Asia Sub-Group Meeting of GRA PRRG

the Workshop "Rice Landscapes and Climate Change: Options for mitigation in rice-based agroecosystems and the scaling-up of climate-smart rice cultivation

13 Oktober 2018

INDONESIA COUNTRY REPORT ON Climate change adaptation and mitigation in paddy rice

Indonesia Agency for Agriculture Research and Development – IAARD

Ministry of Agriculture

GRA-PRRG

Country overview

Current situation

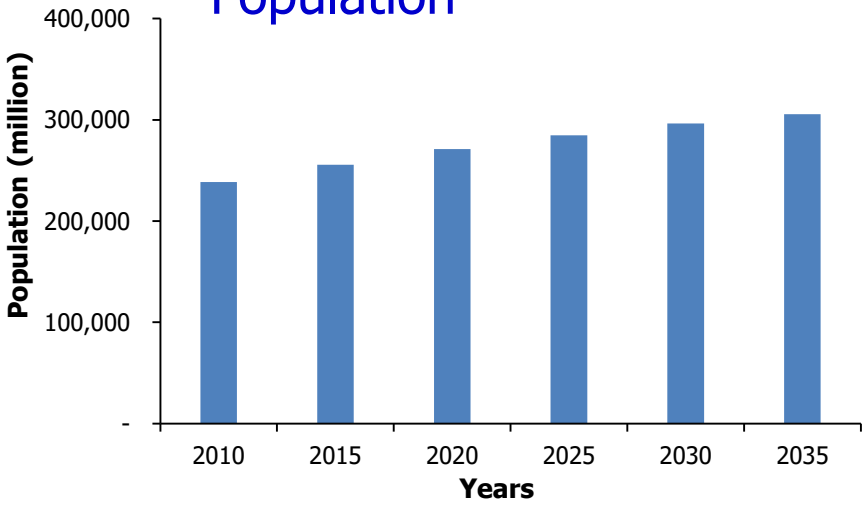
Adaptation and mitigation on Rice in Indonesia

Conclusion

1 Country overview

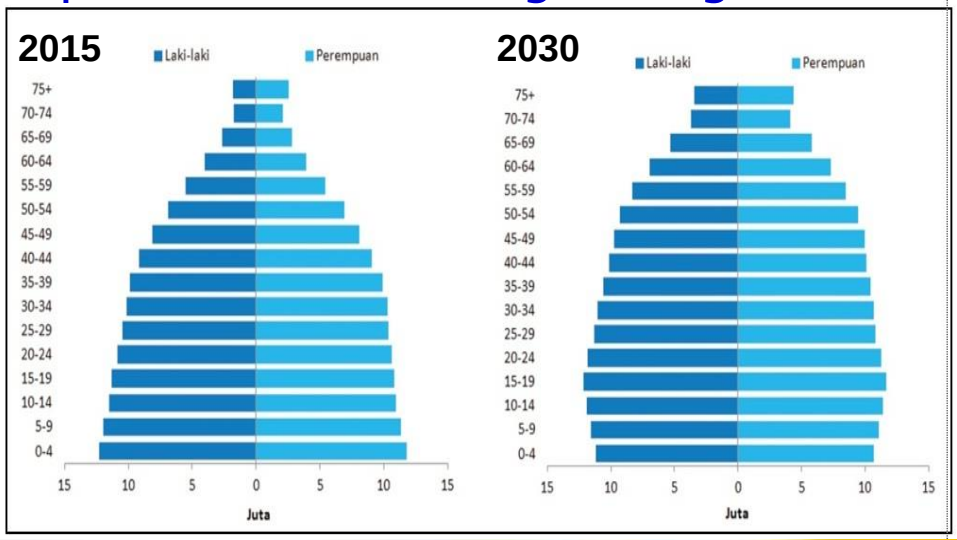
Demographics of Indonesia

Population



Source: Statistics Indonesia, 2018

Population based on age and gender



Source: Ministry of National Development Planning (2015)

Indonesia Land resources

Indonesia's land area: 191.1 M ha

- Wetland 43.6 M ha

  - **Non swamp** : 9.4 M ha
  - **Swamp** (34.1 M ha)
    - Tidal swamp: 8.9 M ha
    - Lebak Swamp: 25.2 M ha -- (Peat : 14.9 M ha)

- Dryland 144.5 M ha

  - **Upland**
    - LK TM : 37.1 M ha
    - LK MA : 107.4 M ha (LKIK : 10.7 M ha)

- Others 3.1 M ha

LK TM: Non acidic soil in dryland
LK MA: Acidic soil in dryland
LKIK : Dry land in dry climate

2 Current situation

Target of Indonesia food self sufficiency

Feed Indonesia
Feed The World

How to feed the world in the future, in a sustainable way?

