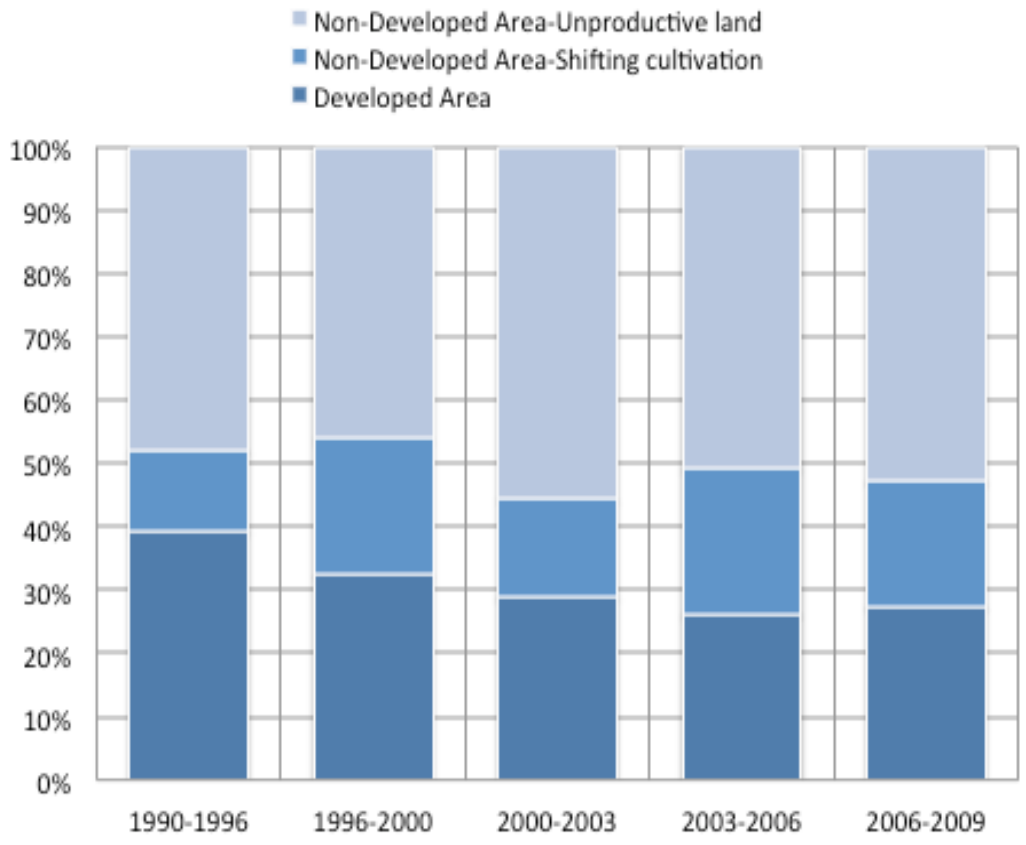
Emission sources of AFOLU sector



- Forest conversion (Deforestation) and peat decomposition and peat fire are two main sources of emission from the LUCF

