MACS-G20
Technical Workshop on Climate Change

"Sustainable Intensification to Meet Food Security and Environmental Objectives"

3-5 August, 2022, Bogor, Indonesia

Country Presentation on Lessons Learned on Climate Resilient (Japan)

Japan International Research Center for Agricultural Sciences

Program Director

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Climate change in Japan

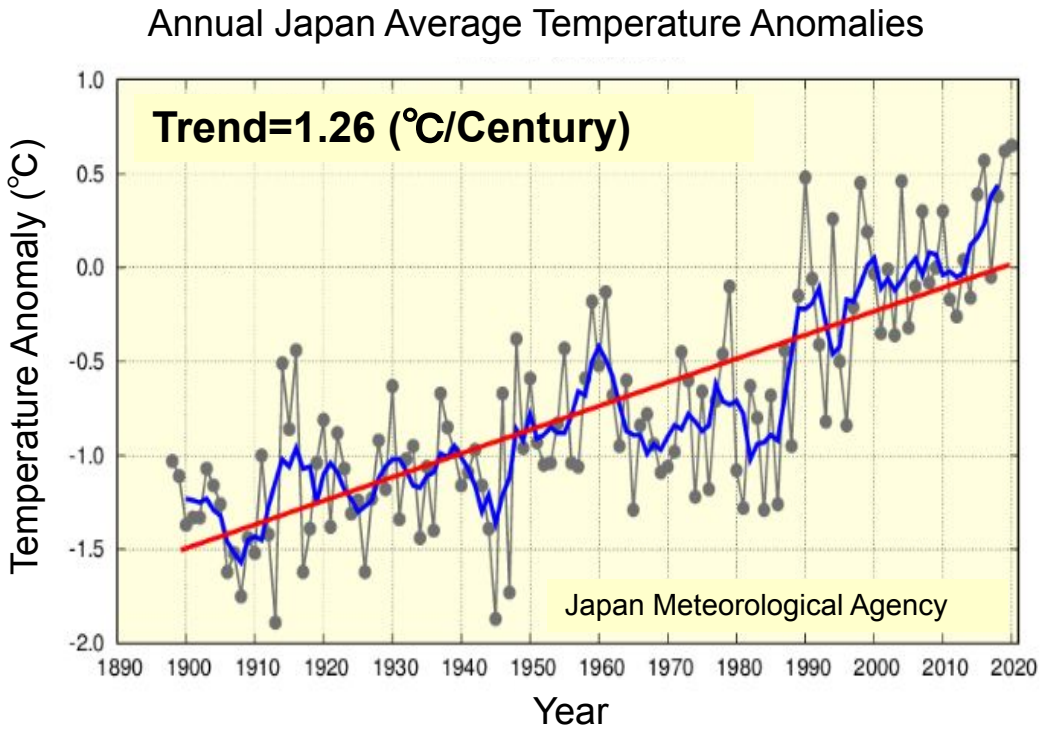


Fig 1. Annual surface temperature anomalies from 1898 to 2020 in Japan

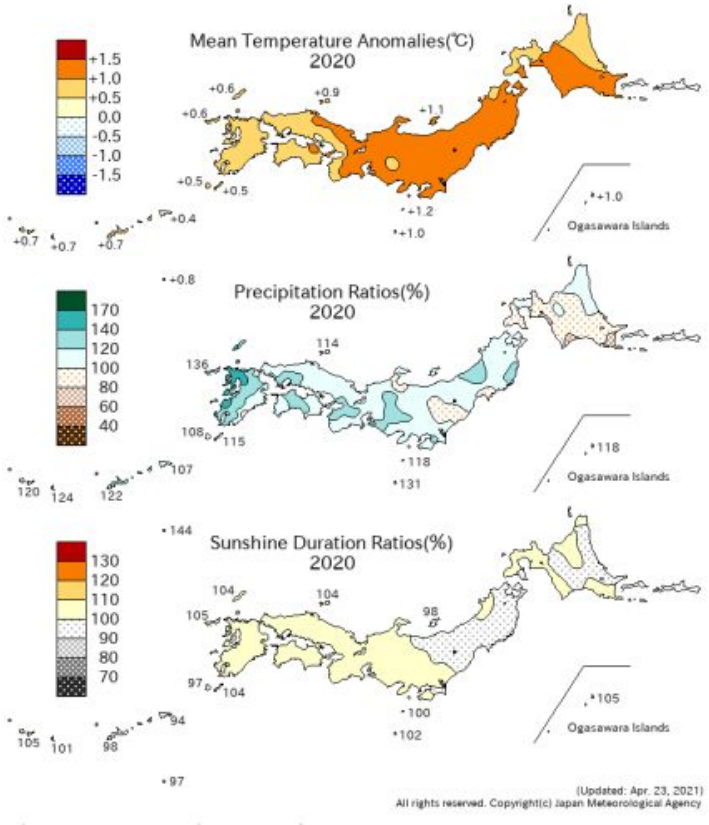


Fig 2. Annual climate anomaly/ratio for Japan in 2020 (the base period for the normal is 1981-2010)

Japan Meteorological Agency (https://www.jma.go.jp/jma/en/NMHS/ccmr/ccmr2020.pdf)

Measures for achievement of Decarbonization and Resilience with Innovation (MeaDRI)

Abstract

~ Innovation will enhance potentials and ensure sustainability in a compatible manner~

MAFF Japan

"MeaDRI," the medium-long term strategy will pave the way for the future.

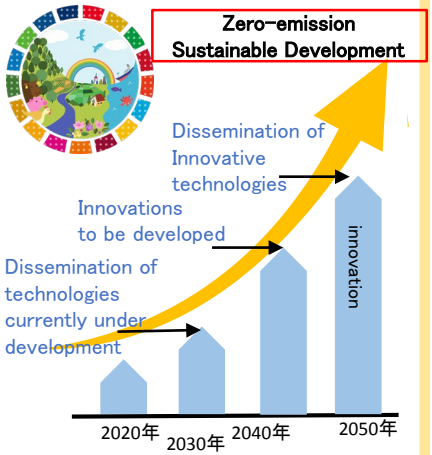
- **Enhancing engagement of stakeholders at each stage of food supply chains**
- **Promoting innovation to reduce environmental load**

Challenges

- Depopulation and aging of producers
- Stagnant rural communities
- Climate change and increasing natural disasters
- Disrupted supply chains due to the COVID-19
- Achievement of SDGs

By 2050, MAFF aims to achieve;

- **Zero CO2 emission** from the agriculture, forestry and fisheries sectors
- **50% reduction in risk-weighted use of chemical pesticides** by dissemination of the Integrated Pest Management and newly-developed alternatives
- **30% reduction in chemical fertilizer use**
- **Increase in organic farming to 1Mha** (equivalent to 25% of farmland)
- **At least 30% enhancement in productivity of food manufacturers** (by 2030)
- **Sustainable sourcing for import materials** (by2030)
- **90% and more superior varieties and F1 plus trees** in forestry seedling
- **100% of artificial seedling rates** in aquaculture of **Japanese eel, Pacific bluefin tuna,** etc.



which will be enabled through:

- development and dissemination of innovative technologies
- greening of MAFF's policy tools

MAFF endeavors to accomplish the triple win of;

