# DEEP DECARBONIZATION OF AGRICULTURE AND FOREST DEVELOPMENT: CHALLENGES FOR FOOD SECURITY

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InCARNet 7th Annual Meeting Program, November 21–22, 2018
Arya Duta Hotel – Jakarta, Indonesia
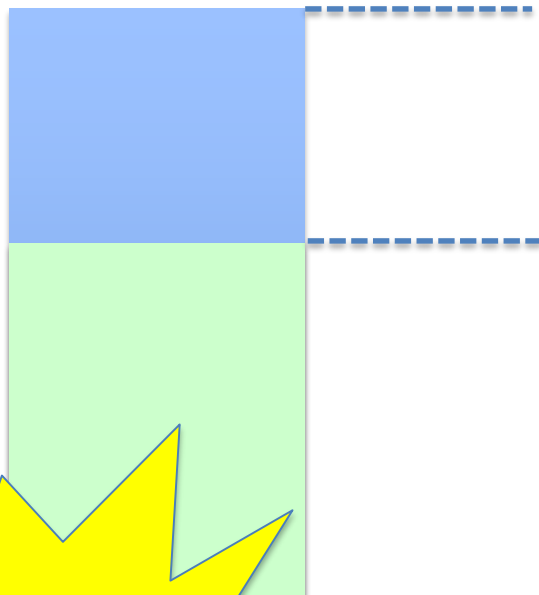
Global temperature change (1850–2016)
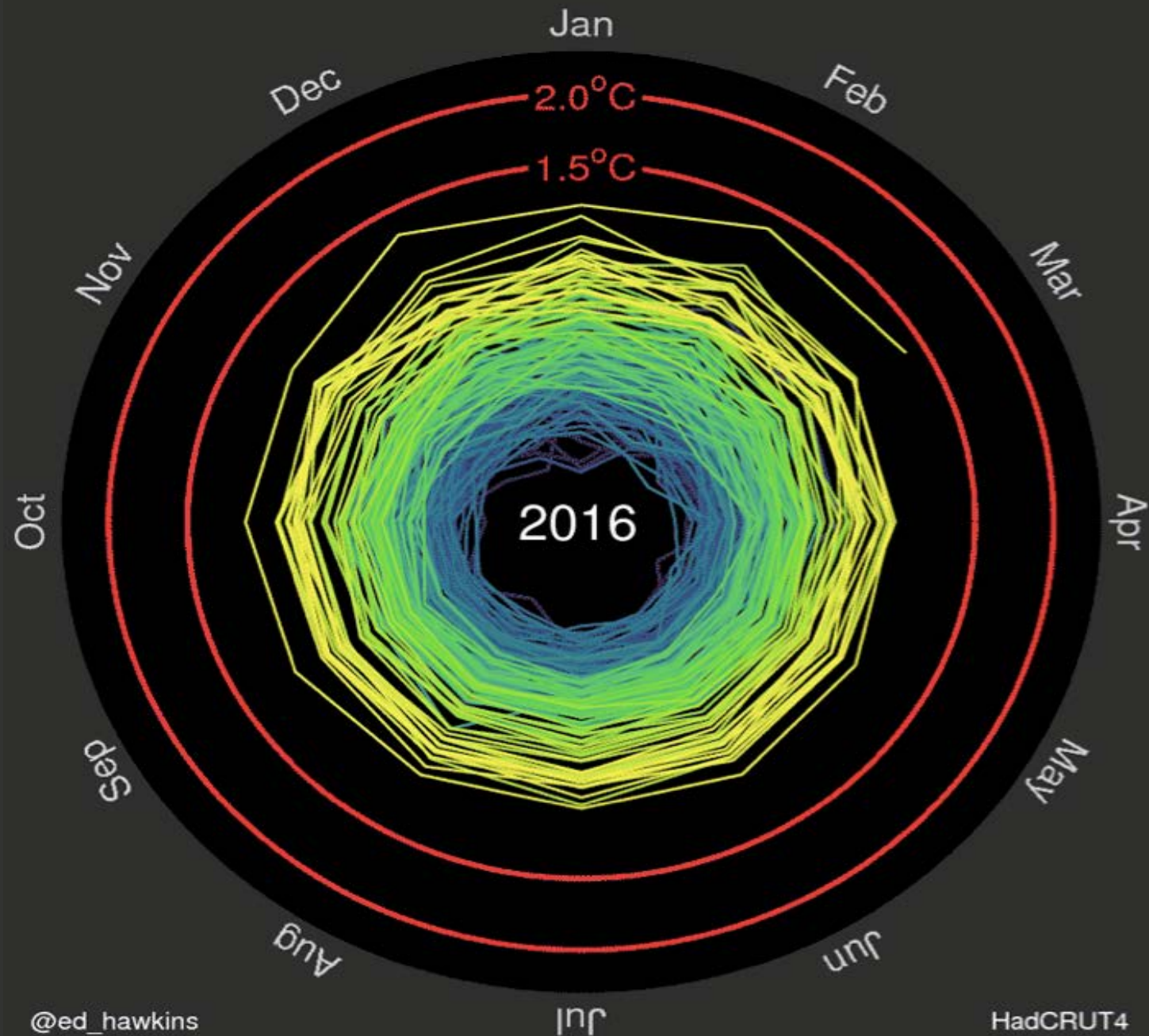
- Global temperature has increased rapidly and almost reach 1.5^{o}C.

- If current level of GHG emission continue, it is estimated that the increase of global temperature will pass 1.5^{o}C between 2030 and 2052

CO2 Emission Quota for 1.5^{o}C?

770 Gt CO2e

Probability of global temperature not to exceed 1.5^{o}C is **50%**

570 Gt CO2e

Probability of global temperature not to exceed 1.5^{o}C is **66%**

Current rate of emission 42+3 Gt CO2e per year

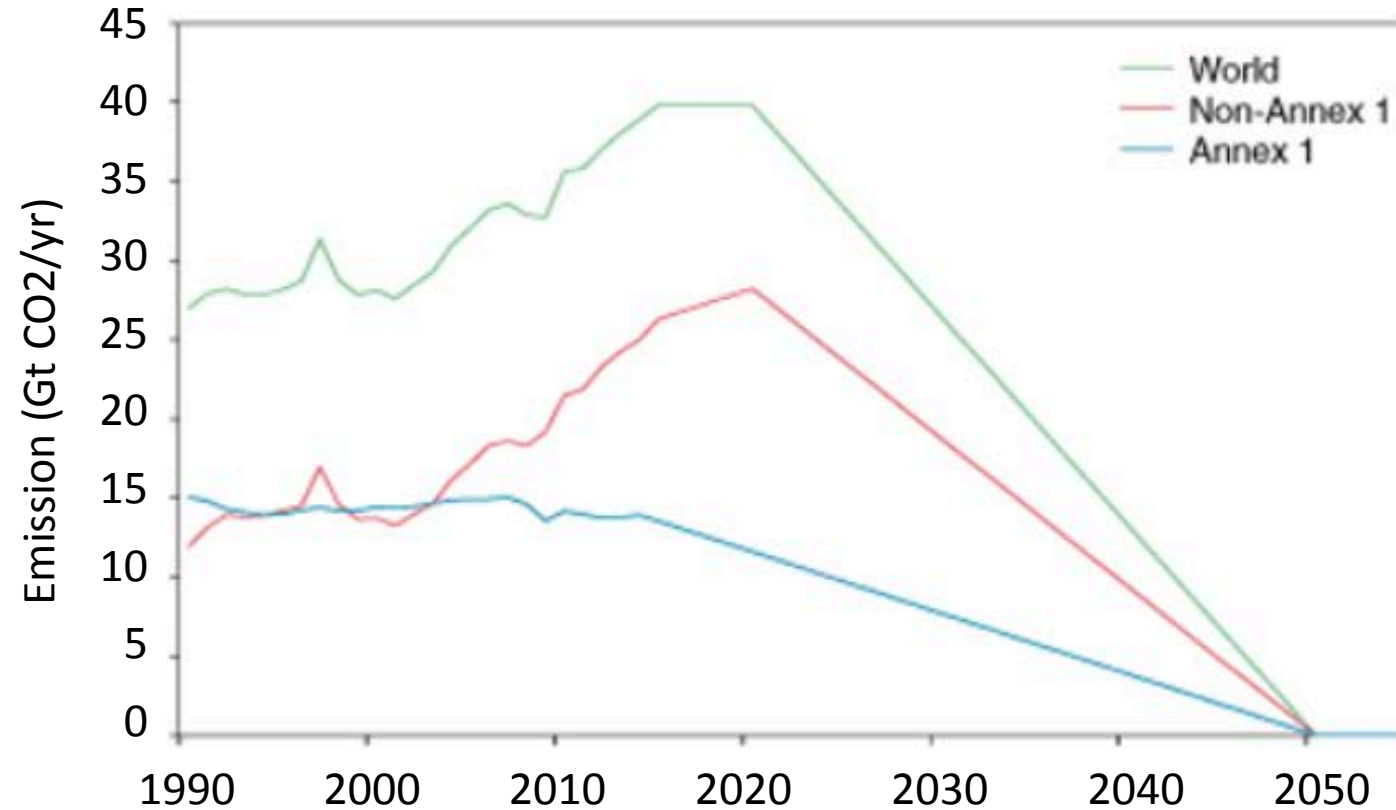Quota will be taken by the release of CO2 and CH4 from the melt of permaforst and wetland