World food barn

2016

Rice, Onion, Chili

2017

Maize

2019

Sugar for consumption

2019

Garlic

2020

Soybean

2024

Sugar for industry

2026

Beef

2045

World food barn

Opportunities and Resources for Agricultural development

Solar power – renewable and sustainable energy

Agro-ecological asset and genetic resources diversity

High demand of agricultural production for food, feed and energy

Networking – national communications and international relations

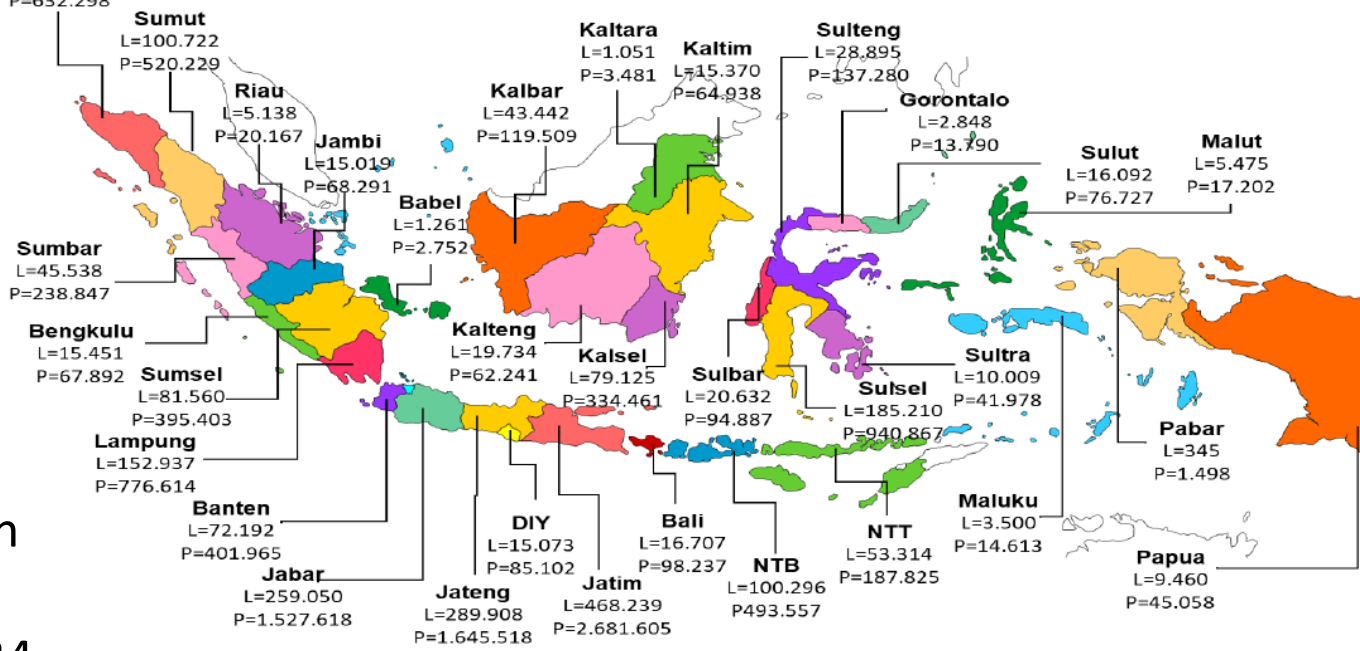
The optimization of Indonesia Resources for Agricultural development

Issues	Problem solving
1. Climate change	1. Mitigation and adaptation
2. Food security and safety	2. Food diversity, enhancing of product quality and agriculture productivity
3. Global market access	3. Increasing of product innovation, product quality standard and availability
4. Competition for land and water resources	4. Optimizing of land and water resources
5. √ Demand vs production ✓ Food vs energy ✓ Ineffective farming system	5. Sustainable agricultural bio-industry

