Rice Research Activities in Malaysia Related to Climate Change

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Paddy Rice Research Group Meeting
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Bali, Indonesia

PRESENTATION OUTLINE

1. Introduction
2. National Communications
3. GHG Emissions in Malaysia (2014)
4. Malaysian Stock-take
5. Recent Research Activities
6. Research Team Members
7. Research Priorities & Support Needed

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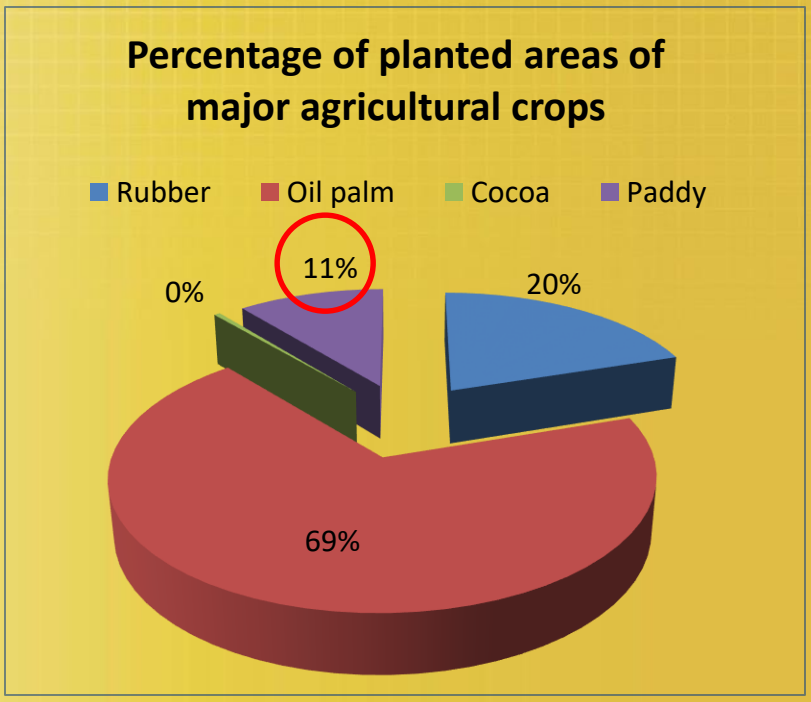
INTRODUCTION – Malaysia

1. Located in Southeast Asia.
2. Consists of West Peninsula Malaysia and East Malaysia (North Borneo).
3. South China Sea (separating East and West Malaysia).
4. Area: 330,803 sq km (2010 estimate)
5. Population: > 30 millions