source: C1.3 SPM (2018)
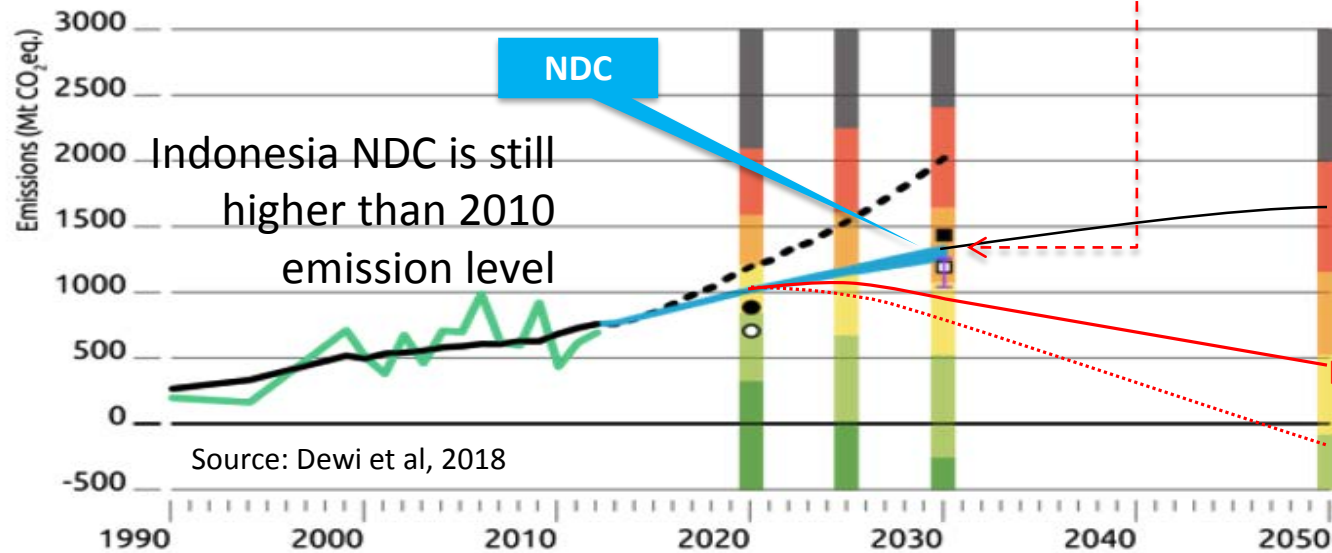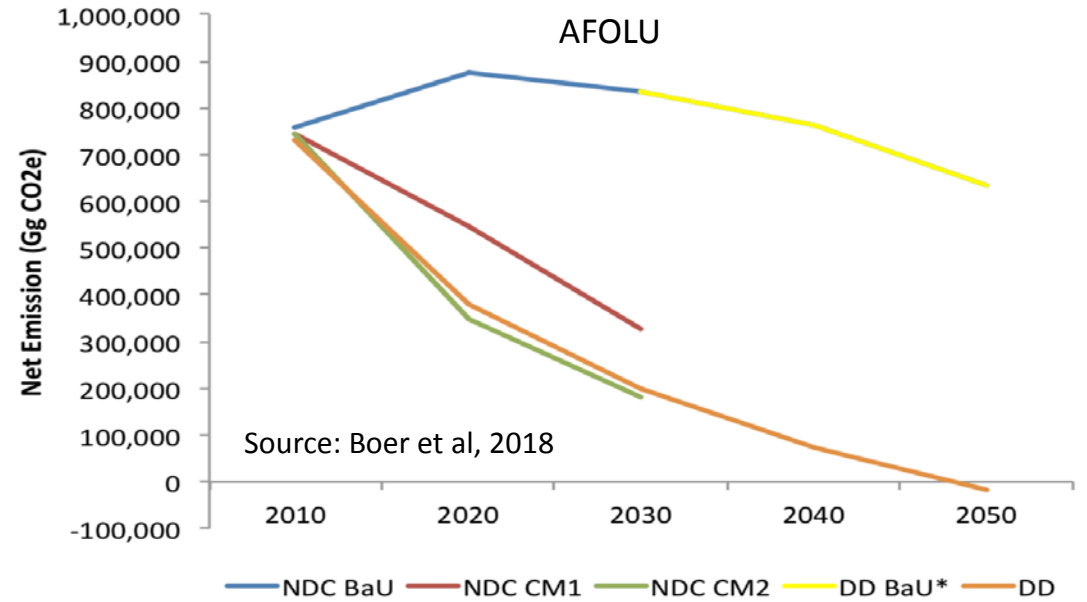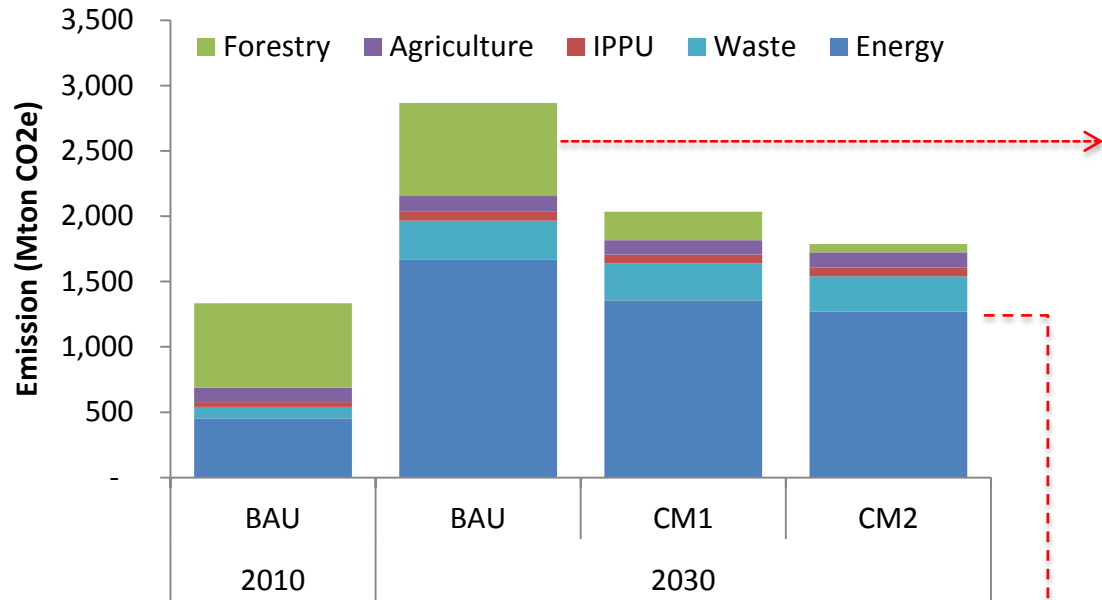
CO2 Emission Quota for 1.5°C Target?

