Methane Emission Factor Development for Rice Cultivars in Indonesia: A Mitigation Approach

Anggri Hervani

Indonesian Center for Agricultural Land Resources Engineering and Modernization

Ministry of Agriculture

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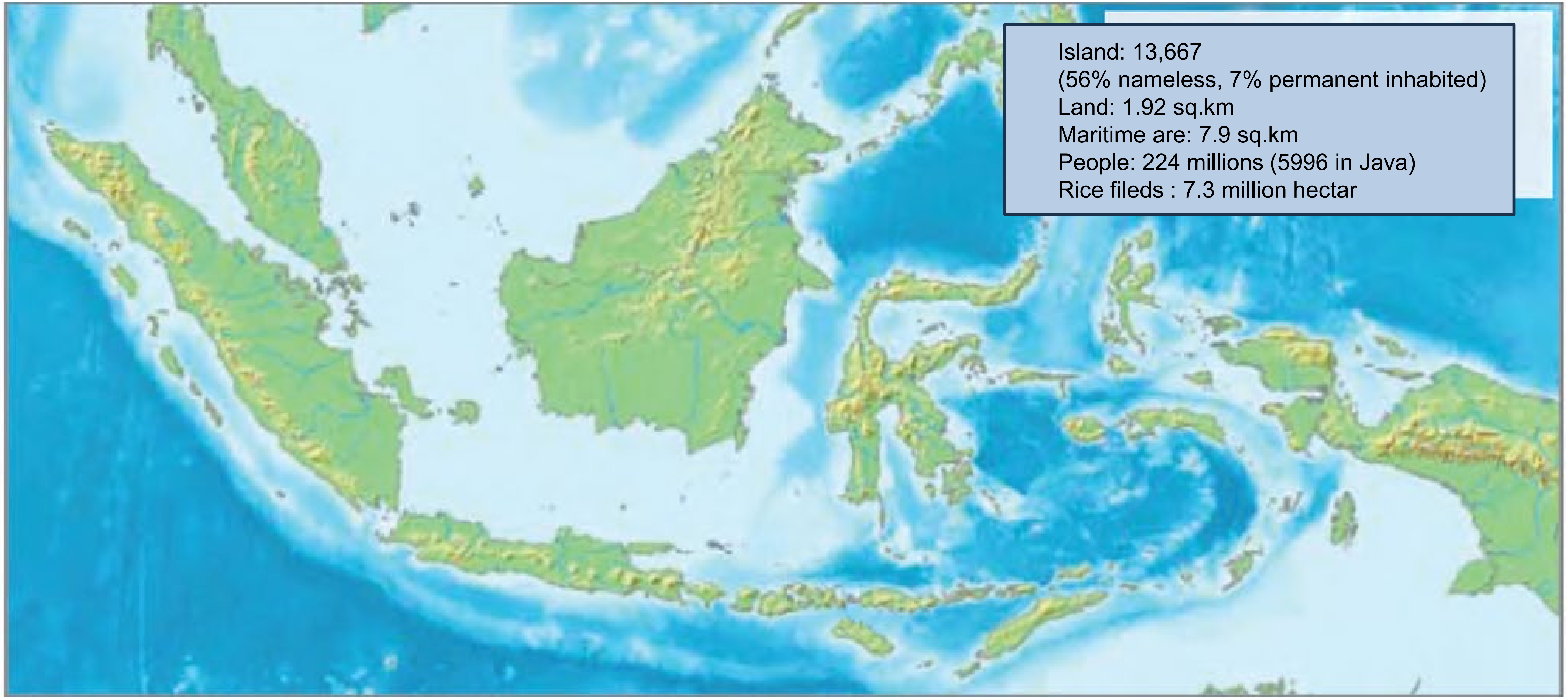
BrMP