Economic sustainability

Ensure robust and resilient food industry

Social sustainability

Improve livelihood, promote balanced diet

Environmental sustainability

Save global environment for the future generation

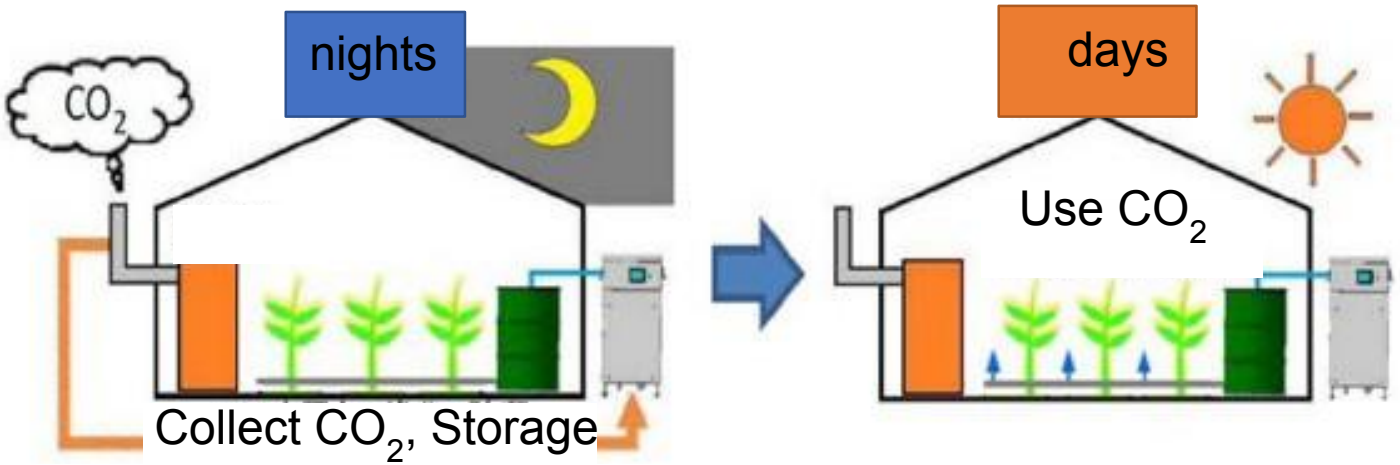
Examples of innovation (1)

2021.5
MAFF

- Zero-emission can also be achieved by innovation .
- Also contributes to save energy and cost.

“Energy-saving” green houses

- Heat-pump, Wood-biomass heating, natural energies
- Data-based cost saving with monitoring and controlling (temperatures/other conditions)
- Increase heat retention with new covering materials
- CO2 collection and reuse of exhaust fumes



Examples of innovation (2)

2021.5
MAFF

Pest diagnosis and pin-point spraying can also reduce pesticide use.

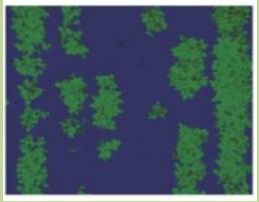
Conventional method

Pesticides are sprayed all over the crop fields

Pin-Point spraying with DRONEs

① Images captured with drones

Images



② Pests are identified with AI use

③ Pin-point spraying with drones

Reduce pesticide use（↓around 10%）

Examples of innovation (3)

2021.5
MAFF

“Keep planting straight” function helps planting with logged water in the fields

- There are technical difficulties using machineries to plant straight in paddy fields filled with water
- “Keep planting straight” function helps planting even with water logged in the paddy fields

Source: Company web site

Automatic operation is available in harvesting with a person assisting

- Automatic operation is available in harvesting with an assistant onboard
- The harvests will be unloaded at the designated point automatically

Source: Company web site

Multiple drainage can cancel out the enhancement of methane emission by biogas effluent application in a rice paddy

GHGs

Production | Demonstration

Crop: Rice

Outline

In a triple-rice cropping system in the Mekong Delta, Vietnam, the combination of multiple drainage and biogas effluent application as fertilizer can reduce methane (CH_4) emission by 11-13% without yield penalty, as compared to the locally conventional practice.