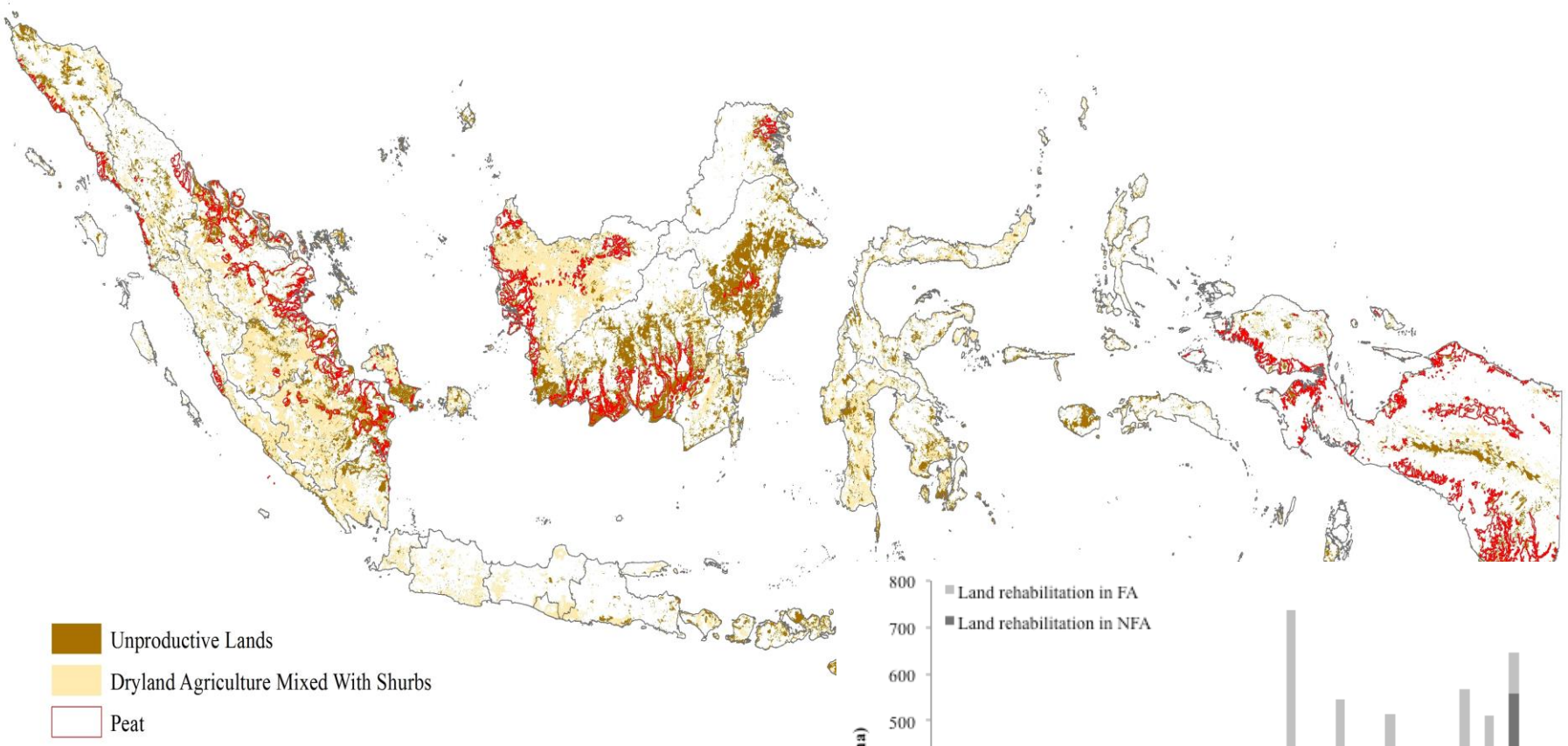
Forest Conversion for Development

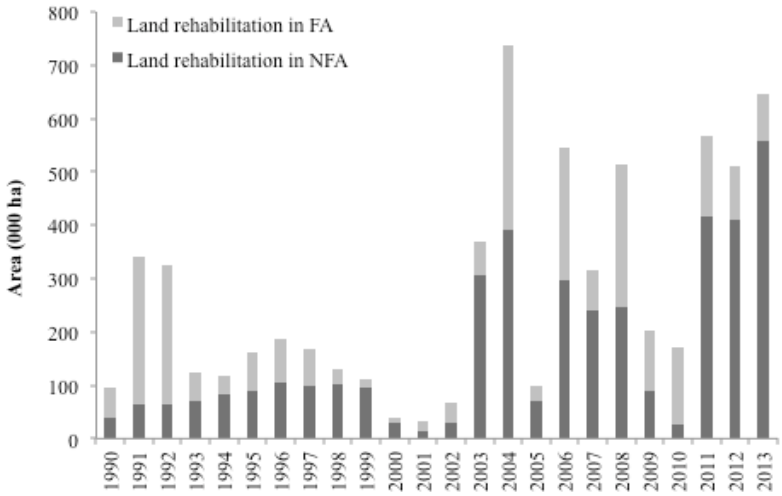
- Rate of deforestation is still high due to illegal activities (high unplanned deforestation) ~ 0.92 Mha per year (1990-2012)
- Area deforested in the period 1990-2009 which are now used for development is less than 50%, mostly remain unproductive and some for shifting cultivation



Fraction of deforested area in period 1990-2009 used and not used for development in 2013 (based on data from DitjenPlan, 2014)

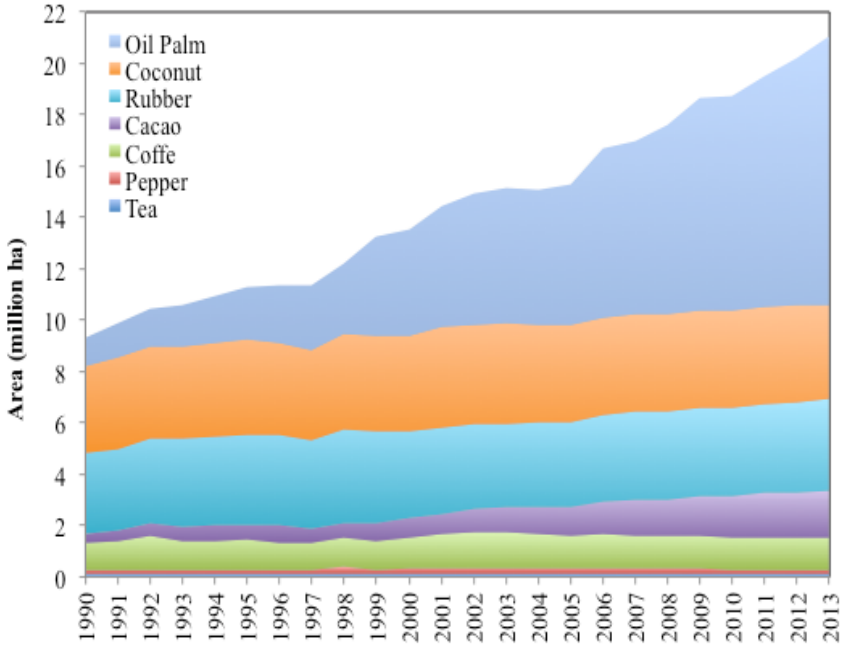
Unproductive lands (grassland and shrubs) in 2013

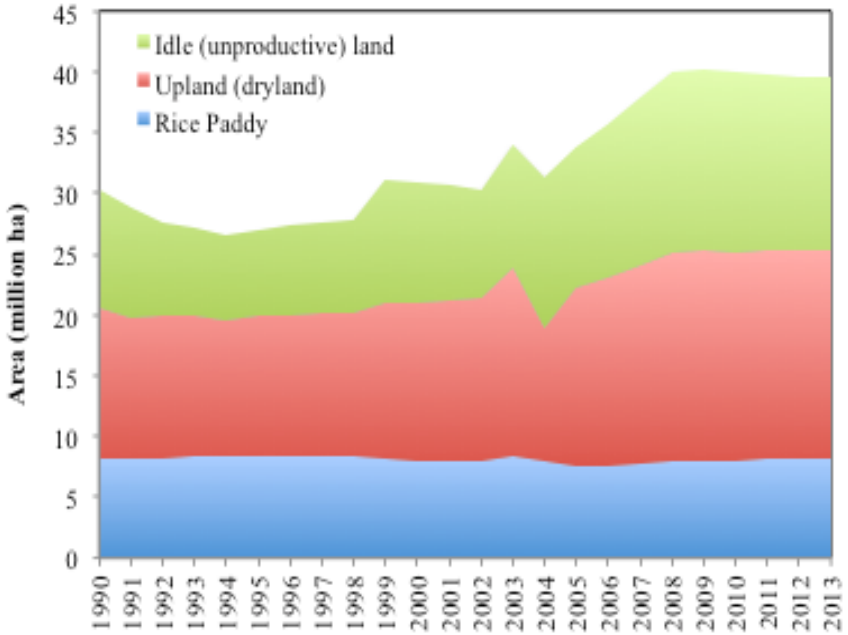




Land rehabilitation rate (1990-2012) only 274 thousand ha/y by the survival rata is very low (west Java was only 20%). **Total critical land (unproductive) reached 23.4 Mha**