KEMENTERIAN PERTANIAN

Map of Indonesia



Introduction

- Indonesia has committed to reduced GHG emissions by 29% with its own efforts and 41% with international support by 2030 in the Updated NDC
- Indonesia has submitted several NDCs,
  - namely the Intended NDC (2015)
  - First NDC (November 2016),
  - Updated NDC (April 2021)
  - Enhanced NDC (2022).
- Currently, Indonesia is preparing its latest NDC called the Second NDC (SNDC).
- The Second NDC will be in line with the global goal of holding the rate of global warming at 1.5 degrees.
- The Second NDC will update the baseline for emission reduction by referring to the 2019 GHG emission level.
- Indonesia also has submitted it's first BTR on 24 December 2024

Enhanced NDC Indonesia

NDC Indonesia has been submitted on September 2022 (Enhanced NDC)

aims

- Re-new the national policy on CC including from Ag sector
- As the requirement of Decision no 1/CMA.3 in Glasgow Para 29, regarding the commitment on increasing the NDC

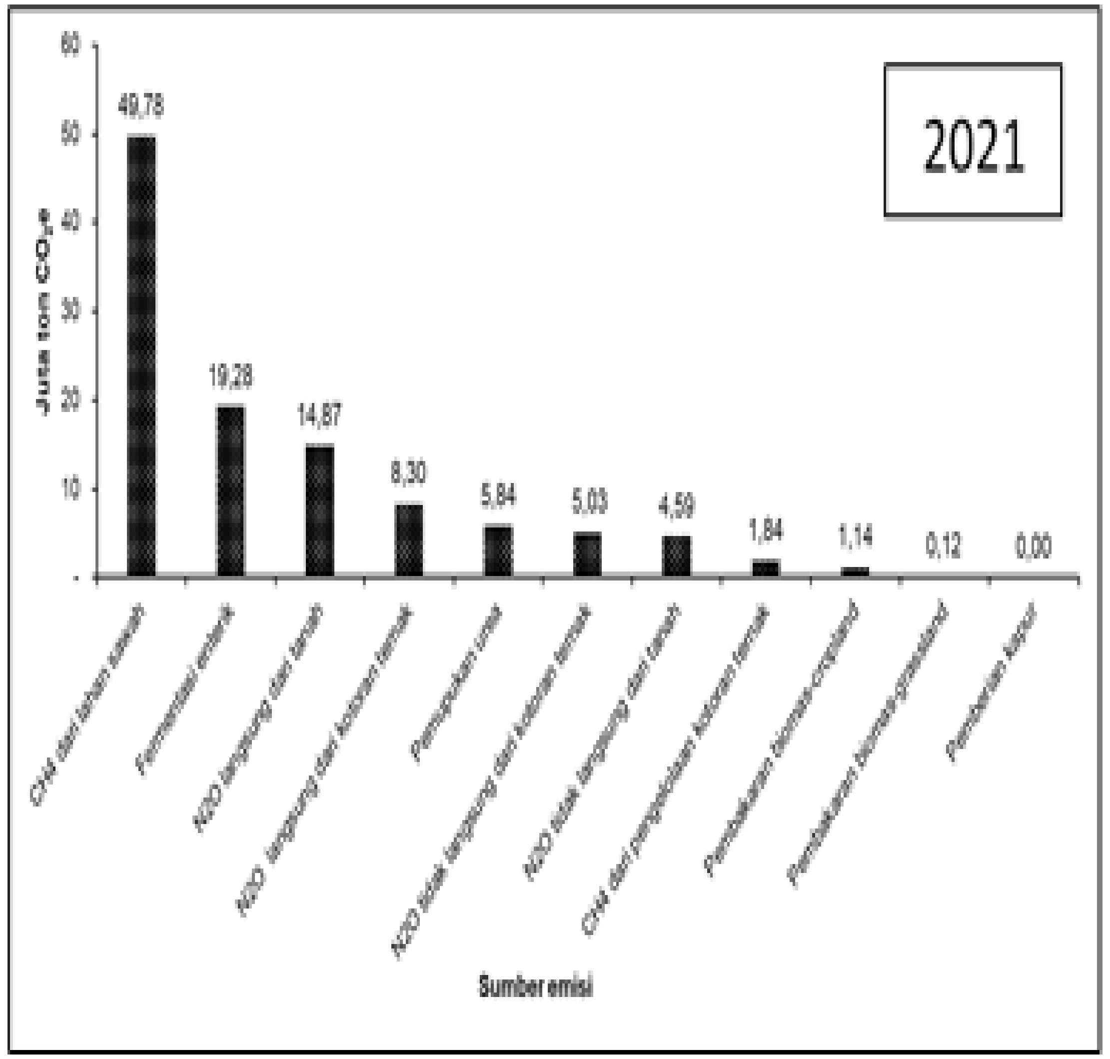
Sector	GHG Emission Level 2010* (MTon CO2-eq)	GHG Emission Level 2030			GHG Emission Reduction				Annual Average Growth BAU (2010-2030)	Average Growth 2000-2012
		MTon CO_2-eq			MTon CO_2eq		% of Total BaU			
		BaU	CM1	CM2	CM1	CM2	CM1	CM2		
1. Energy*	453.2	1,669	1,311	1,223	358	446	12.5%	15.5%	6.7%	4.50%
2. Waste	88	296	256	253	40	43.5	1.4%	1.5%	6.3%	4.00%
3. IPPU	36	69.6	63	61	7	9	0.2%	0.3%	3.4%	0.10%
4. Agriculture	110.5	119.66	110	108	10	12	0.3%	0.4%	0.4%	1.30%
5. Forestry and Other Land Uses (FOLU)**	647	714	214	-15	500	729	17.4%	25.4%	0.5%	2.70%
TOTAL	**1,334**	**2,869**	**1,953**	**1,632**	**915**	**1,240**	**31.89%**	**43.20%**	**3.9%**	**3.20%**