- Emission reduction target for not exceed 1.5°C
  - By 2030, emission rate should be 45% below 2010 emission level
  - By 2050 almost zero emission
- Emission reduction target for not exceed 2.0°C
  - By 2030, emission rate should be 20% below 2010 emission level
  - By 2050: emission per capita reach 2 tCO2e
  - By 2075 emission and removal reach balance
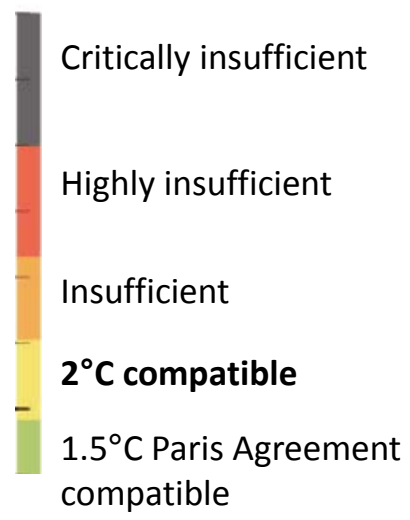
Emission path towards 1.5 target

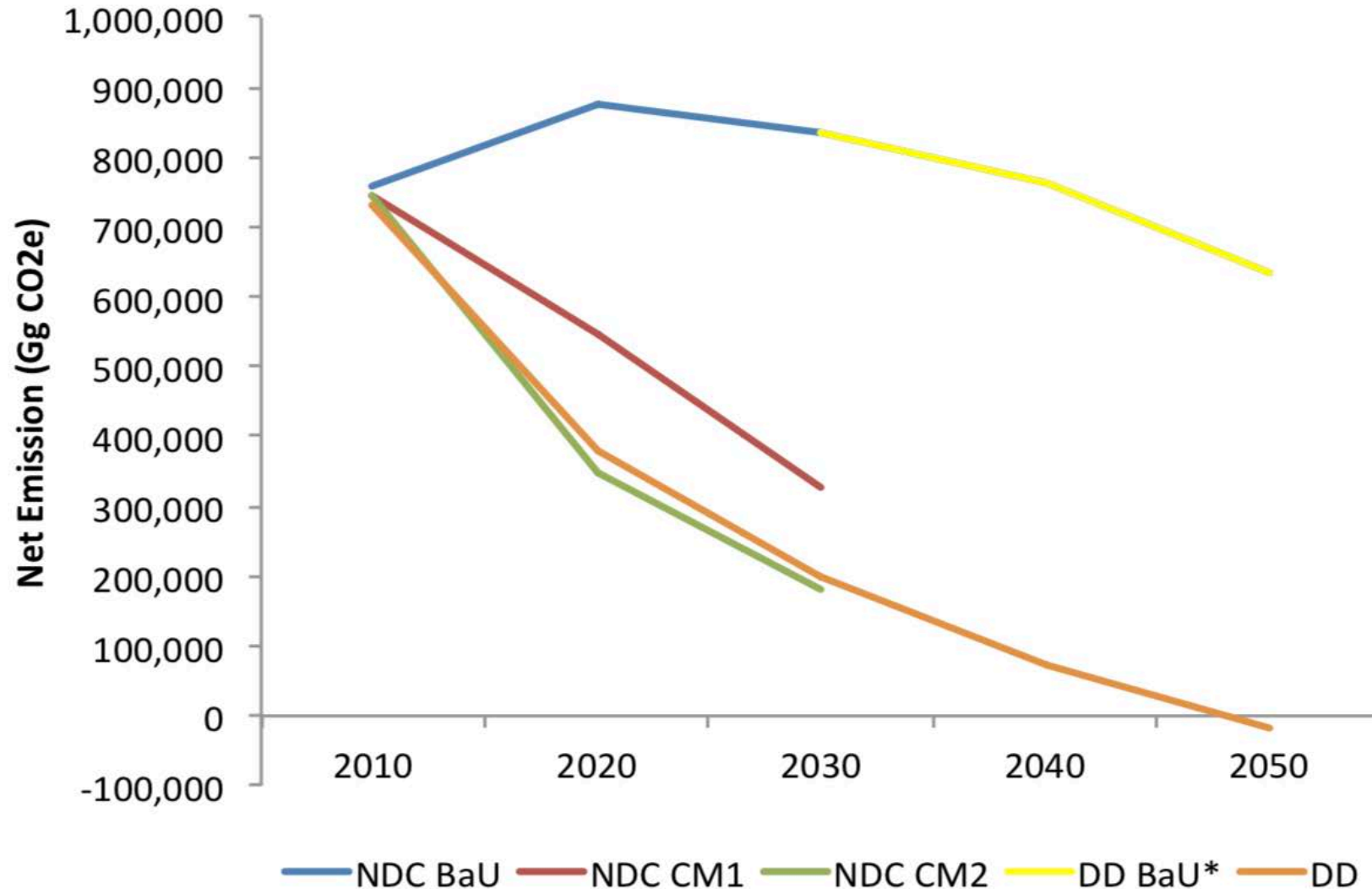*Source: Nature Climate Change 8:564-569 (2018)*

NDC INDONESIA

Source: Boer et al, 2018

Indonesia NDC is still higher than 2010 emission level

NDC

DD

Source: Dewi et al, 2018

- Historical emissions, excl. forestry
- Historical emissions/removals from forestry
- Current policy projections
- 2020 pledge unconditional/ conditional
- NDC unconditional/ conditional
- Reference for pledges (BAU)
- National Energy Policy targets and biofuel targets

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Climate Analytics/Ecofys/
NewClimate