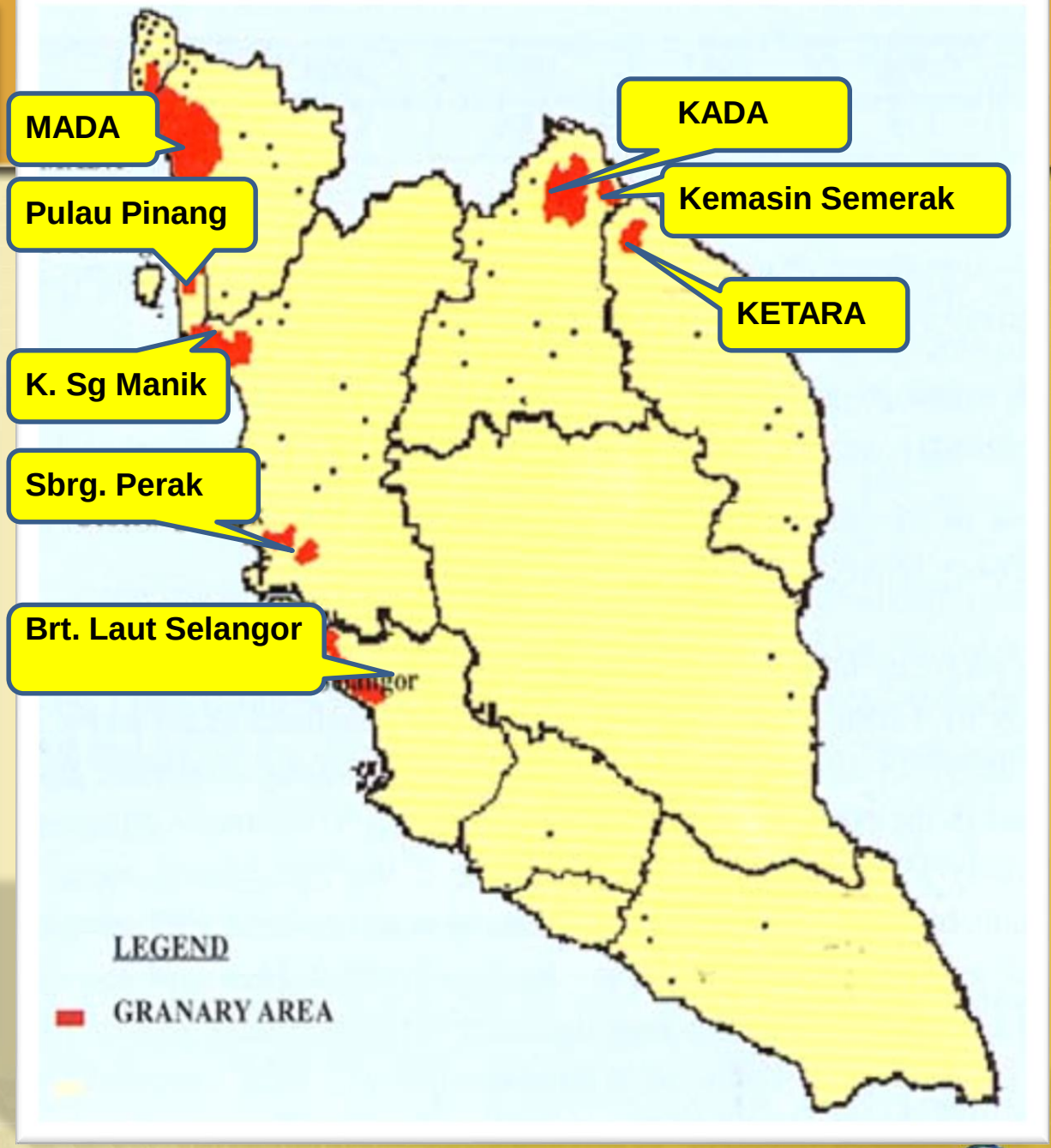
INTRODUCTION: Rice cultivation in Malaysia

- The most important staple crops
- Third most widely planted crop after oil palm and rubber
- Growing area was 688 thousand hectares (2016)
- Total rice production was 2,727 thousand tons (2016)
- Grown mainly under *flood* irrigation

  (8 major irrigation schemes)
- Harvesting is 95% using mechanical harvester
- In irrigated double cropping areas, rice straw was mainly burned to clear the field



Eight major irrigation schemes in Malaysia



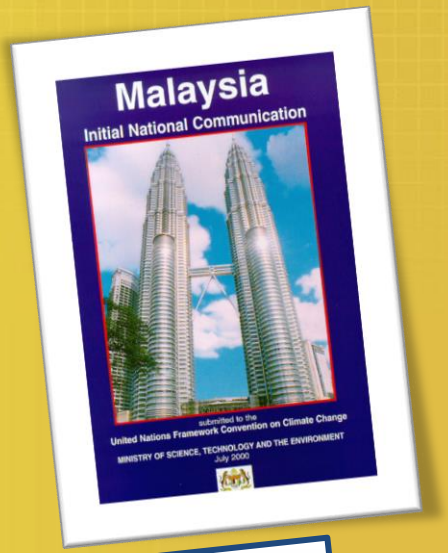
Direct seeding

Transplanting

- Crop establishment: (95% direct seeding and 5% transplanting)

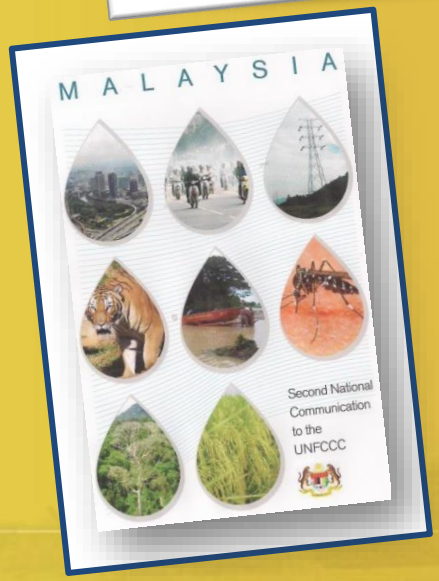
NATIONAL COMMUNICATIONS & BIENNIAL UPDATE REPORT (MALAYSIA)