Land for Agriculture Development

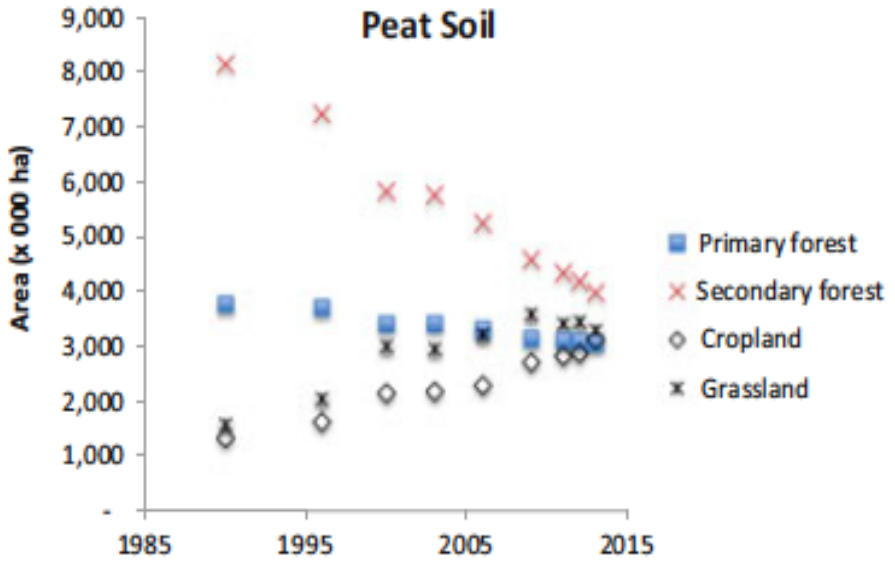


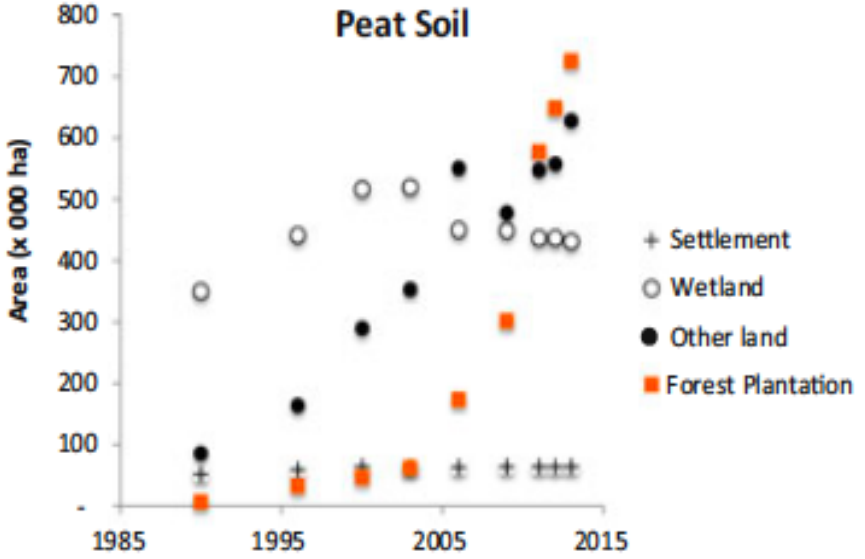


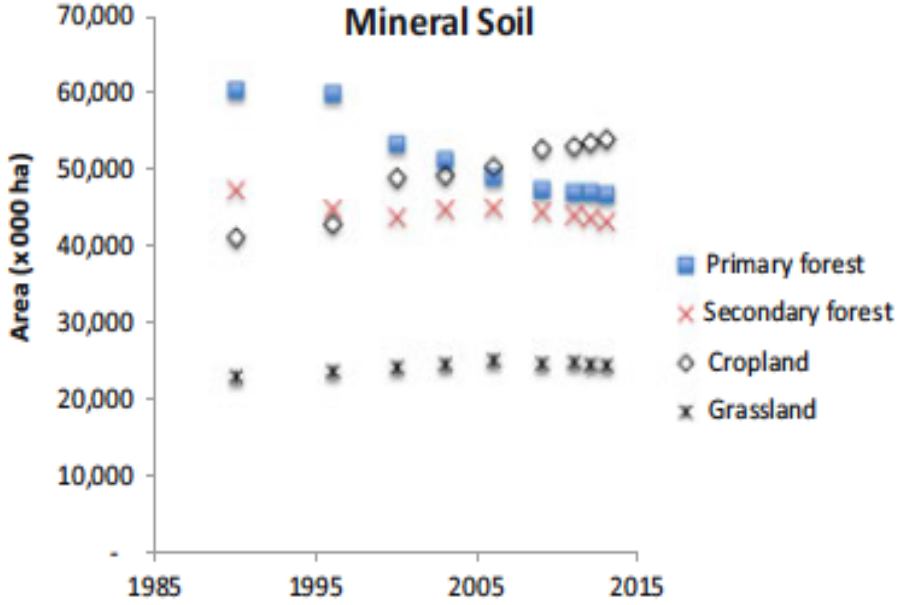
- The increased in land demand for agriculture was mainly for the establishment of large agricultural plantations, particularly for palm oil (increased exponentially at an average rate of 12% annually. For annual crops (food crop), the rate of increase is relatively low, but many of the lands are idle land, and the area of idle land tended to increase.

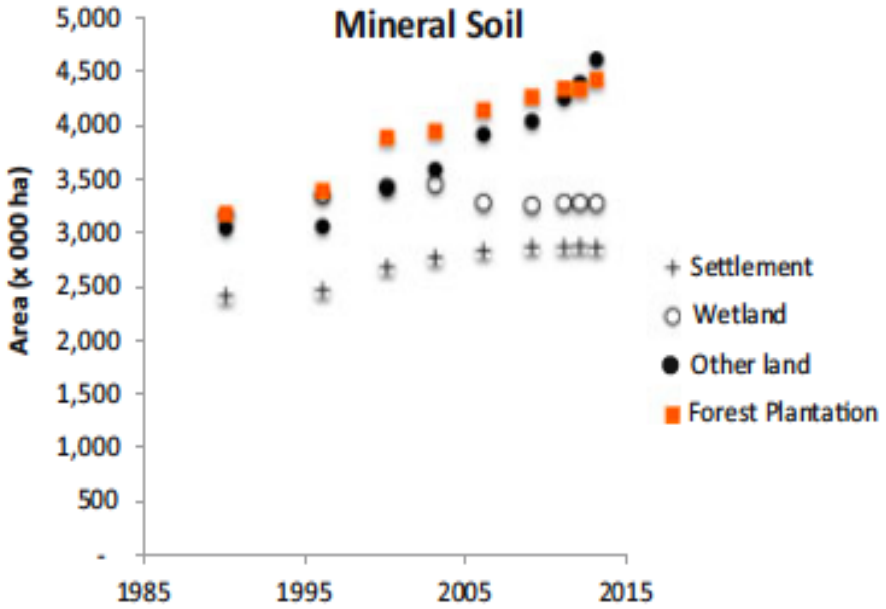
Use of peatland for development (1990-2013)

(Source: Boer, 2015)