Critically insufficient

Highly insufficient

Insufficient

2°C compatible
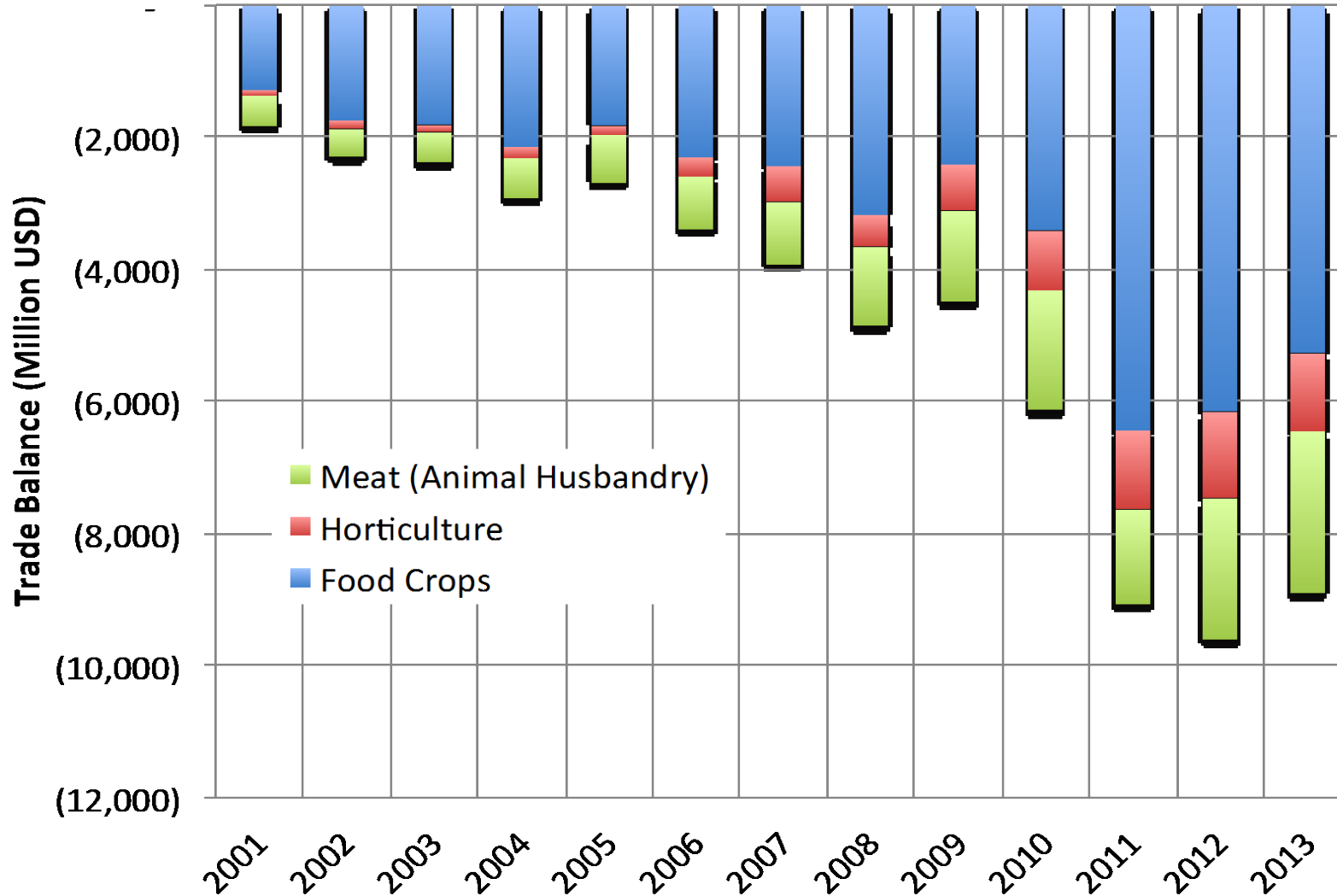
1.5°C Paris Agreement compatible

DD Pathway scenario for AFOLU

Indonesia is possible to deep decarbonized its AFOLU sector

- Progressive target in reducing deforestation (half to 2/3 of the BAU) by increasing land use intensity (productivity and cropping intensity)

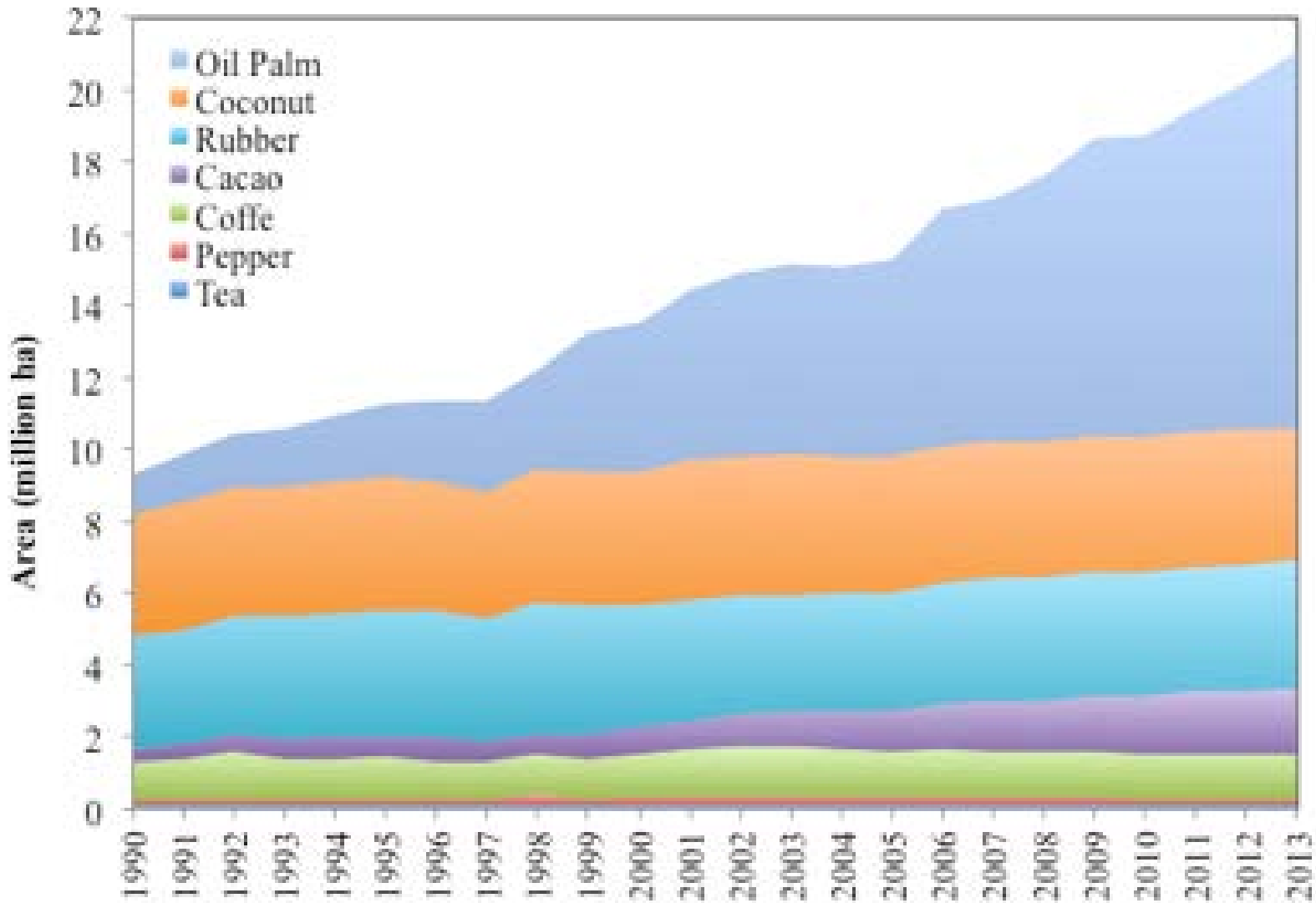- Optimizing the use of unproductive lands

Trade Balance

Trade Balance (Million USD)

(2,000)

(4,000)

(6,000)

(8,000)

(10,000)

(12,000)

Meat (Animal Husbandry)
Horticulture
Food Crops

2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013

Source: Kementan, 2014

- Demand for land is still high to meet the food demand
- At present, most of food commodities still rely on import
- Contribution of export commodities on national income is expected to increase in the future