STATUS FOR INVENTORY



Initial National Communication (INC)

- Tier 1 (IPCC 1995 GL)
- Base year: 1994
- EF for rice: Thailand

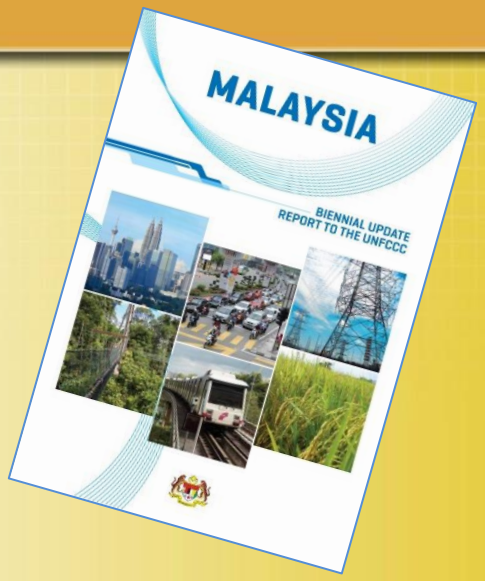


Second National Communication (NC2)

- Tier 1 (IPCC 1996 GL)
- Base year: 2000
- EF for rice: Thailand

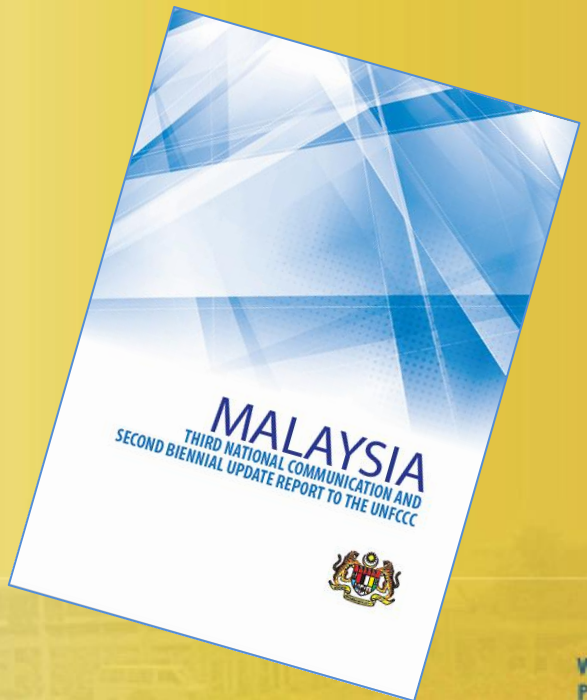
• NATIONAL COMMUNICATIONS & BIENNIAL UPDATE REPORT (MALAYSIA)