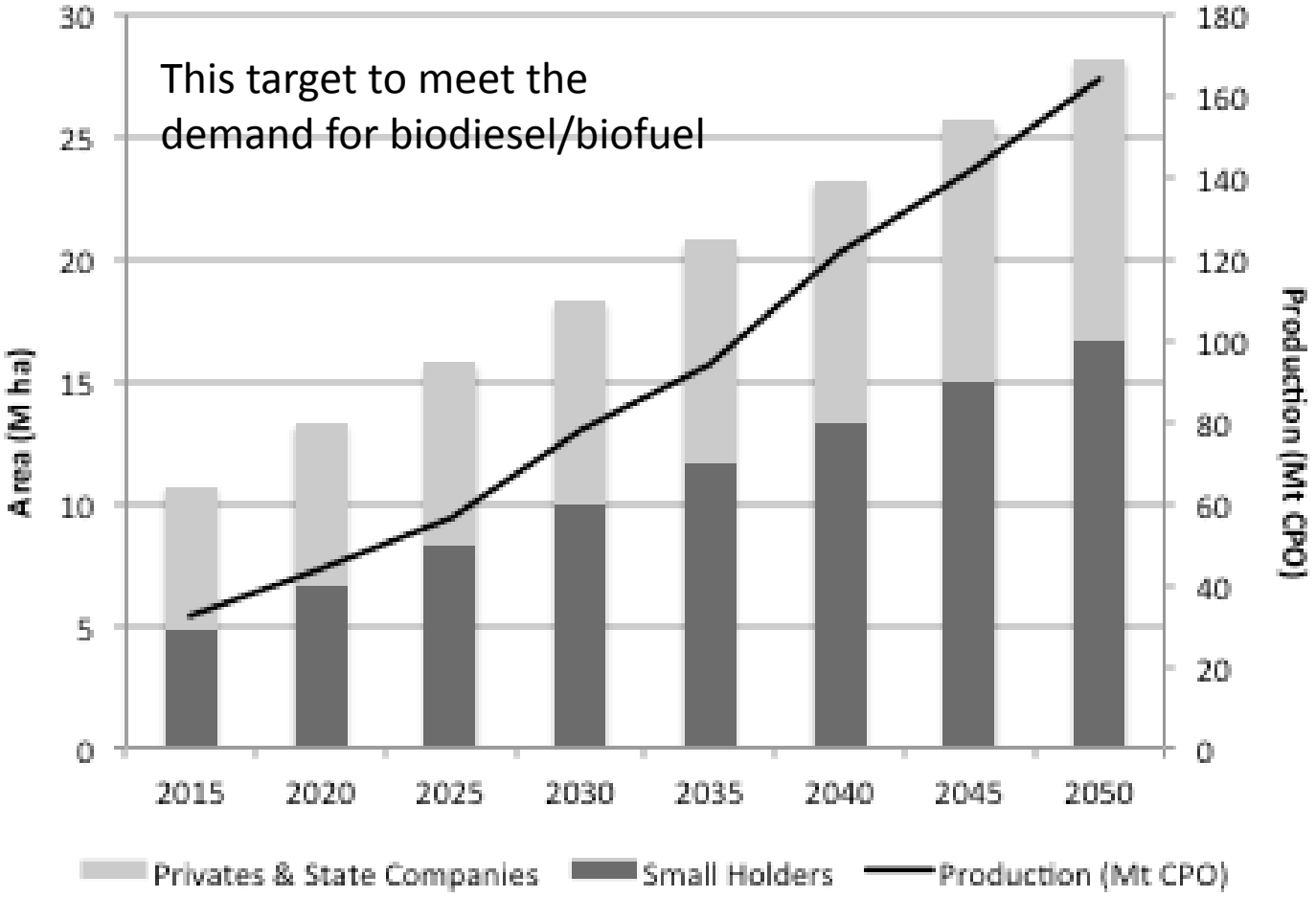






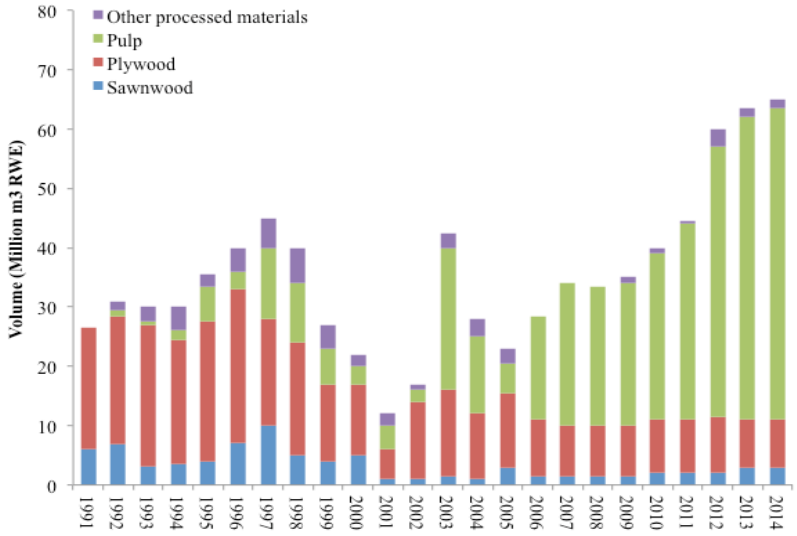


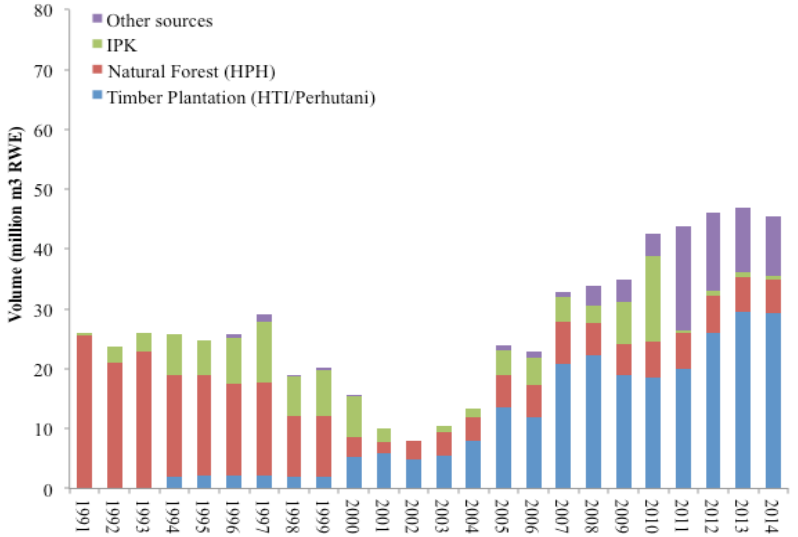
Ambitious Target of Palm Oil Production (GAPKI, 2014)