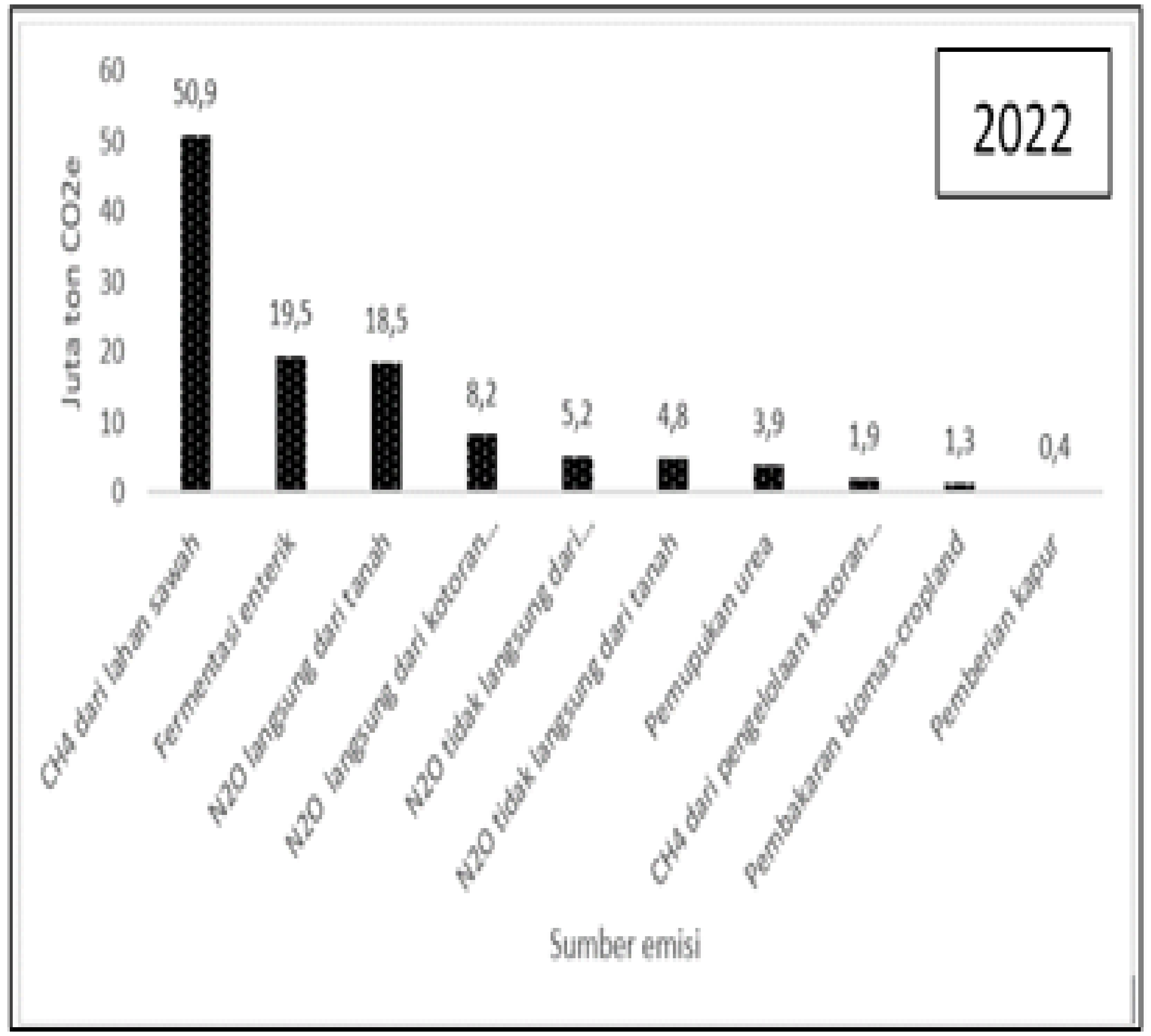
CM1 & CM2

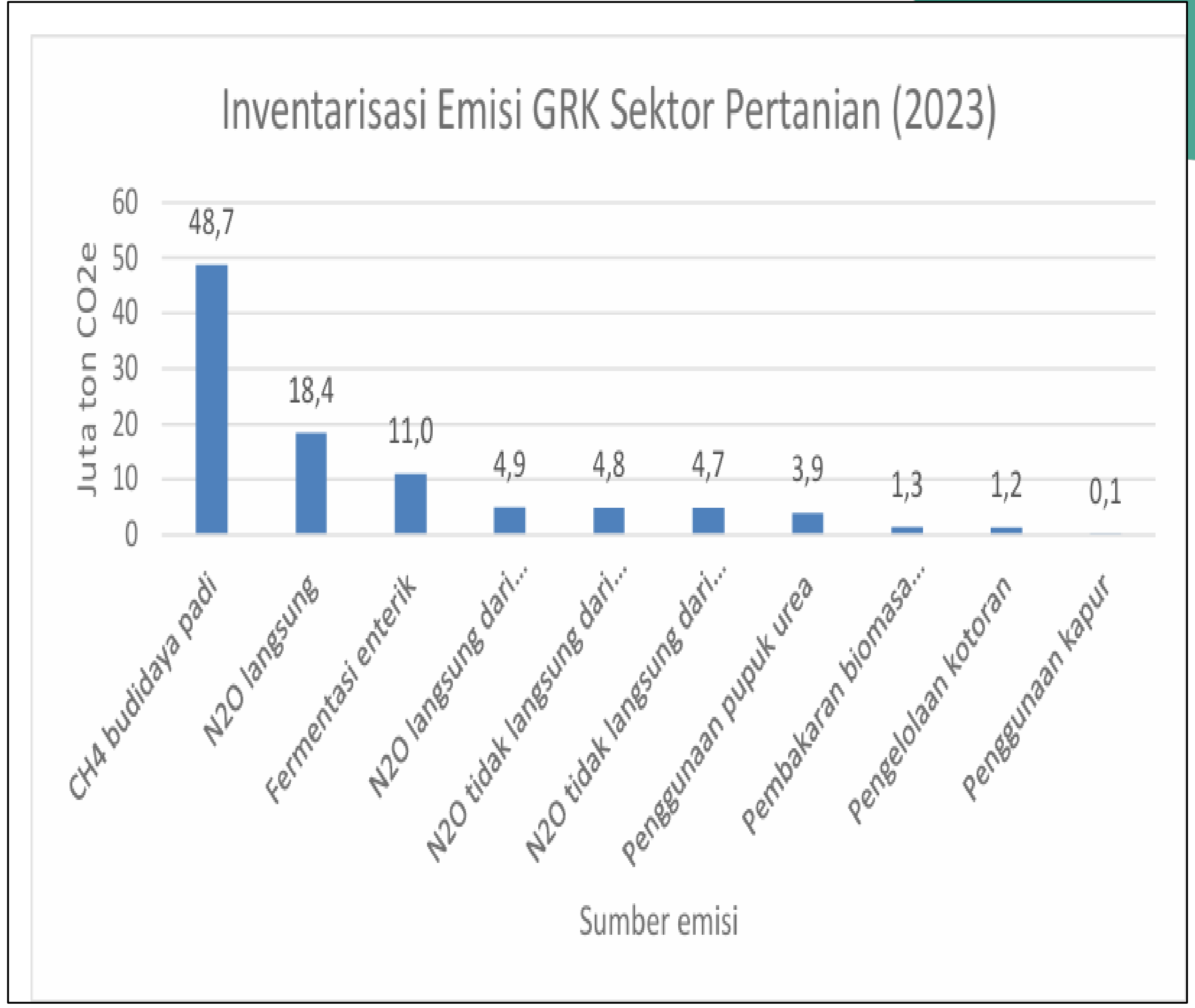
Notes: **CM1**= Counter Measure 1 (*unconditional mitigation scenario*)
CM2= Counter Measure 2 (*conditional mitigation scenario*)