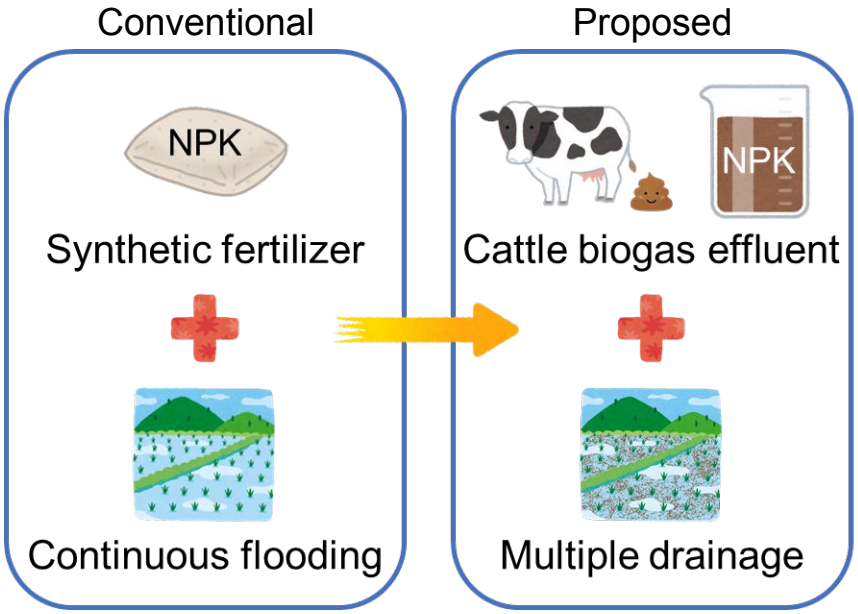


Fig 1 The proposed agronomic practice in the Mekong Delta, Vietnam

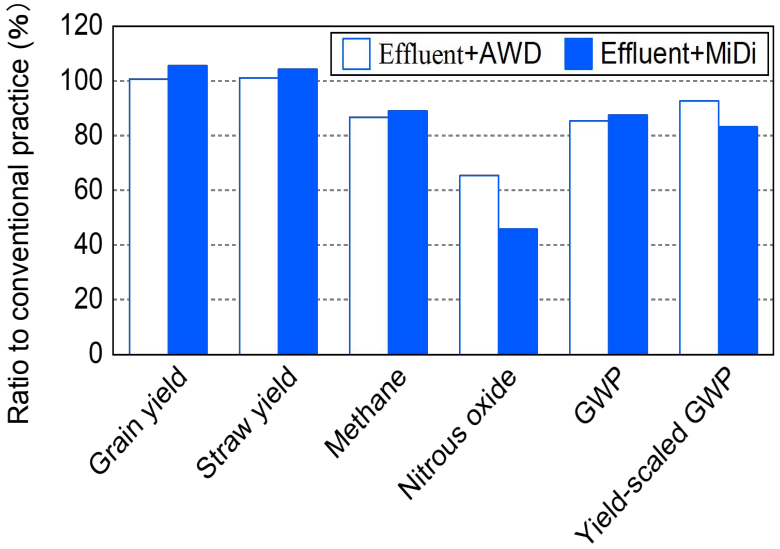


Fig 2 Comparisons between the proposed combination practice and the conventional practice
GWP: CO_2-equivalent of combined CH_4 and N_2O emissions

Details: https://www.jircas.go.jp/en/publication/research_results/2021_a01

Biological Nitrification Inhibition (BNI)-enabled wheat which maintains the yield with reduced nitrogen fertilizer application

GHG & Fertilizer

Production | Demonstration

Crop: Wheat

Outline

BNI was successfully introduced into wheat from wild wheat (Fig. 1). The BNI-enabled high-yielding variety results in 2-fold BNI capacity, suppressing nitrification in the field and reducing environmental load such as N_2O emissions (Fig. 2). Also, the wheat showed improved productivity without a significant reduction in the yield (Fig. 3), grain quality even with a 60% reduction in nitrogen fertilizer application.