Growth of plantation area

Legend:
- Oil Palm
- Coconut
- Rubber
- Cacao
- Coffe
- Pepper
- Tea

Y-axis: Area (million ha)
X-axis: 1990–2013

Sumber: MoEF, 2016

- Growth of palm oil plantation area 0.571 Mha/yr while other almost stagnant except cacao
- Share of Palm oil to economic growth is significant ~ contribute to about 70% of export earning of plantation sector
- Set high target for CPO production:
  - 2020: 40 million ton
  - 2030: 60 million ton
  - 2050: 160 million ton
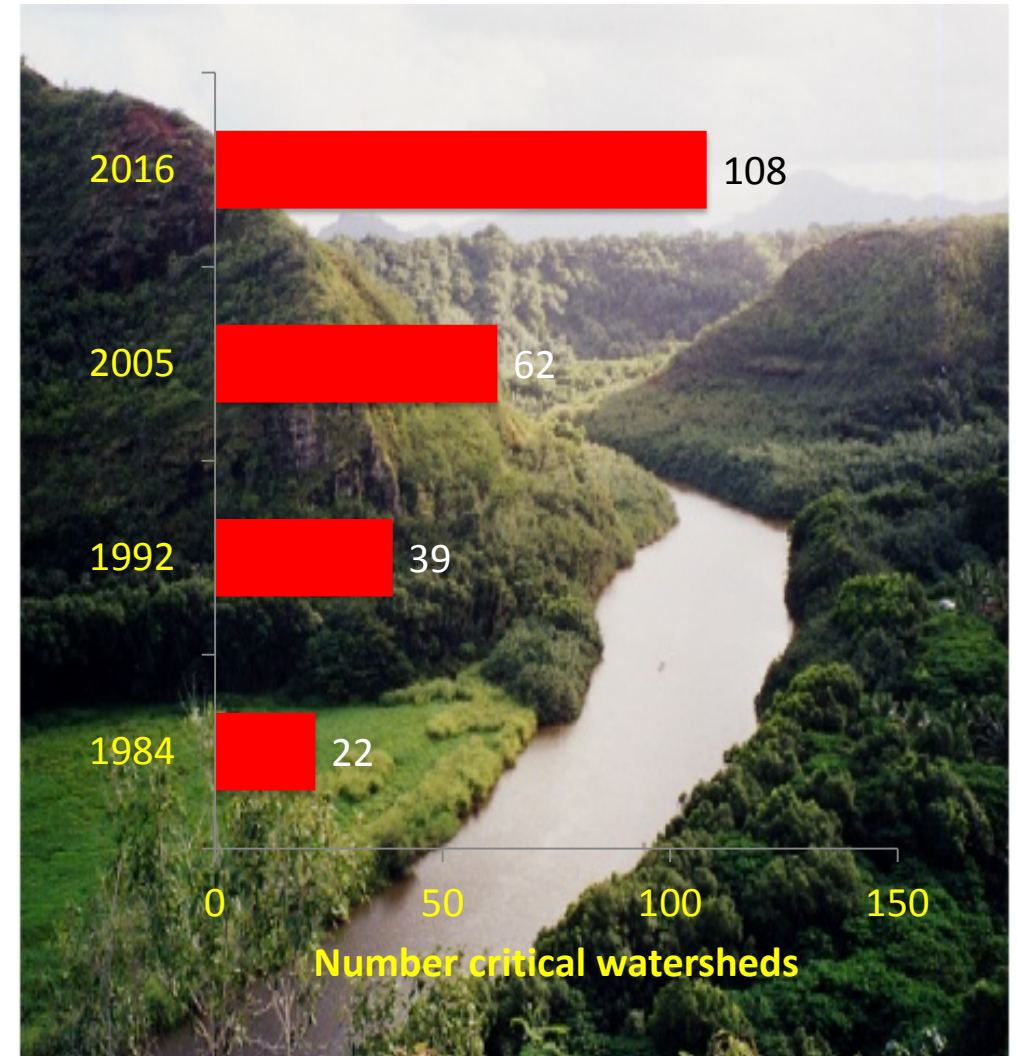
Crop Productivity Improvement (Boer et al., 2017)

Commodities	Current Yield[1]	Yield Target DD (2050)	Attainable Yield
		t/ha	
Rice in Java	5.80	6.50	8.80
Rice outside Java	4.20	5.60	5.57
Upland rice	3.04	3.50	5.00
Maize	4.40	7.00	10.60
Cassava	20.22	35.00	40.00
Sugarcane (*cane bar*)	47.89	80.00	100.00
Palm oil (CPO)	4.02	9.00	10.00
Vegetables[3]			
- Red Chilli	8.37	11.13	11.65
- Red Onion	9.57	12.72	12.23
Other Industrial crops[3]			
- Rubber	0.94	1.55	1.90
- Coffee	0.70	1.16	2.00
- Cacao	0.42	0.70	2.00
- Tea	1.19	1.90	2.00

About 14 million ha of agriculture land located in forest area with very low productivity

Planting Intensity Improvement
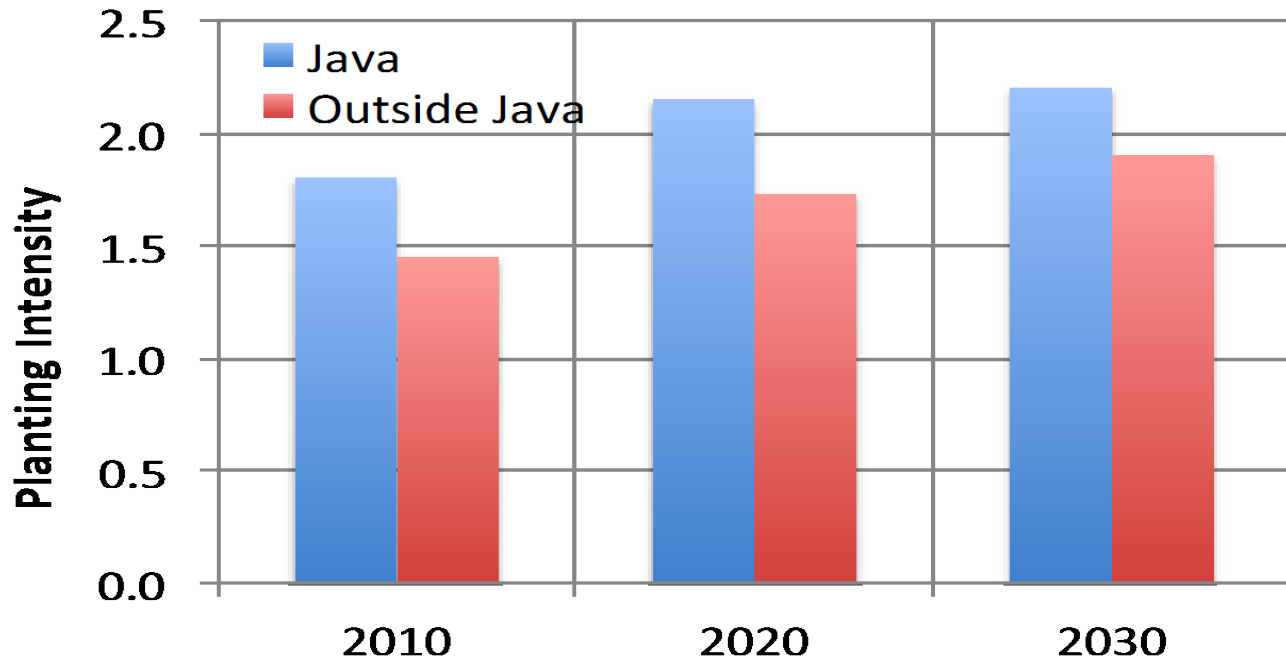
- Other commodities need to increase the planting intensity between 5%-15% by 2030
- Condition of Irrigation infrastructure may limit the potential for increasing the cropping intensity
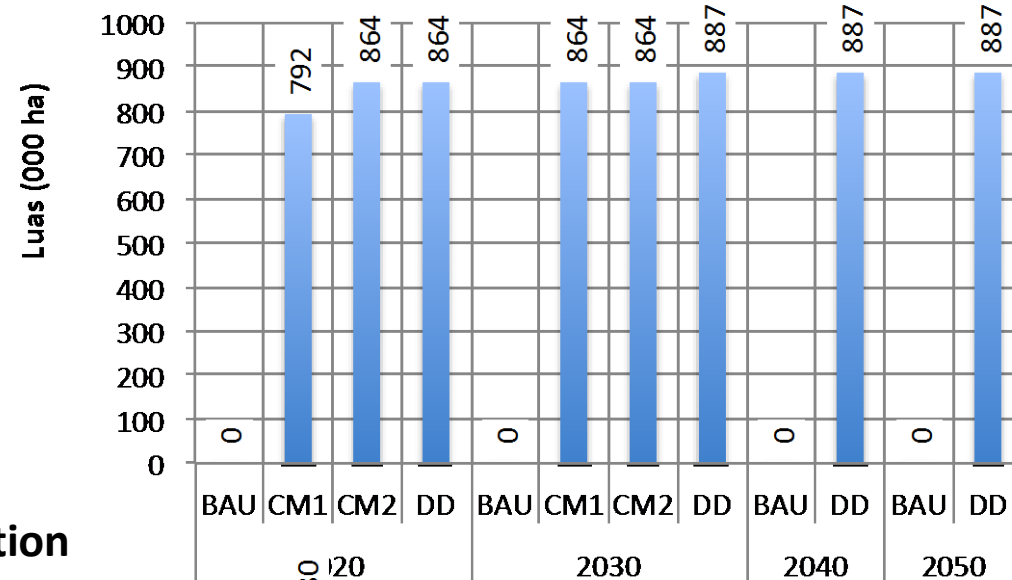- Water supply for the irrigation may also limited due to the degradation of watersheds