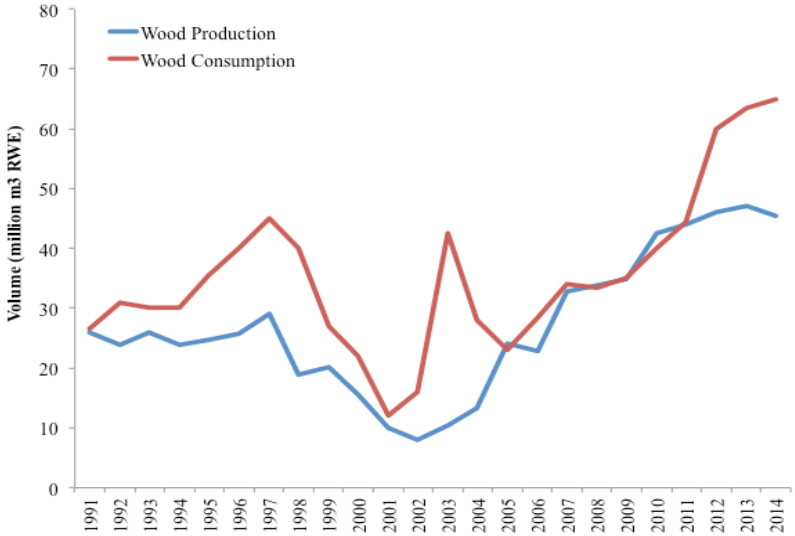
Target of wood production based on RKTN (MoF, 2011) also high 360 million m^3 mainly from HTI (~15 Million ha)

Big Gaps between wood production and consumption



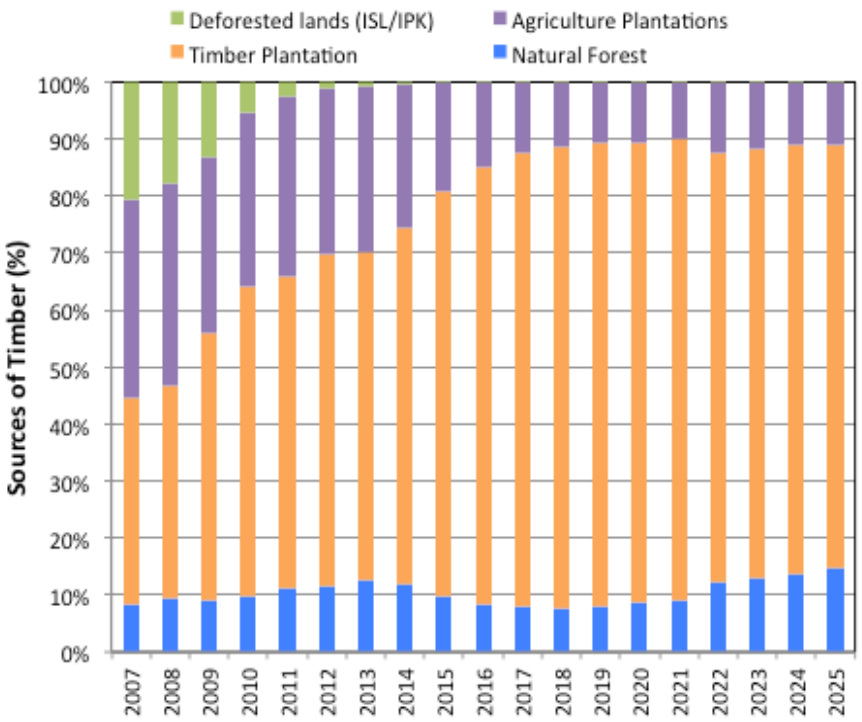


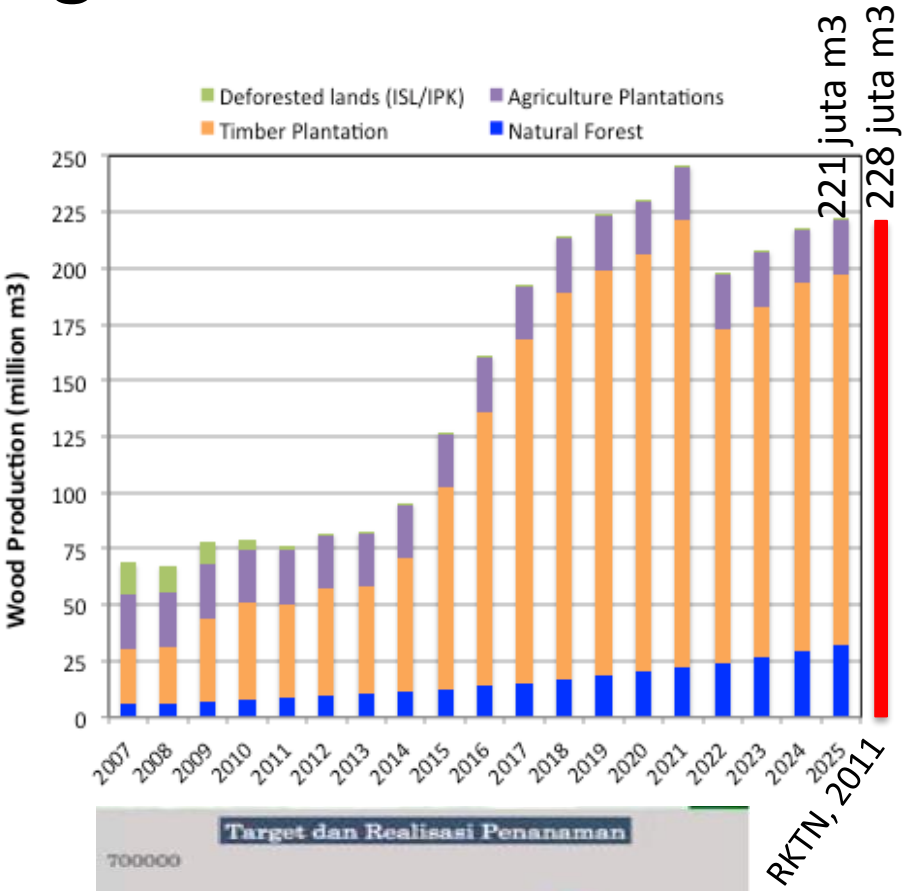
The gaps indicated illegal sources (MoFor, 2007; Klassen, 2010; Hoare and Welleslay, 2014).