STATUS FOR INVENTORY



1st Biennial Update Report

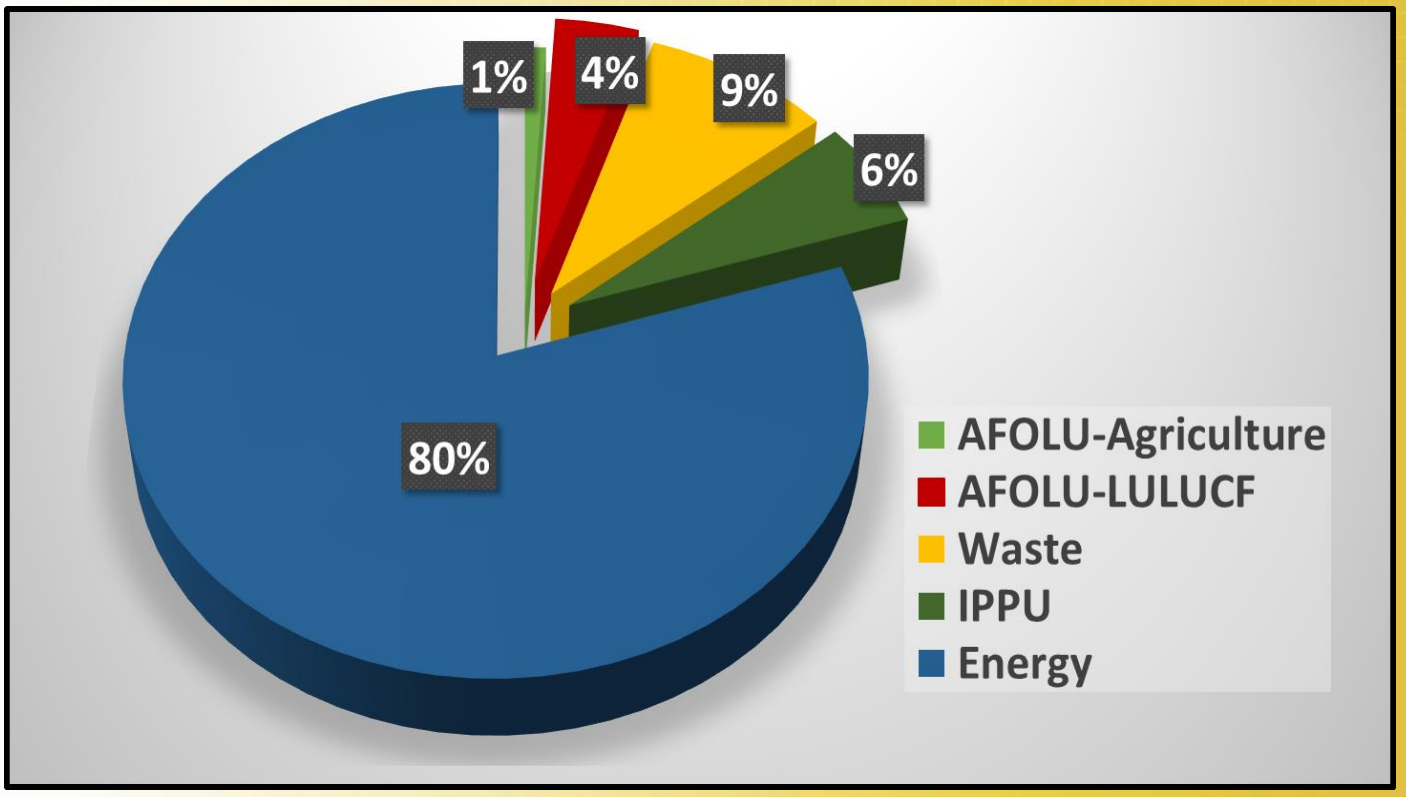
- Tier 1 (IPCC 1996 GL)
- Base year: 2005
- EF for rice: Thailand
- Submitted March 2016



Third National Communication & 2nd Biennial Update Report (BUR2)

- Tier 1 (IPCC 2006)
- Base year: 2005
- EF for rice: Thailand
- Submitted September 2018