Sumber: Boer et al., 2017)

KEY MITIGATION ACTIONS FOR AFOLU FOR NDC AND DD: CUMULATIVE AREA FROM 2011 (000 HA)
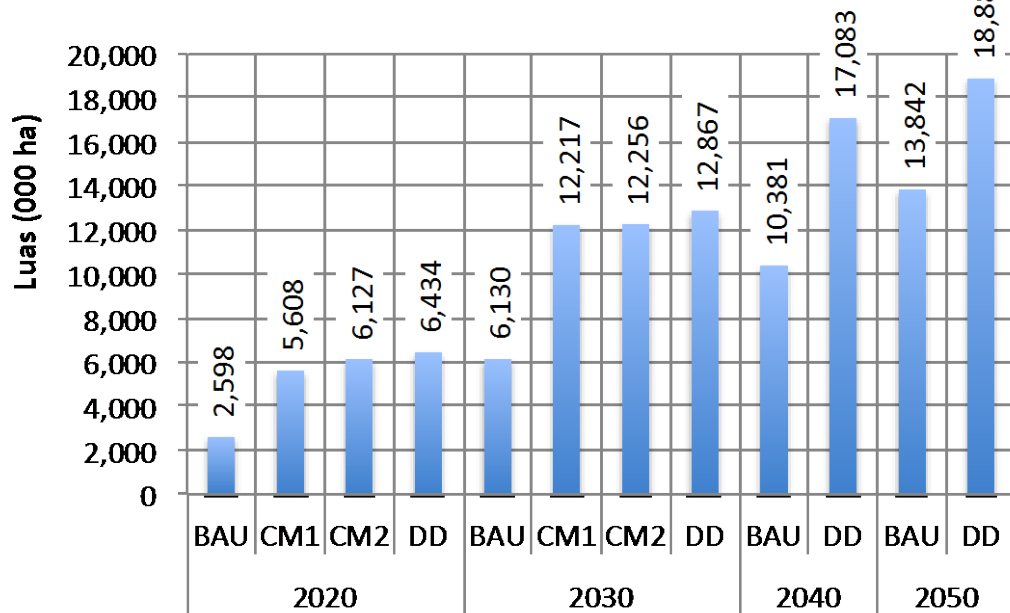

Peat Restoration
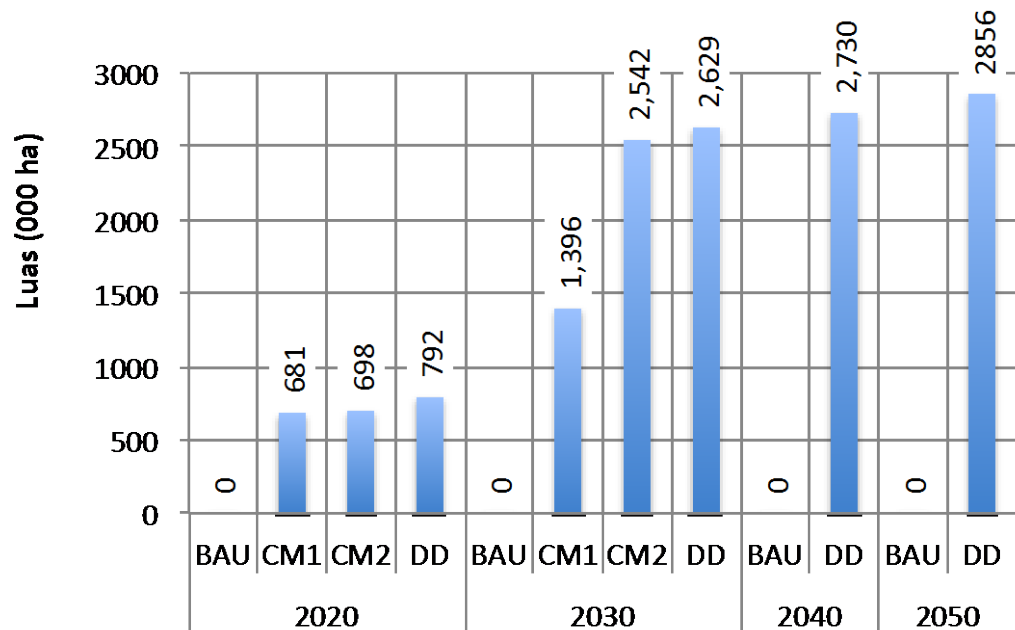
Improvement of peat water management

Land rehabilitation

Optimize use of unproductive land for various land-based economic activities
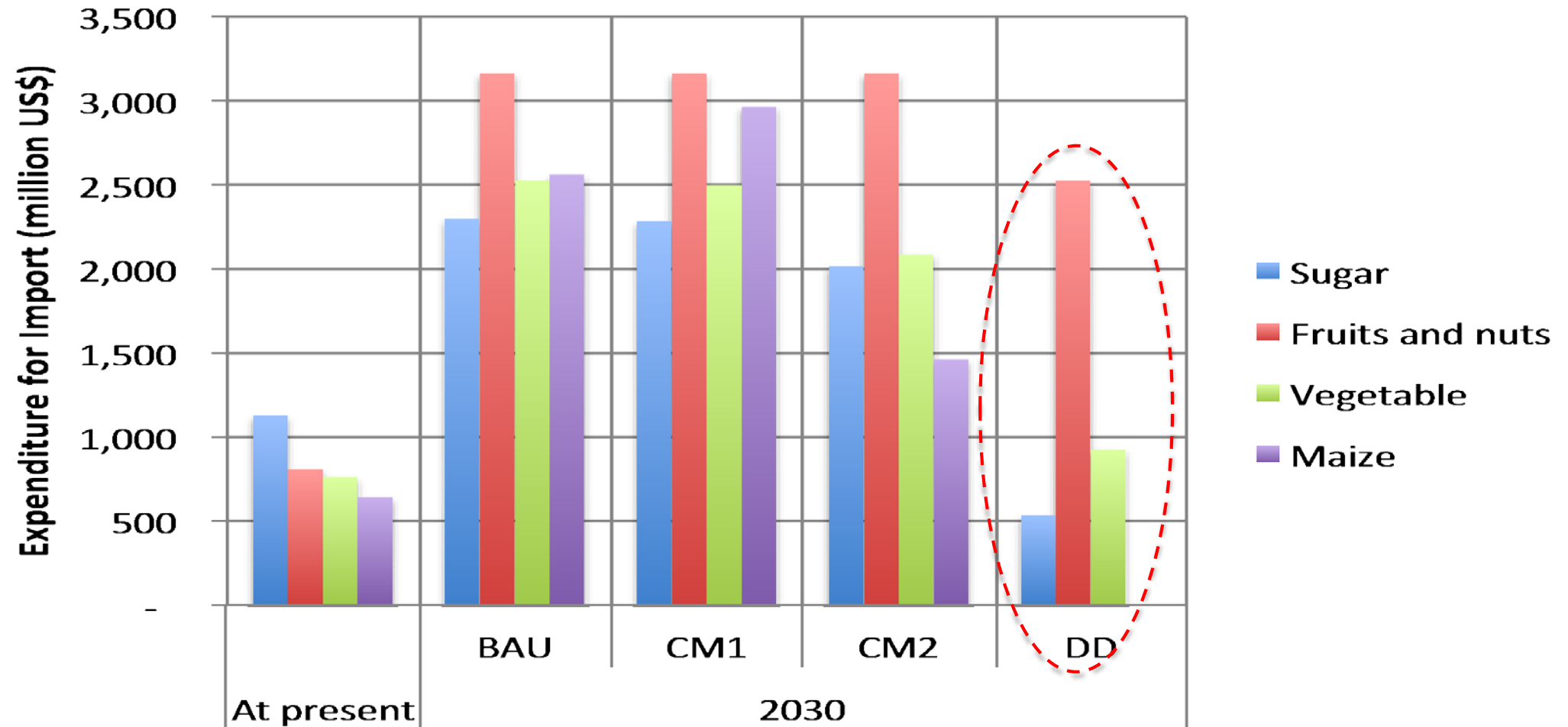
Food Balanced