In the Road Map for the Revitalization of the Forest Industry, illegal round wood consumed by wood processing industries might reach 42.2 million m^3 RWE in 2002 and reduce to 20.3 million m^3 RWE in 2005

Timber Production Target and the Sources





To reduce dependency on natural forest, the source of wood from timber plantation should be increased significantly. By 2030, area of timber plantation is targeted reaching 14.5 million ha in order ot meet the industrial wood demand. But realization is much lower from the target – contribute to illegal logging

Assessment of Deep Decarbonizing

- To explore the potential for deep decarbonizing AFOLU sector that is currently a major source of GHG emission in Indonesia
- To explore land uses and management choices that can lead to significantly reduce greenhouse emission from this sector while maintaining government target
- To explores the key policies required to create enabling environment for pushing the application of improved land and forest management practices toward deep decarbonization pathway

Low Carbon Development Scenarios for AFOLU

- **BAU scenario** is development scenario in which the implementation of development plans is without mitigation policies and measures.
- **Development Scenario (DEV) scenario** is development scenario that includes mitigation policies and measures in the implementation of development plan and achieving production target.
- **Deep Decarbonized Pathway (DDPP) scenario** is similar to *DEV* but with improved system and intensified mitigation policies and measures
- For all scenarios, it is set to
  - Keep rice to be self sufficient
  - Land demand for livestock is meet
  - Land demand for settlement is meet
  - Meet the target of production for palm oil and wood (For palm oil, follow the GAPKI scenario and for wood based on RKTN, i.e. 360 million m^3 by 2030; MoF 2011)

Mitigation Strategies

1. Improving the management of land and forest resources by acceleration the establishment of forest management unit (FMU) in all forest areas (**Expected to reduce unplanned deforestation to zero in 2030**)
2. Pushing adoption of sustainable management practices in production forests and palm oil plantation by implementing **mandatory certification systems** (PKPHPL and ISPO),
3. Reducing dependency on natural forests in meeting wood demands through **acceleration of establishment of timber plantation** on community lands and state lands and enhancement of sink through **restoration of production forests ecosystem and land rehabilitation**
4. Reducing pressure on natural forest for establishment of development areas and agriculture expansion through improvement of land use spatial plan, **optimization of the use of unproductive lands and improvement of crop productivity and cropping intensity**,
5. Reducing emission from peatland through improvement of peat management, **peat restoration and moratorium** of new permits/concession on peat lands

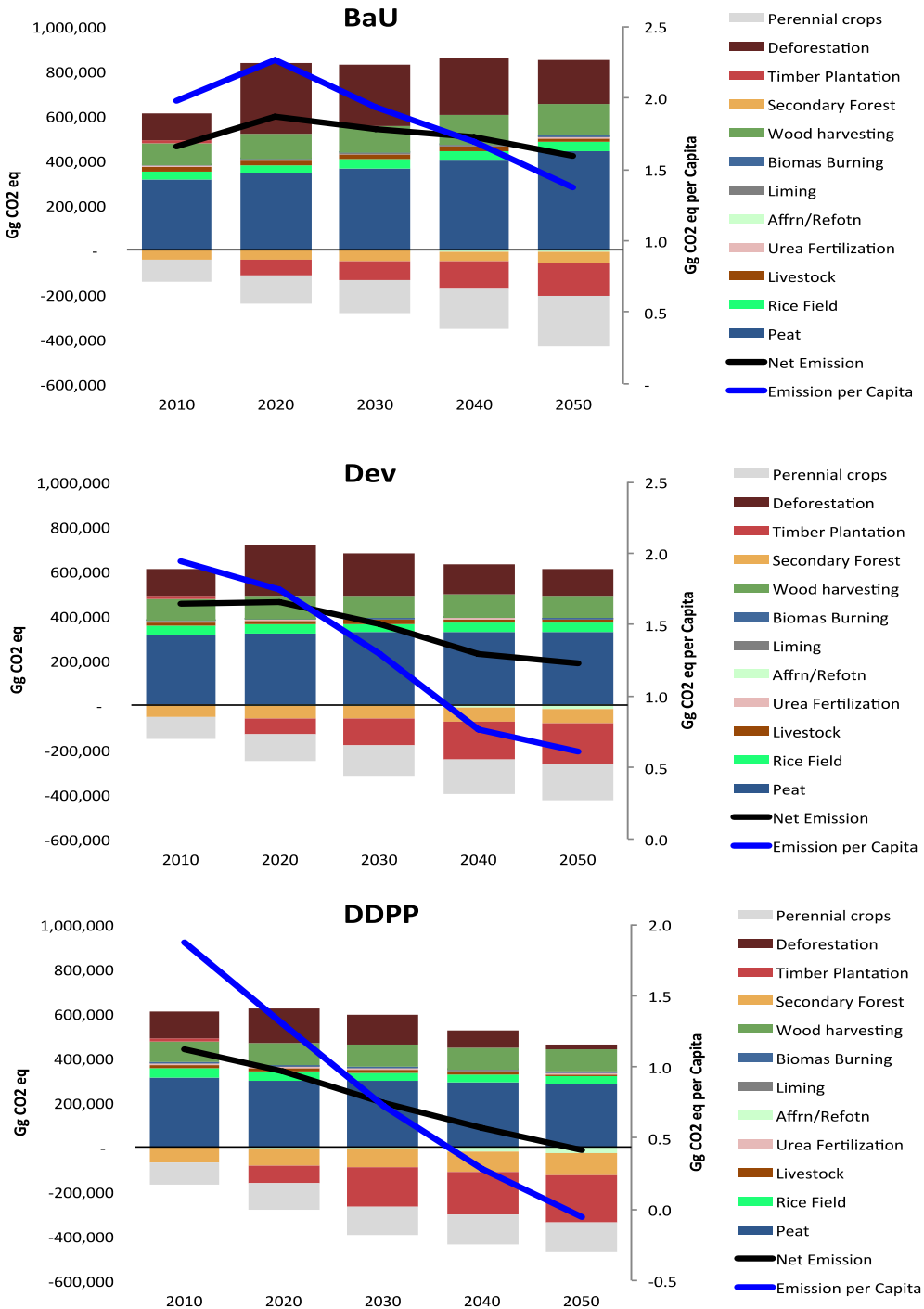
Mitigation Policies

Conversion of peat land natural forest to others	Historical	BAU	DEV	DDPP
HTI	1	1	0	0
Palm oil	1	1	1	0
Rubber	1	1	1	1
Other perennial crops	1	1	1	0
Rice outside Java	1	0	0	0
Other annual crops	1	1	1	1
Grassland	1	0	0	0

Moratorium of permit on peatland and natural forest (Presidential Instruction No.10/2010, Presidential Instruction 6/2013, 8/2015, renewed every two years) and peat restoration (Presidential (Presidential Regulation No. 1/ 2016)