Rice

14,9%
Juta Ton

2014	2015	2016	2017*
70,84	75,39	79,35	81,38

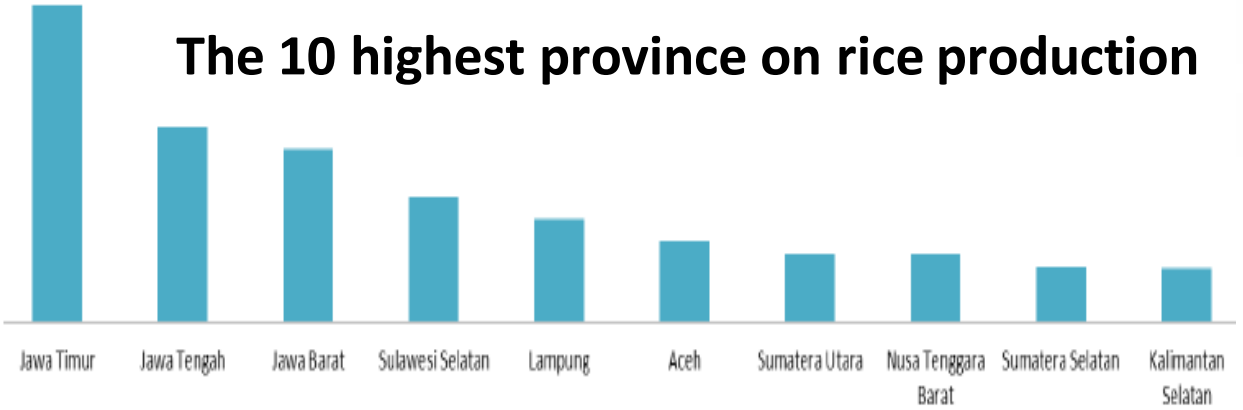


Note: L = harvested area, P = rice production

Growth of rice cultivation areas during 2015-2017 16.39 M Ha (increase 2.34 M ha/16.65%) → Rice cultivation index 1.73% (increase 2.95%)

Target of growth rice cultivation area in 2018: 1.75 M ha → 80.08 M ton

The 10 highest province on rice production



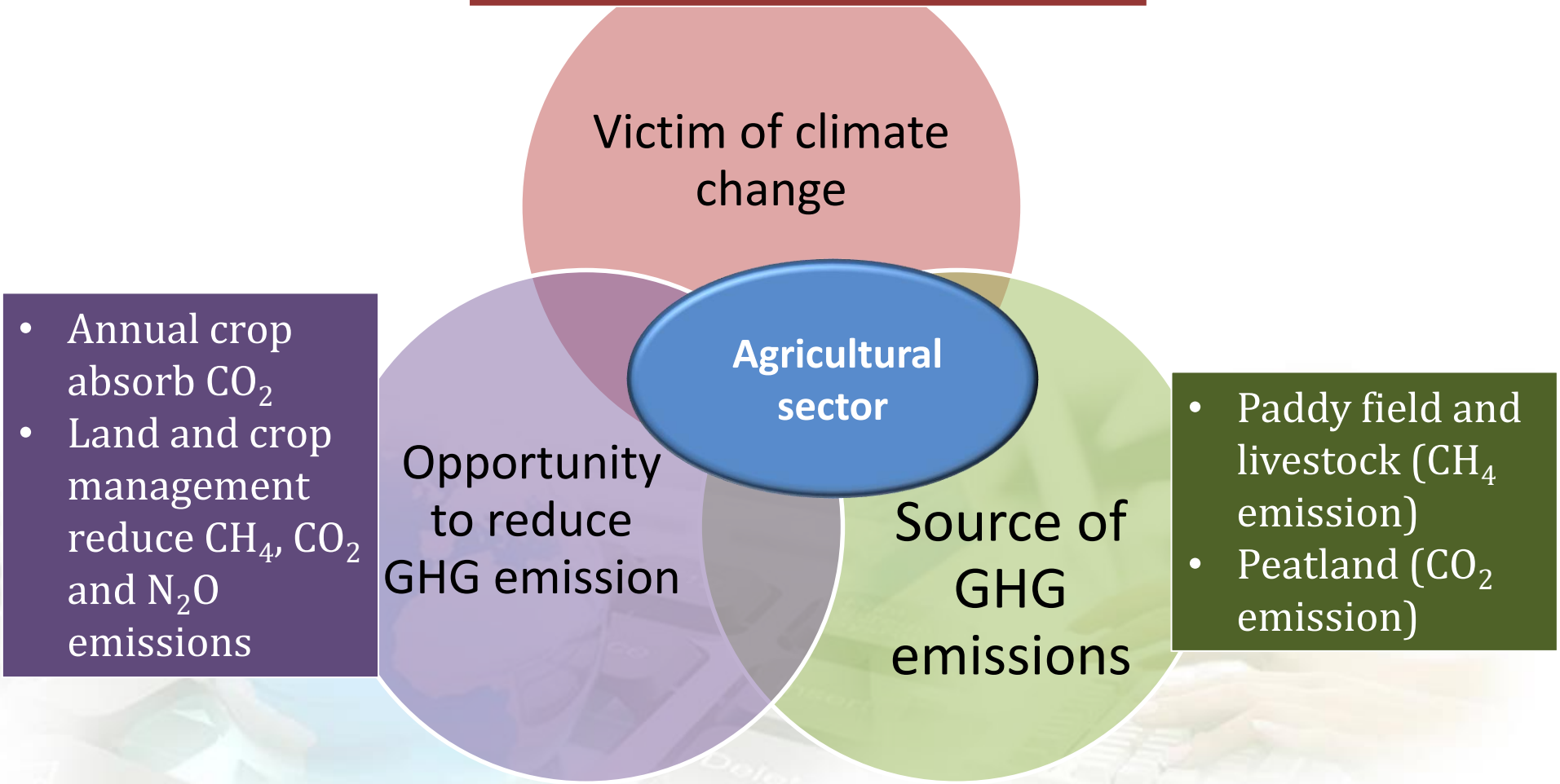
Total of rice harvested area: 2,252,962 ha
Yield potential: 11,812,447 ton (March 2018)