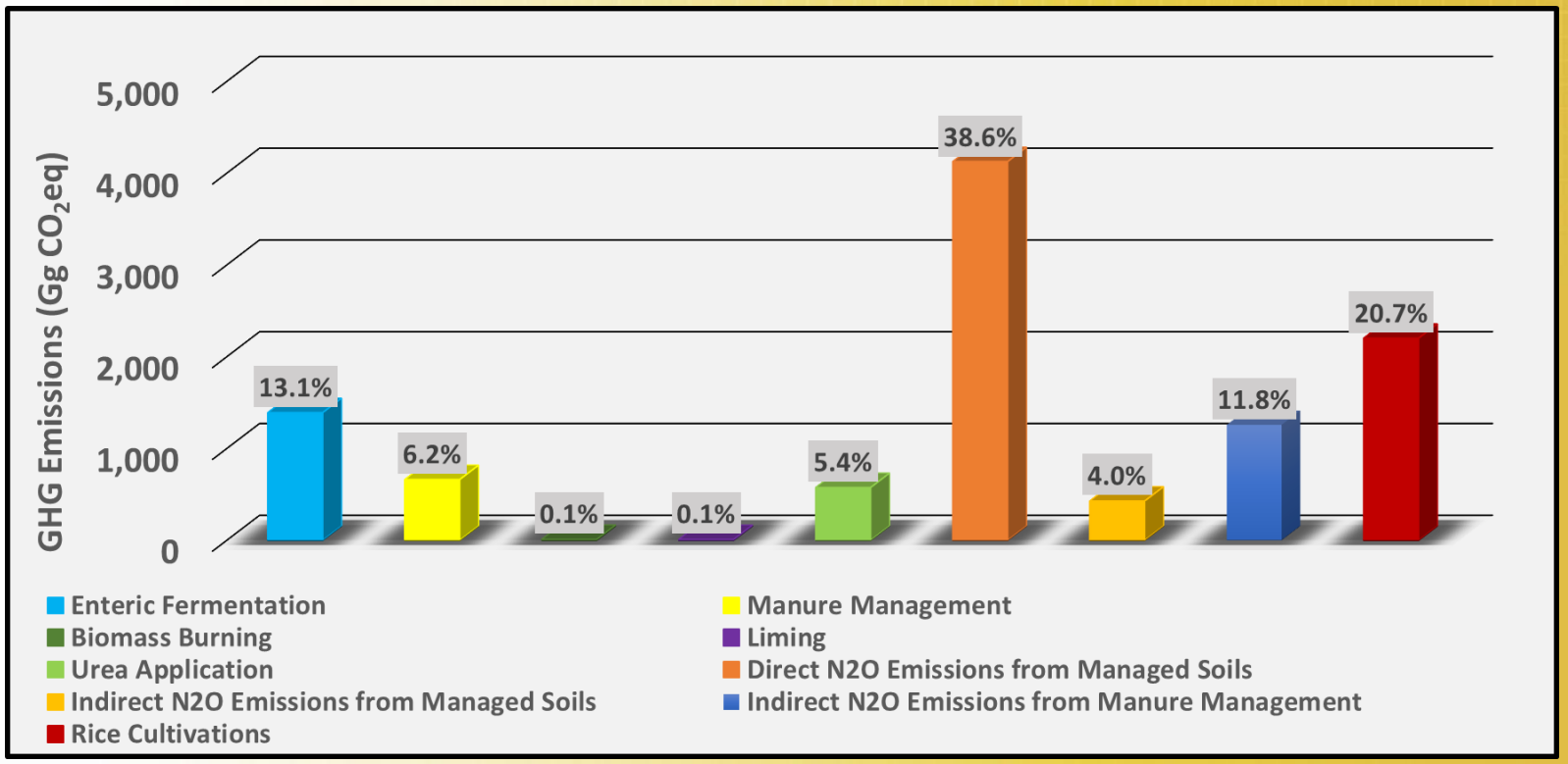
GHG EMISSIONS IN MALAYSIA (2014)



Source: Third National Communication & Second Biennial Update Report, Malaysia (2018)

- Malaysia emitted a total 317,626.83 Gg CO_2 eq from all sectors
- Agriculture sector contribute 4% from all sectors (10,850.77 Gg CO_2 eq)

GHG EMISSIONS OF AGRICULTURE IN MALAYSIA (2014)