Results

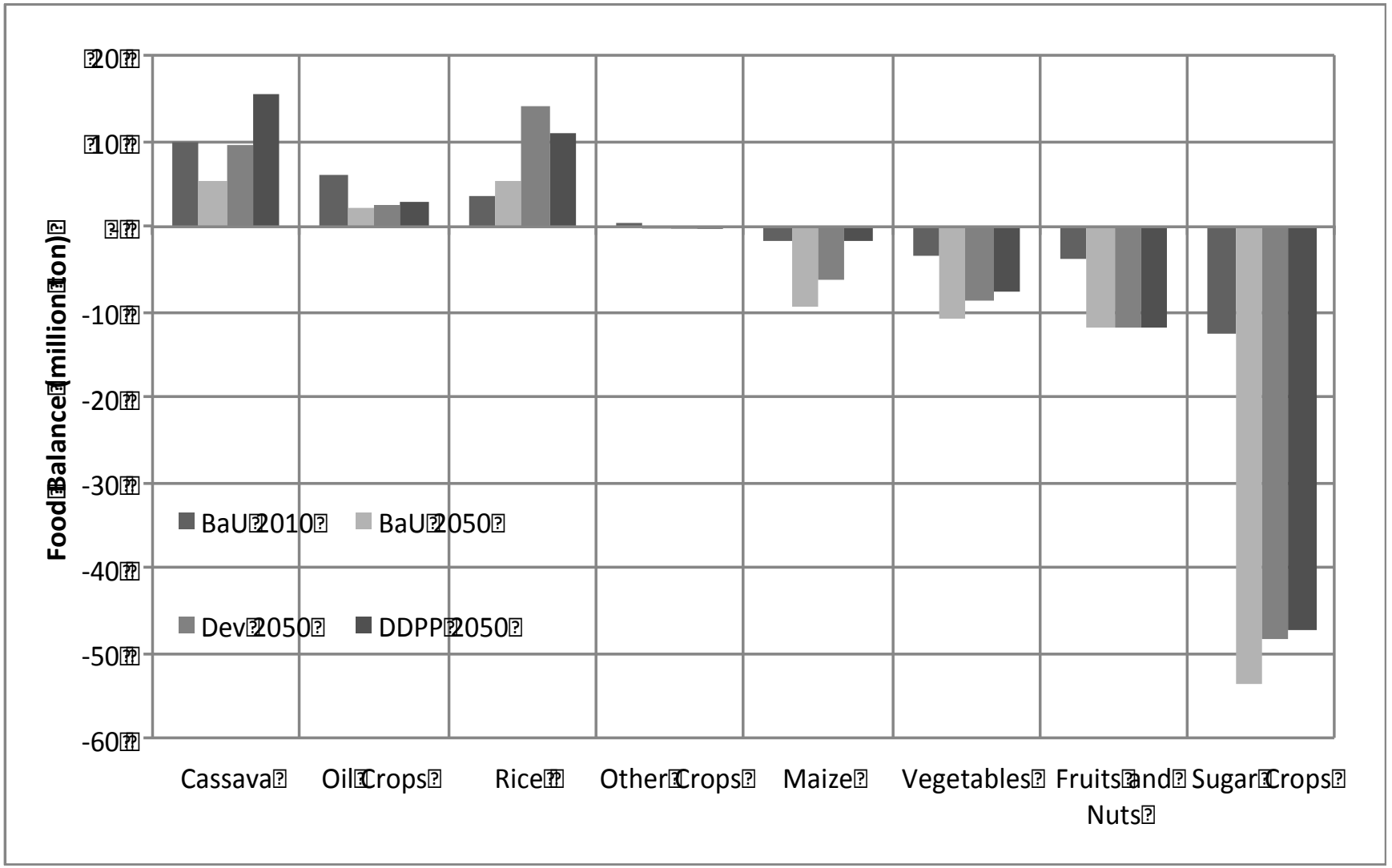
- BAU scenario, emission from AFOLU would increase up to 2020 and then decrease slightly thereafter (by 2050, 1.36 ton CO_2e/cap)
- GOV scenario, the GHG emission starts decreasing from 2010 very slowly and quite rapid after 2020 (by 2050, 0.6 ton CO_2e/cap) ,
- DDPP scenario, the emission decreased quite rapidly (by 2050, -0.05 ton CO_2e/cap) .