3 Adaptation and mitigation on Rice in Indonesia

Indonesia's commitment

- GHG emission reduction targets by **2030** are targeted at 29% (unconditional) and 38% (conditional)
- Indonesia, as an archipelagic country (± 17,000 island), is identified as one of the vulnerable countries → responding to the challenge of climate change is a part of priority policies for Indonesia

- Yield loss
- Pest and diseases infestation
- Flood and drought

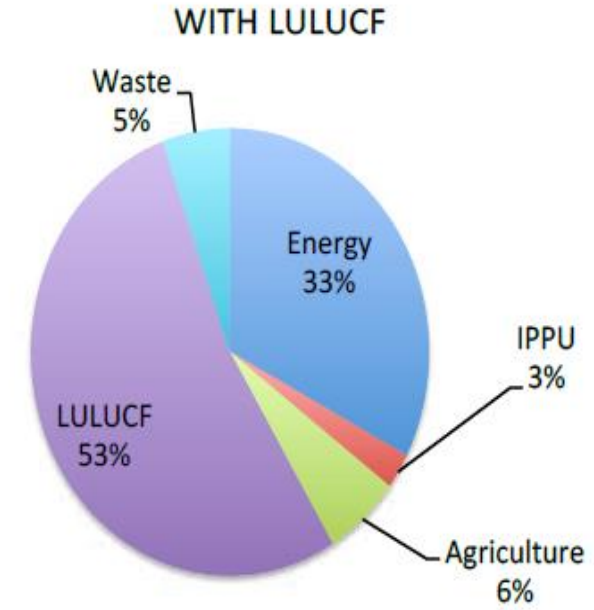


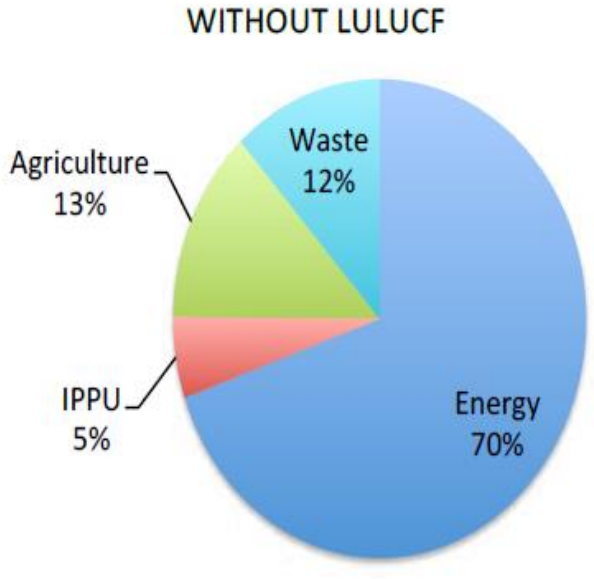
- Annual crop absorb CO_2
- Land and crop management reduce CH_4, CO_2 and N_2O emissions