- Until 2030, Indonesian reliance on food import still continue, but it will decrease compare to current

- Rice production will surplus and export volume for some key industrial crop will increase, particularly for cassava

- Maize will self sufficient
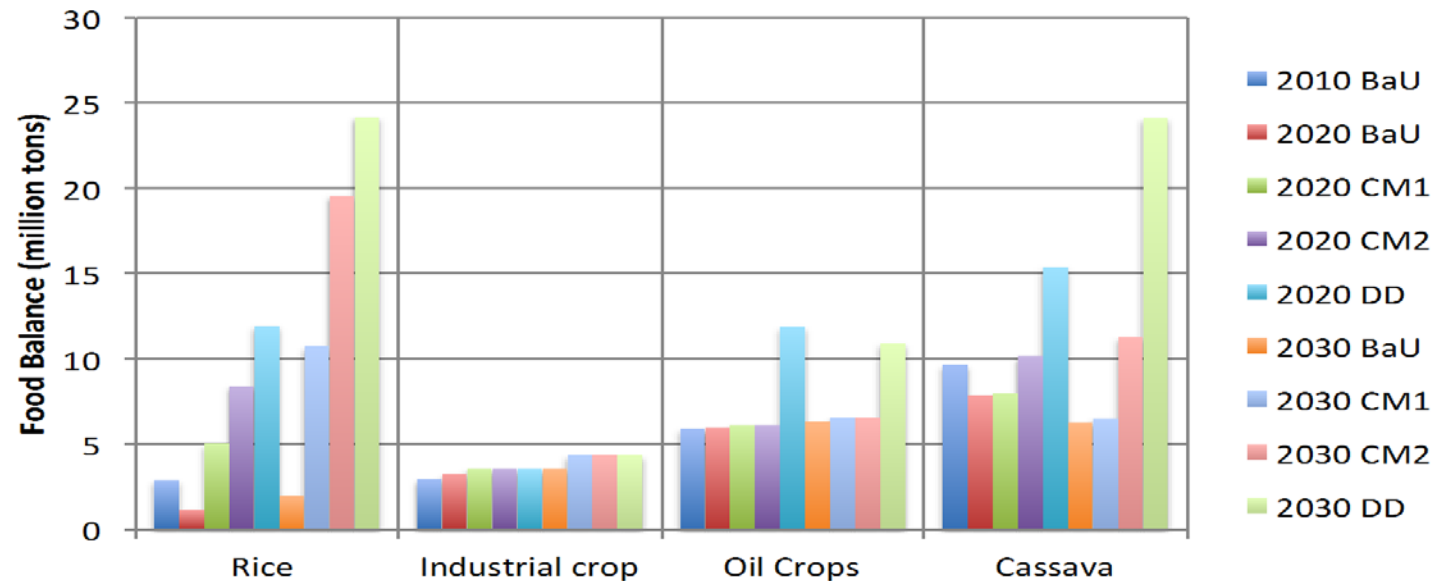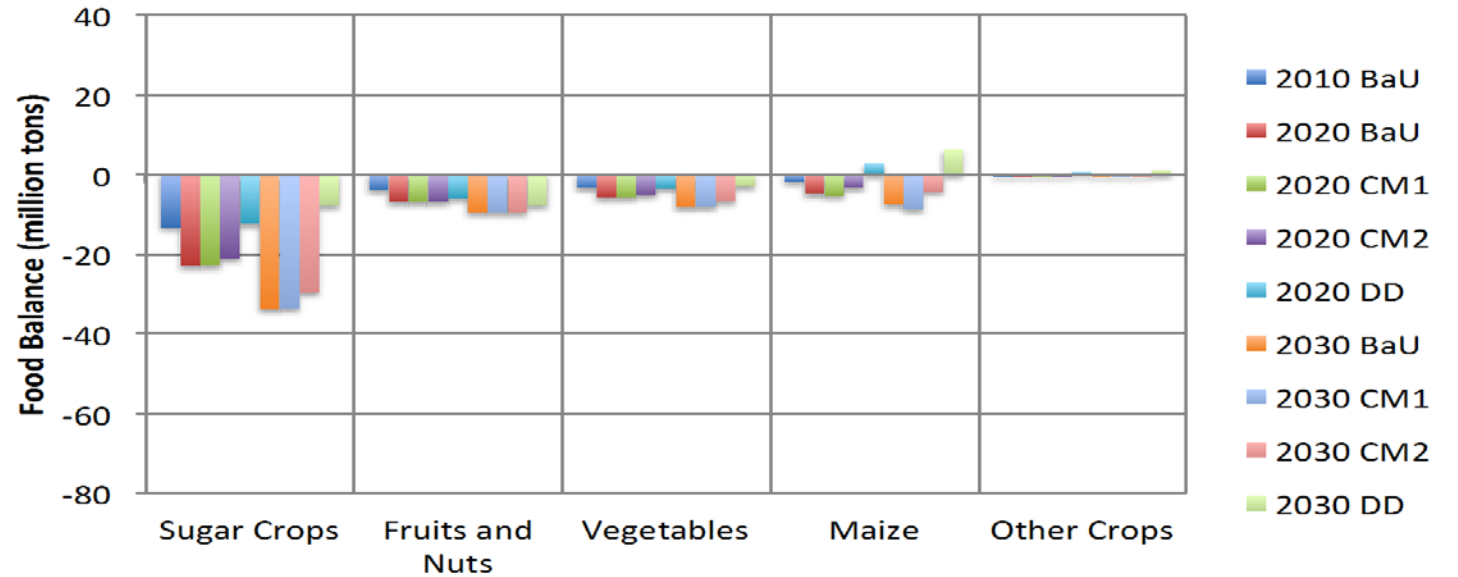
Source: Boer et al. 2017
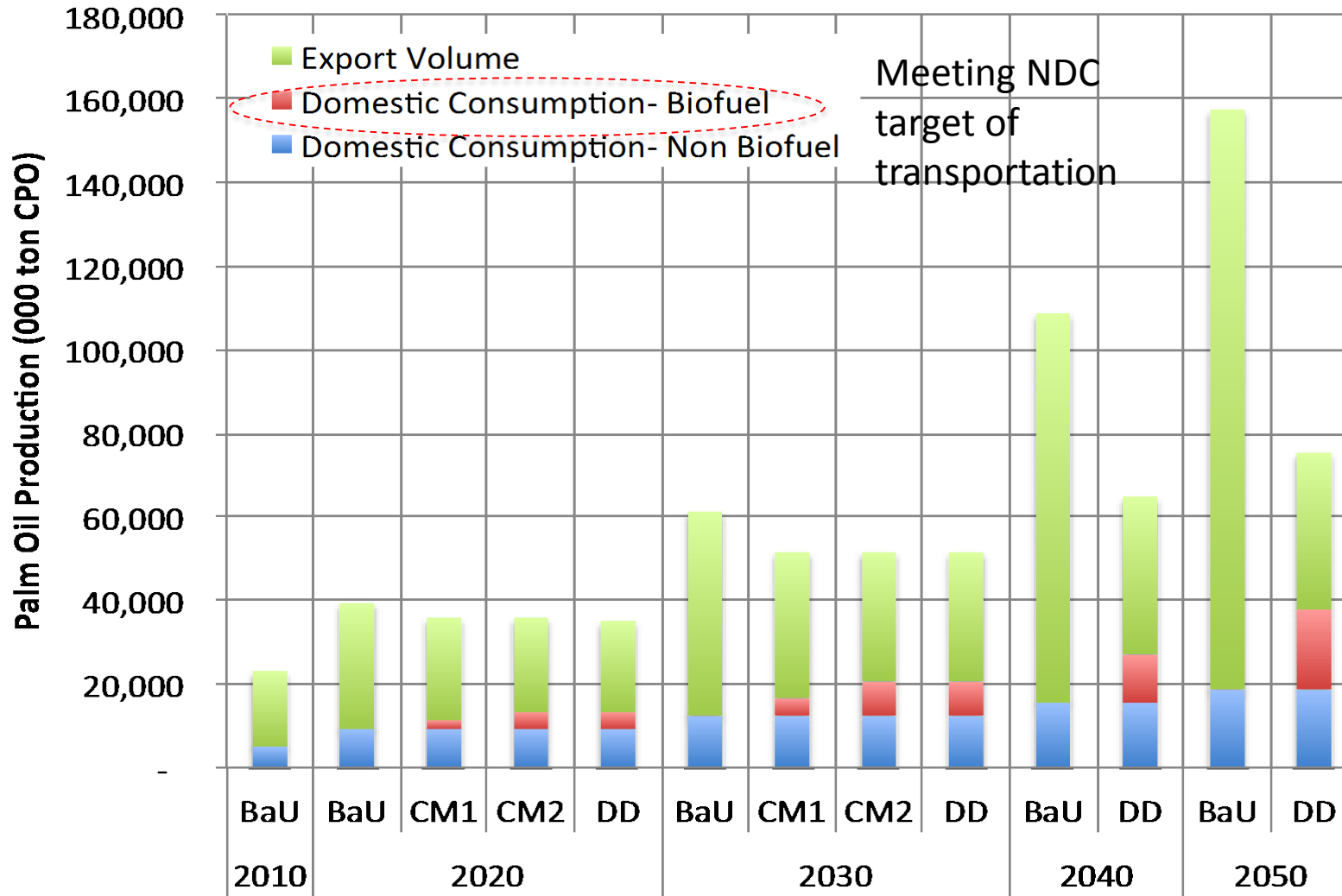
Expenditure for importing agriculture commodities between scenarios