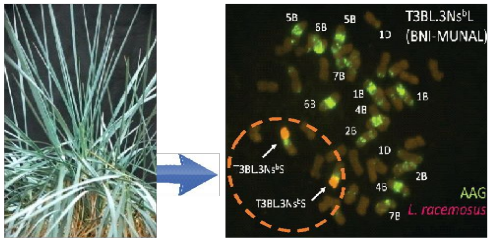


Fig. 1. BNI-enabled wheat with *Leymus racemosus* N chromosome (ex. BNI-Munal)

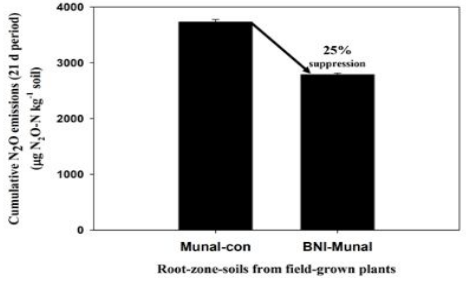


Fig. 2. N_2O emissions from rhizosphere soil

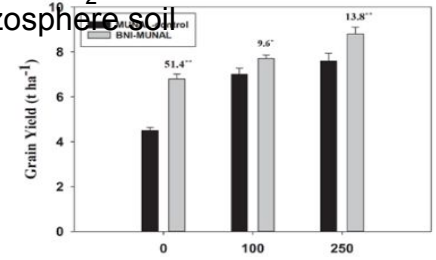


Fig. 3. Grain yield in different nitrogen applications

Details : https://www.jircas.go.jp/en/publication/research_results/2021_a04

Mitigation of methane emissions from Vietnamese local cattle by cashew nut shell liquid feeding

GHGs

Production | Application

Livestock: Beef cattle

Outline

Feeding the Vietnamese local cattle (Lai Sind) with cashew nut shell liquid has an inhibitory effect on methanogen activity in the rumen, and can mitigate enteric CH_4 emission by 20%.

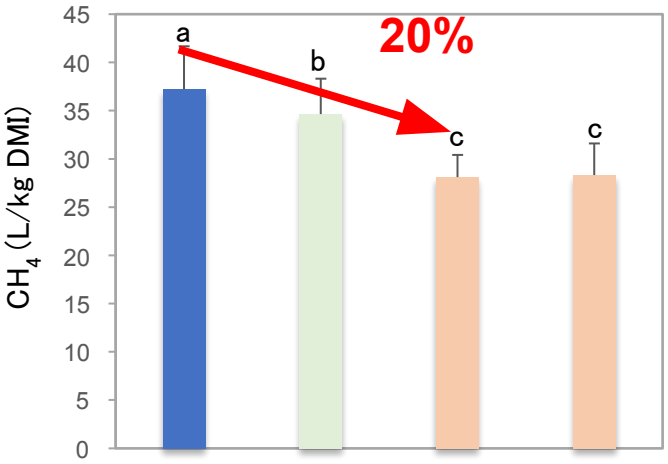


Fig 1. Enteric CH_4 emission

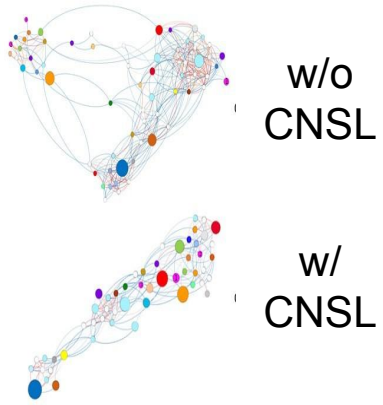


Fig 2. Changes the partners in metabolic relationship

Details:https://www.jircas.go.jp/en/publication/research_results/2020_a01

Sustainable material procurement and utilization for unused biomass discharged from the palm oil industry

GHGs

Procurement | Demonstration

Crop: Oil Palm

Outline

Procurement of sustainable fuel pellets and wood substitutes is achieved by development of Multi-Biomass Treatment Process from unused biomass (oil palm trunks, empty fruit bunches and fronds) discharged from the oil palm industry.