- Paddy field and livestock (CH_4 emission)
- Peatland (CO_2 emission)

National GHG Emissions in year 2000 and 2014 (Gg CO2e)

No	Sector	Three main gases		All Gases	
		2000	2014	2000	2014
1	Energy	298,412	602,458	298,412	602,458
2	IPPU	42,610	47,449	42,883	47,489
3	Agriculture	99,717	113,440	99,717	113,441
4	LULUCF (Inc. Peat fire)	505,368	979,422	505,368	979,422
5	Waste	61,351	101,560	61,351	101,560
Total without LULUCF		502,090	864,907	502,363	864,948
Total with LULUCF & peat fire		1,007,458	1,844,329	1,007,731	1,844,370





Source: MoE, 2017

achievement of target (in percentage)

Sector	Emission Reduction Target by 2020[1]		Emission Reduction Target by 2030[2]	
	26% (Unconditional)	41% (Conditional)	29% (Unconditional)	38% (Conditional)
Forestry and peatland	87.62	87.38	59.31	60.15
Waste	6.26	6.56	1.31	2.61
Energy and Transportation	4.95	4.71	37.93	36.61
Agriculture	1.04	0.93	1.10	0.34
Industry	0.13	0.42	0.34	0.29
Total	100.00	100.00	100.00	100.00

Source: [1]Presidential Regulation No.61/2011, [2]MoEF (2016)

Adaptation actions in agricultural sector based on various studies

Sector	Adaptation Options		Source
Agriculture	Irrigation technology	7	Sumaryanto (2012); Surmaini et al.
	Improve farmer activities	3	(2010); Lamid (2011); Foerster et al.,
	Use of superior varieties	3	(2011); Sakya & Mahardhika (2010); IFC
	Climate Insurance	2	(2009); Kartikasari et al. (2015); Ruminta
	Develop varieties tolerant	2	& Handoko (2012); Syaukat (2011);
	Increasing crop productivity	2	Lassa, Mau, Li, & Frans (2014); Muslim
	Adjustment of plant season	2	(2013); Supriadi & Heryana (2011);
	Land expasion	2	Maulidah, Santoso, Subagyo, & Rifqiyyah
	Food diversification	1	(2012); Muslim (2013). Surmaini et al.
	Global partnership	1	(2010); Rachmiati et al. (2014)
	Reducing food consumption	1	
	Modification of planting media	1	
	Crop replanting	1	
	Simulation technology		
	Forecast harvest time		
	Transpotation access	1	
	Climate field school	1	