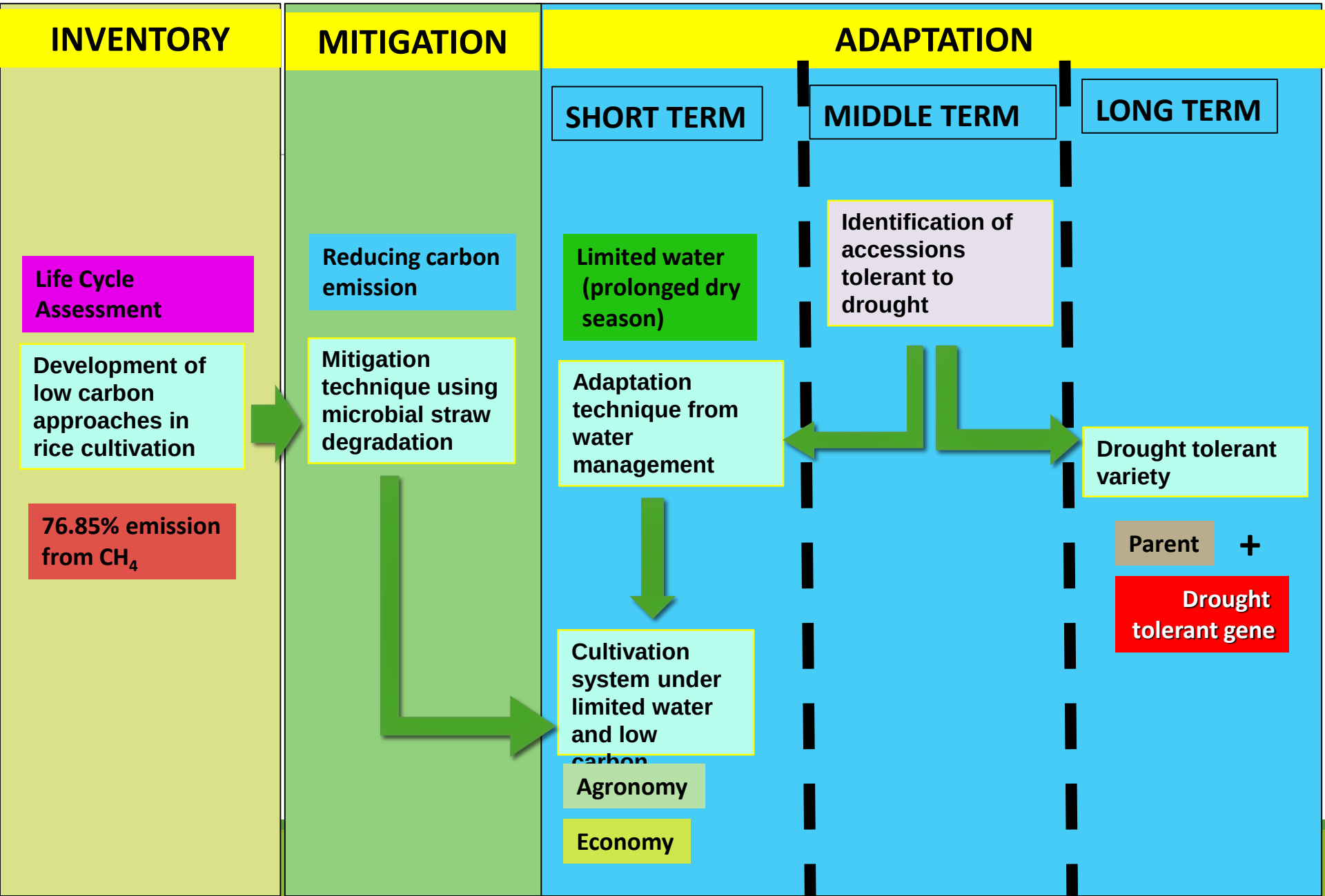
Source: Third National Communication & Second Biennial Update Report, Malaysia (2018)

- Rice cultivation contributes 20.7% from the total agricultural emissions.
- This is equivalent to 2,202.12 Gg CO_2 eq.