*) Including fugitive.
**) Including emission from estate and timber plantations.

GHG Inventory from Ag Sector







GHG Inventory from Ag Sector from 2021- 2023

Mitigation Action from Ag Sector

Actions	Emission reduction (million ton CO_2e)				
	2019	2020	2021	2022	2023
Biogas	0.103	0.006	0.007	0,004	0,002
Organic Fertilizer Unit, UPPO	0.010	0.006	0.011	0,082	0,005
Organic village	0.004	0.001	0.003	0,003	0,005
Low methane varieties	11.893	12.698	5.624	5,030	3,504
Improving feed quality	0.014	0.057	0.085	0,112	0,201
Balanced Fertilizer	0.208	0.384	0.482	0,492	0,473
Water level management on peatland	7.831	7.831	7.831	7,831	7,831
Carbon Sequestration from annual horticulture				2,063	2,512
Total	**19,54**	**20,98**	**14,05**	**15,62**	**14,53**

Most popular rice cultivars in Indonesia

1960-1970
- PB8 (1967)
- PB5 (1968)

1970-1980
- Pelita 1 (1971)
- Pelita 2 (1971)
- IR36 (1978)

1980-1990
- IR42 (1980)
- Cisadane (1980)
- IR64 (1986)
- Cisokan (1985)
- Ciliwung (1988)

1990-2000
- Memberamo (1995)
- Cilamaya Muncul (1996)
- Way Apo Buru (1998)

2000-2010
- Ciherang (2000)
- Sintanur (2001)
- Cigeulis (2002)
- Cibogo (2003)
- Mekongga (2004)

2010-2020
- Inpari 13 (2010)
- Inpari 30 (2012)
- Inpari 32 (2013)
- Inpari 33 (2013)
- Inpari 42 (2016)
- Inpari IR Nutrizinc (2019)
- Ciherang (2000)

2021
- Inpari 32 HDB (2013)
- Ciherang (2000)
- Mekongga (2004)
- Inpari 42 (2016)
- IR 64 (1986)
- Situ Bagendit
- Inpari 30 Ciherang Sub1
- Inpari 43