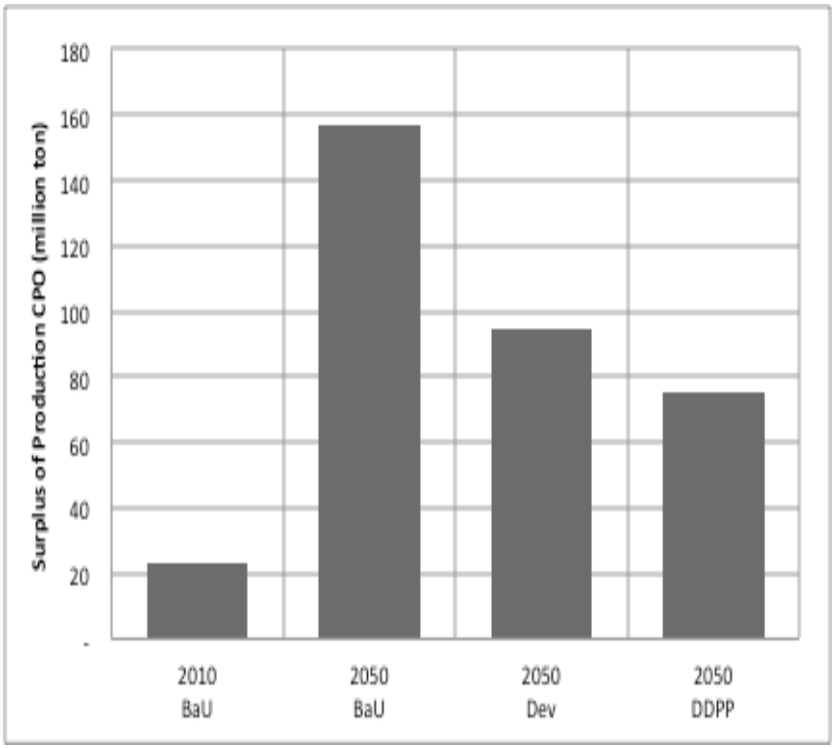
Mitigation measures

BAU		2010	2020	2030	2040	2050
Rice (000 ha)	Rice paddy area	8,763	8,710	8,700	8,732	8,810
	Mitigation Variety	-	-	-	-	-
	Mitigation Irrigation	-	-	-	-	-
Crop lands	Area of crop lands (000 ha)	54,303	61,591	66,837	72,919	80,377
	Nitrogen application (000 ton urea)	6,422	6,587	6,465	6,379	6,639
Livestock (000 heads)	Total Livestock Population	443,183	460,506	478,505	497,209	516,643
	Feed Supplement	-	-	-	-	-
	Biogas	-	-	-	-	-
Peat (000 ha)	Total Area of Peatland	14,585	14,508	14,440	14,381	14,327
	Improved Water Management	-	-	-	-	-
	Peat Restoration	-	77	145	204	258
Afforestation/Reforestation (Aff/Ref; 000 ha)	Land available for Aff/Ref program	14,033	-	-	-	-
	Aff/Ref program without rotation	-	972	1,944	2,915	3,887
	Survival Rate (%) without rotation	-	22%	24%	27%	30%
	Aff/Ref program with rotation	-	1,098	2,196	3,294	4,392
	Survival Rate (%) with rotation	-	54%	59%	64%	70%
DEV		2010	2020	2030	2040	2050
Rice (000 ha)	Rice paddy area	8,763	8,148	7,570	7,009	6,441
	Mitigation Variety	-	466	958	1,491	2,082
	Mitigation Irrigation	-	412	849	1,325	1,855
Crop lands	Area of crop lands (000 ha)	54,303	60,417	64,441	67,235	68,772
	Nitrogen application (000 ton urea)	6,422	6,462	6,233	5,881	5,441
Livestock (000 heads)	Total Livestock Population	443,183	457,547	466,903	470,818	468,830
	Feed Supplement	-	2,958	11,602	26,391	47,813
	Biogas	-	79	314	725	1,333
Peat (000 ha)	Total Area of Peatland	14,585	14,001	13,311	12,978	12,702
	Improved Water Management	-	342	789	880	914
	Peat Restoration[2]	-	242	485	727	969
Afforestation/Reforestation (Aff/Ref; 000 ha)	Land available for Aff/Ref program	13,938	-	-	-	-
	Aff/Ref program without rotation	-	1,383	2,767	4,150	5,533
	Survival Rate (%) without rotation	-	25%	31%	40%	50%
	Aff/Ref program with rotation	-	1,369	2,739	4,108	5,478
	Survival Rate (%) with rotation	-	57%	67%	77%	90%
DDPP		2010	2020	2030	2040	2050
Rice (000 ha)	Rice paddy area	8,763	7,918	7,115	6,344	5,592
	Mitigation Variety	-	453	902	1,351	1,808
	Mitigation Irrigation	-	400	798	1,197	1,605
Crop lands	Area of crop lands (000 ha)	54,303	60,048	62,524	63,368	63,561
	Nitrogen application (000 ton urea)	6,422	6,422	6.048	5,543	5,028
Livestock (000 heads)	Total Livestock Population	443,183	457,547	466,903	470,818	468,830
	Feed Supplement	-	2,958	11,602	26,391	47,813
	Biogas	-	79	314	725	1,333
Peat (000 ha)	Total Area of Peatland	14,585	13,749	13,201	12,797	12,394
	Improved Water Management	-	432	576	576	576
	Peat Restoration	-	404	808	1,212	1,615
Afforestation/Reforestation (Aff/Ref; 000 ha)	Land available for Aff/Ref program	13,843	-	-	-	-
	Aff/Ref program without rotation	-	1,789	3,578	5,368	7,157
	Survival Rate (%) without rotation	-	27%	37%	51%	70%
	Aff/Ref program with rotation	-	1,637	3,274	4,911	6,548
	Survival Rate (%) with rotation	-	57%	67%	77%	90%

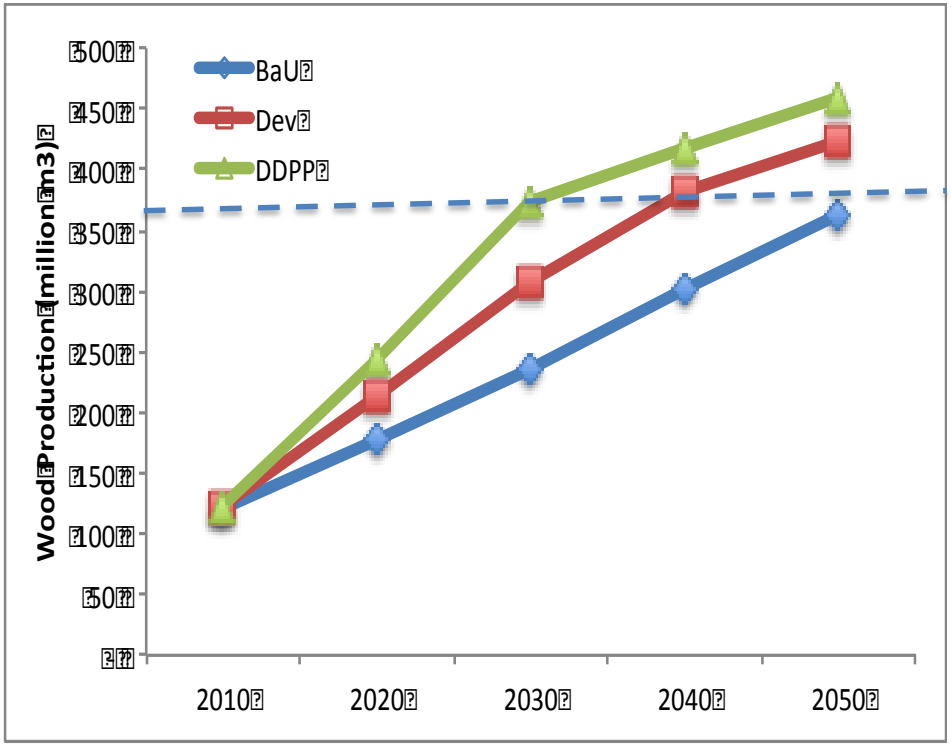
Crop Production



Palm Oil and Wood Production



Surplus of CPO



Surplus of wood

Conclusion

- By 2050, Afolu sector in Indonesia can lower the emission and turn into net sink without significantly affect the production target (food, feed and timber), except for palm oil, the target need to be reduced by half from about 160 million ton CPO into around 80 million ton CPO.
- However, there is a need to significantly changes the land management practices particularly peat land and optimization on the use of low carbon stock land for agriculture expansion – need the acceleration of the implementation of agrarian reform
- Development and improvement of agriculture infrastructure particularly irrigation facilities and crop productivity also another key challenges (fund limitation, the need for restoring the catchment area for ensuring the water supply for irrigation. At present most of the watershed that supply water for agriculture are at the critical stage (heavily degraded)

Conclusions

- Improvement of land and forest management may require high investments particularly for
  - enhancing institutional capacity of forest management unit in all open access areas.
  - Investment for producing high yielding varieties suitable for marginal lands and technology for peatland management
  - Optimizing the use of unproductive land faced great challenges, in particular in addressing land tenure issues.
  - Incentive system for accelerating the development of timber plantation on degraded land, and increasing community access to fund for green investment would be required.