MALAYSIAN STOCK-TAKE: Irrigated rice

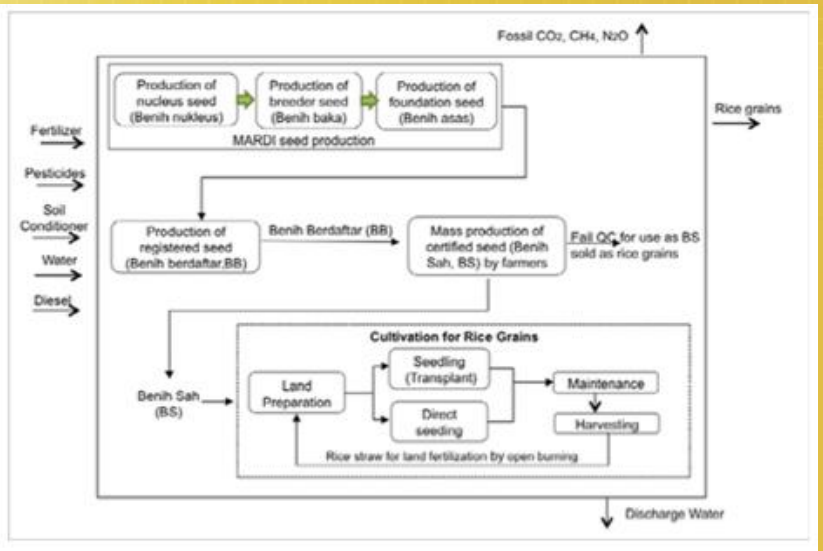
Gas	Topic	Keyword	Primary Outcome	Secondary Outcome
CH_4	GHG accounting / LCA	accounting local emission factors	improved national inventory	development of adaptation & mitigation technologies/ techniques
	Farm systems	quantifying various mitigation option	discovery of mitigation technologies/techniques	development of adaptation & mitigation technologies/ techniques
N_2O	GHG accounting / LCA	accounting local emission factors	improved national inventory	accounting methodologies
	Farm systems	quantifying various mitigation option	discovery of mitigation technologies/techniques	development of adaptation & mitigation technologies/ techniques

CURRENT RESEARCHES IN MARDI



RECENT RESEARCH ACTIVITIES (1)
LIFE CYCLE ASSESSMENT

- Inventory of GHG emissions from rice
- Cradle-to-gate approach
- Comprised of the seed production cycle, energy utilization, CH^4 emissions from field and others
- Foreground and background data
- Straw management as one of the options for mitigation.
- Status: Published



Source: Hariz et al. (2019). System boundary in rice production

Mohammad Hariz A.R., Chen S.S., Putri Razreena A.R, Nurul Ain A.B., Mohammad Shahid S., Norziana Z.Z., Azzami Adam M., Fazlyzan A.B. Fauzi J., Rahiniza K., Shamsul Amri S., Shaidatul Azdawiyah A.T. (2019). Life Cycle Assessment in Conventional Rice Farming System: Estimation of Greenhouse Gas emissions using Cradle-to-Gate Approach. Journal of Cleaner Production, 212 : 1526-1535

RECENT RESEARCH ACTIVITIES (2)

Straw management using substrate + microbes for degradation

- Improves straw degradation during pre-season
- Evaluation of GHG emissions during cultivation
- Closed chamber method
- MARDI Research Stations & field studies

Experiment sites

1. MARDI HQ, Serdang, Selangor
2. Sg. Besar, Selangor

RECENT RESEARCH ACTIVITIES (3)

Rice cultivation under limited water

- Evaluation on the effects of water availabity to the growth of rice (local variety).
- Trial under saturated and normal water condition.
- Evaluation of GHG emissions during cultivation.
- Field studies in Kg Selarung Kedah (north of Peninsular Malaysia)

Experiment sites

1. Kampung Selarung, Kedah

RECENT RESEARCH ACTIVITIES (4)

Identification of accessions and development of drought tolerant variety

- Identification of accessions tolerant to drought.
- Development of drought tolerant variety.
- MARDI Research station (Seberang Perai, north of Peninsular Malaysia)

Experiment sites

1. MARDI Sbg Perai, Penang

GHG Sampling & Analysis

Experimental plot

Gas (15ml) collection from chamber head

Transfer into evacuated glass vial

Analysis of gas at laboratory:
Agilent Micro GC3000 series

RESEARCH PRIORITIES AND SUPPORT NEEDED

Priorities

- Development of local emission factor – improved inventory
- Discover and develop various adaptation & mitigation options for paddy rice – water and straw management

Support Needed

- Capacity building/training – GHG measurement
- Research collaborations – sharing experiences/knowledge

RESEARCH TEAM MEMBERS

- Mohamad Zabawi Abd Ghani: (*Plant Physiology*)
- Mohammad Hariz Bin Abdul Rahman: (*Environmental Engineering)*
- Mohd Fairuz Md Suptian (*Environmental Biology*)
- Fauzi Jumat: (*Plant Nutrition*)
- Shaidatul Azdawiyah Abd Talib: (*Plant Modeling*)
- Nurul Ain Abu Bakar: (Microbiologist)
- Mohd Saufi Bastami: (Environmental Science)

THANK YOU ~Terima Kasih~