NEW RICE CULTIVARS FOR FACING CLIMATE CHANGE

Characteristic	Variety	Yield Potential (ton/ha)	Productivity (ton/ha)
Early Harvested Period (100-105)	Inpari (13, 19) Cakrabuana, Padjadjaran	8,8 - 10,0	5,7 - 6,9
Drought Acidic Soil Tolerance	Inpago (6, 7, 8, 9, 10, 11, 12, 13 Fortiz), Rindang 1, Rindang 2	5,8 - 8,9	4,0 - 6,6
Submergence Tolerance	Inpari 30, Inpara 8, Purwa, Inpara 10	5,6 - 9,6	4,4 - 7,2
Salinity Tolerance	Inpari (34 Salin dan 35 Salin)	5,6 - 8,1	4,4 - 5,1
Brown Plant Hopper Tolerance	Inpari (31, 33, Padjadjaran, Mantap, Arumba, 47 WBC, 49 Jembar), Cakrabuana	8,0 - 9,8	6,8 - 7,1
Bacterial Leaf Blight Tolerance	Inpari (32, 43) Siliwangi, Gemah, HIPA (18, 19, 20, 21)	8,4 - 12,0	6,3 - 8,5
Blas Disease Tolerance	Inpari (38, 39, Cakrabuana, 48 Blas, 50 Marem, Respati)	8,1 - 9,9	5,7 – 7.6
Tungro Disease Tolerance	Inpari (7, 8, 9, 36, dan 37)	9,1 -10,0	6,2 - 6,7

RICE VARIETY FOR PARTICULAR AGRO-ECOSYSTEM

Rainfed Ecosystem

- Inpari 39
- Cisaat
- Inpari 46 GSR TDH

Dry Land

- Inpago 8
- Inpago 12

Swamp Land

- Inpara 2
- Inpara 8
- Inpara 3
- Inpara 10

Saline Land

- Inpari 34 Salin Agritan
- Inpari 35 Salin Agritan

High Land

- Inpari 28
- Luhur 1

GHG Laboratory Facilities

Automatic system for measuring CH_4, CO_2 and N_2O

Automatic chamber for measuring CH_4, CO_2 and N_2O

Shimadzu GC 2014 for analyzing CH_4, CO_2 and N_2O

GC Varian GHG 450 for Analyzing CO_2, CH_4, N_2O simultaneously equipped with auto injector

Manual Sampling – Closed Methode

Assumption for Scaling Factor for Rice Cultivars (SFr):

1. IR 64 cultivars as a baseline to compare with other cultivars
2. Test location was in the same place
3. Soil, water, fertilizer and all amendment were the same condition
4. Single factor only from different cultivars itself.
5. Three replications were used for each cultivars

Cultivars	Plant age (day)	Rice productivity (ton/ha)	Scaling factor (SF_w)
Gilirang	120	6	2,46
Fatmawati	110	6	1,81
Tukad Unda	110	4	1,21
IR 72	120	5	1,1
Cisadane	135	5	1,01
IR 64	110	5	1
Margasari	120	3,5	0,93
Cisantara	115	5	0,92
Tukad Penatu	110	4	0,78
IR 36	115	4,5	0,73
Memberano	110	6,5	0,72
Dodokan	115	5,1	0,72
Way Apoburu	105	5,5	0,72
Tukad Balian	110	4	0,57
Cisanggarung	110	5,5	0,57
Ciherang	115	6	0,57
Limboto	110	4,5	0,49
Wayarem	110	3,5	0,45
Maros	118	6,3	0,37
Mekongga	120	6	1,16

Cultivars	Plant age (day)	Rice productivity (ton/ha)	Scaling factor (SF_w)
IR 42	140	5	1,33
Rokan	110	6	1,52
Inpari 1	108	7,32	1,34
Inpari 6 Jete	116	6,82	1,34
Inpari 9 Elo	125	6,41	1,77
Aromatik	115		1,35
Batang Anai	110	6,4	0,76
Muncul	125		0,63
Mendawak	110	3,98	1,26
BP 360	110	5,39	1,06
BP 205	110		0,97
Hipa 4	116	8	0,98
Hipa 6	110	7,4	1,08
Hipa 5 Ceva	110	7,3	1,6
IPB 3S	110	7	0,95
Inpari 13	99	6,6	0,89
Inpari 18	102	6,7	0,9
Inpari 31	119	6	1,05
Inpari 32	120	6,3	1,22
Inpari 33	107	6,6	0,95

CONSTRAINS AND CHALLENGING

RICE CULTIVARS - THE MITIGATION ON CLIMATE CHANGE AGRICULTURE SECTOR

- Challenging on the historical data activity for rice cultivars planted – area
- New rice cultivars released based on the productivity concern
- Low Market demand of low methane rice
- The MRV need to be developed
- Need to catch up with methane status for new rice cultivars

THANK YOU