Characterization of each pellets made by Multi-Biomass Treatment Process using oil palm biomass

Properties	OPT pellet	EFB pellet	OPF pellet	MCF pellet
Bulk specific gravity	720 kg/m³	850 kg/m³	800 kg/m³	795 kg/m³
Lower heating value	17,470 J/g	17,920 J/g	17,940 J/g	18,750 J/g
Potassium	<500ppm	1400ppm	900ppm	900ppm
Moisture	8.8%	7.4%	9.4%	4.4%
Mechanical durability	97.1%	98.9%	98.9%	92.6%

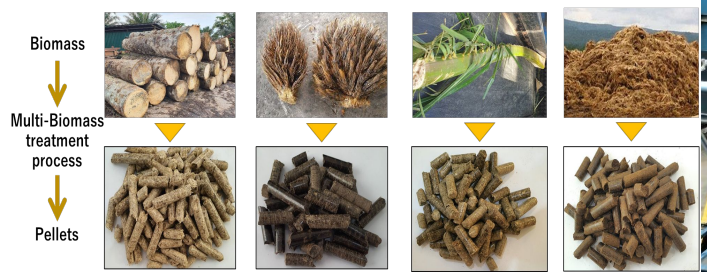


Fig. 1. Biomass pellets are produced by the Multi-Biomass Treatment Process. Sustainable and high-quality pellets can be produced in the same process.

Fig. 2. Demonstration pilot plant in Kluang, Johor, Malaysia.

Details : https://www.jircas.go.jp/ja/publication/research_results/2019_c03
https://www.jircas.go.jp/ja/publication/research_results/2015_c07

A simple shoot-tip grafting method for virus-free passion fruit for practical use at farm level

Agrochemicals

Production | Implementation

Crop: Passion fruit

Outline

A practical technology for virus-free propagation of passion fruit using a simple shoot-tip grafting method has been developed for individual farm level.

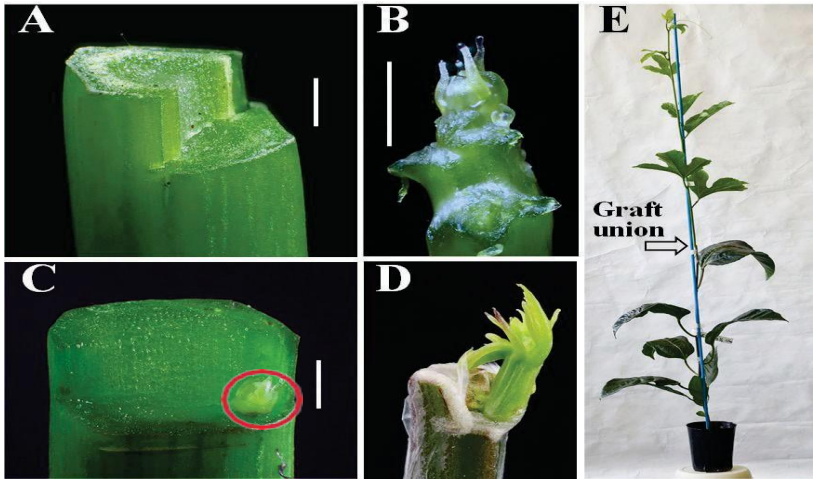


Fig. 1. In vivo shoot-tip grafting of passion fruit (bar=1 mm.

A: Preparation of a rootstock.
B: The shoot-tip is used as a scion (0.2-1.0 mm)
C: The excised shoot-tip attached on the cambium of the rootstock and covered with laboratory film to prevent drying.
D: Sprouting of the scion in about one month.
E: After about two months, the growing scion is ready for virus detection.

Details:
https://www.jircas.go.jp/en/publication/research_results/2021_c02

www.jircas.go.jp