How to improve or maintain productivity to face CC

Source: MoE, 2017

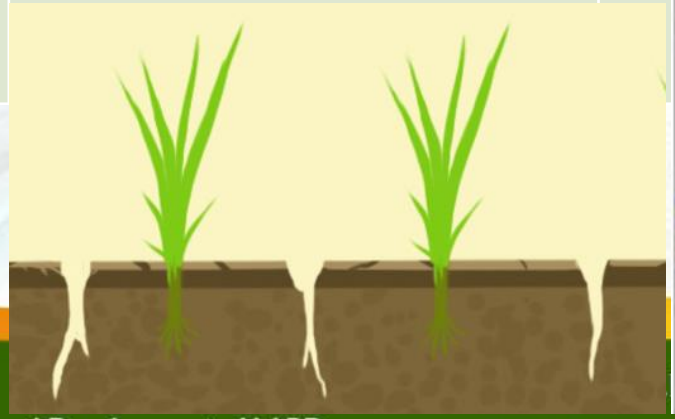
Cropping calendar

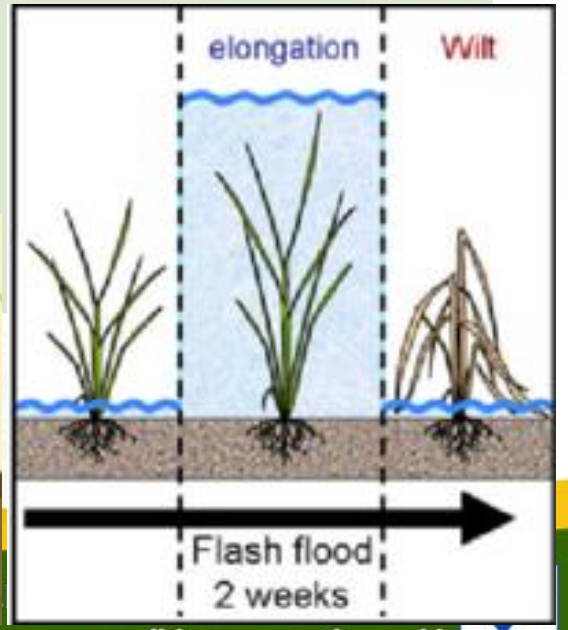
Water harvesting -- embung

Crop insurance

Technologies for Climate Change Adaptation and Mitigation in Rice

Drought tolerant Rice Varieties	Flood tolerant Rice Varieties	Salinity Tolerant Rice Varieties
Inpari 18, Inpari 19, Inpari 20, Inpago 4, Inpago 5, Inpago 6, Inpago 8, Inpago Lipigo 4	Inpari 29, Inpari 30 Ciherang Sub-1, Inpara 4, Inpara 5	Inpari 34 Inpari 35





GHG mitigation from agricultural sector

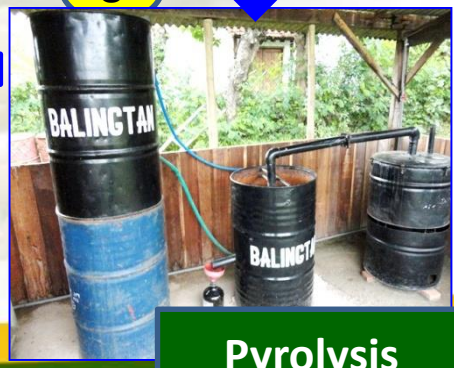
1. Production must increase!

2. Low GHG emission

Integrated crop-livestock system

Yield

Residue



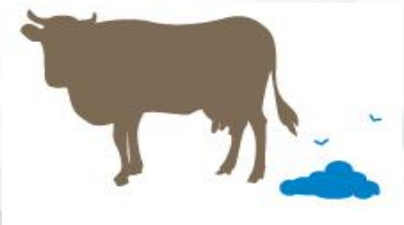
Biochar

- ✓Low CH_4 emitting rice cultivar
- ✓Pulse irrigation
- ✓Leaf color chart

Integrated crop-livestock

Water managements	Rice varieties	Yield (t/ha)	GHG emissions (t CO_2-e/ha)	Emission Index (t CO_2-e/t yield)
CF	Ciherang	3,26	4,56	1,40
	Inpari 30	3,18	5,04	1,58
	IPB3S	3,20	4,18	1,31
Intermittent irrigation	Ciherang	3,11	2,90	0,93
	Inpari 30	3,21	2,58	0,80
	IPB3S	2,95	3,26	1,11

Intermittent irrigation reduced CH_4 emission around 30-47%



Cow dung were kept in bio-digester

Sludge production was around 2 kg/day or 730 kg/year → additional income

The profit from cattle and manure management:

1. Weight gain of the cattle
2. Biogas could reduce CH_4 emission around 1231 ton CO_2e/year
3. CH_4 capture that converted into LPG was around Rp 4.399.200,- (315 USD)

Global Warming Potential from intensive rice farming system

Treatments	GWP (t CO_2-eq/ha)				Total of GWP (t CO_2-eq/ha/year)	Yield (t/ha/year)	Index of yield/ GWP
	PS I	PS II	PS III	PS IV			
Conventional	8.3	7.9	10.6	11.5	38.4	18.8	0.49
Conventional-intermittent	4.7	5.6	7.8	7.3	25.8	20.7	0.80
ICM-continuous flooded	5.4	7.6	10.5	10.8	34.4	20.4	0.59
ICM-intermittent	3.4	4.3	8.0	6.6	22.4	20.8	0.93
SRI-intermittent	3.4	6.5	7.3	3.3	20.4	12.1	0.59
Semi SRI-intermitternt	5.2	5.9	9.0	7.7	28.9	16.9	0.58

Conclusion

- Adaptation co-benefit in paddy rice is needed to explore more in respond to handle high demand of rice and tackle climate change

Thank you,
Terimakasih