Source: Boer et al. 2017

Palm Oil Production

Meeting NDC target of transportation
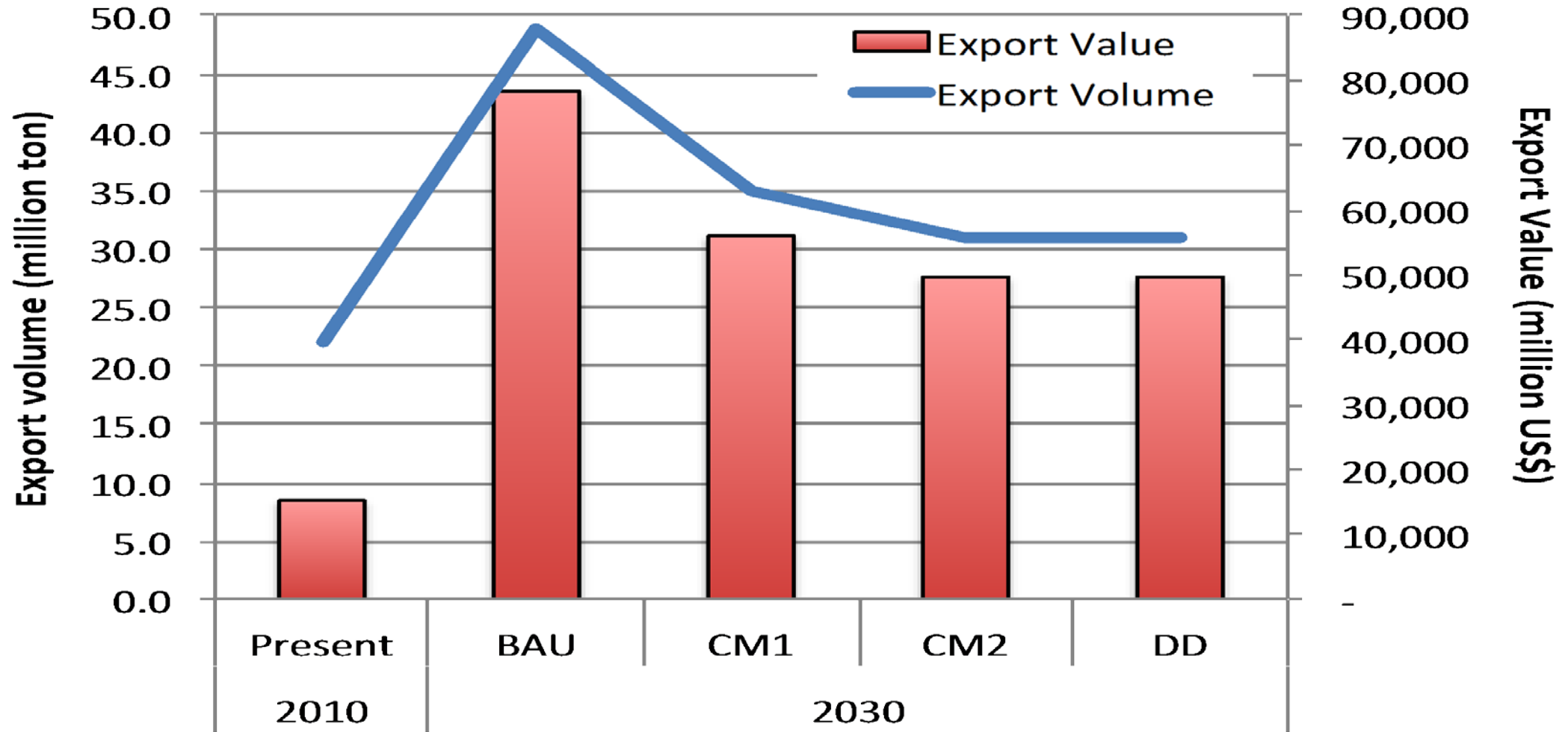
- Reducing target of palm oil expansion by half will preserve expansion opportunities for other crops, avoid the risk of deforestation and allowing the domestic demand for biofuel of the NDC target to be met

Sumber: Boer et al. 2017

Export of CPO between scenarios

Volume export CPO for CM and DD decrease from 45 million ton to about 30 million ton CPO by 2030

Land Demand for Development under NDC and Alternative Scenario

Source: Boer et al. 2017

Land use category	Commodities	2011-2030			2011-2050
		CM1	CM2	DD	DD
Croplands	Rice	487,131	579,786	655,183	1,423,557
	Other Annual Crops	1,945,045	556,908	2,980,614	8,580,614
	Palm Oil	2,760,015	2,760,015	2,563,543	2,854,656
	Rubber	533,910	533,910	523,232	1,138,945
	Other Perennial crops	-	-	-	407,883
Settlement	Housing and commercial	522,272	190,486	237,645	738,561
	Total	6,248,373	4,621,105	6,960,217	15,144,216

Area of Convertible Production Forest in 2013: 15.52 million ha meaning that forest area allocated for the development is enough until 2050

Challenges

- 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 forest and land management practices and optimization on the use of low carbon stock land for agriculture expansion – need the acceleration of the implementation of agrarian reform and diversifying economic activities in forest area with agriculture through social forestry programs

- 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)

Challenges

- 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.