Impact and adaptation assessment on rice yields in Vietnam

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Introduction

- Rice is the most important crop in Vietnam.
- However, there are very few studies on impact assessment on rice production in Vietnam.
  - no studies on adaptation assessment
- Climate-related impacts have already happened across Vietnam.

little water in dam

flooded paddy rice fields

- In order to adapt to the impacts, it is necessary to assess CC impacts and the effect of adaptive options.

Objective

- Assess the future climate impacts on rice production in Vietnam
- Assess the effects of adaptations
  - ✓using future climate projections and a crop growth simulation model

No	Menu		Cost	Effect	Actor			
					Gov.	Scientist	Farmer	Company
1	Change in variety (existing variety)	Easy	Low	Low			√	
2	Change in agricultural management (e.g., planting date, fertilizer, etc.)		Low	Int.			√	
3	Change in planting crop		Low	Int.			√	
4	Real time monitoring system		Int.	Int.	√	√		(√)
5	Early warming system		Int.	Int.	√	√		(√)
6	Seasonal forecasting system		Int.	Int.	√	√		(√)
7	Climate and agricultural insurance		int.	Int.	(√)		√	√
8	Change in variety (new variety)		Int.	High	√	√	√	√
9	Change the postharvest system		Int.	High	√		√	√
10	Development of irrigation system		High	High	√			√
11	Land use change	Difficult	High	High	√			√

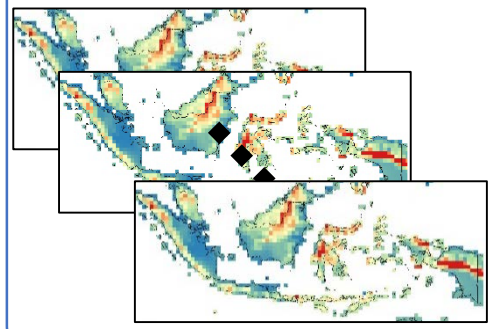
Category： Agricultural technology | ICT and smart agriculture | Agricultural finance | Infrastructure

Three adaptive options:
1. High temp. tolerant variety
2. Drought tolerant variety
3. Irrigation system

Method

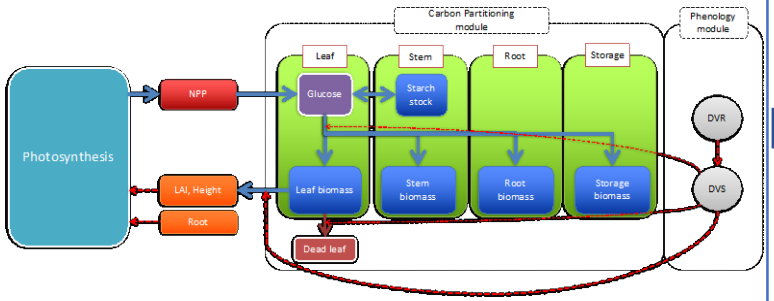
①Input

Future climate projections



②Impact model

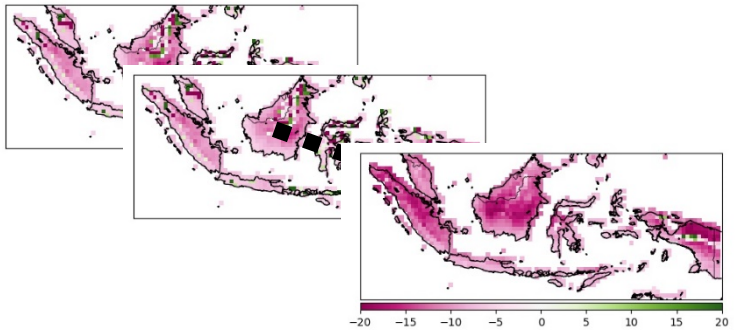
Crop Growth Simulation Model : MATCRO



Masutomi et al. (2016a,b)

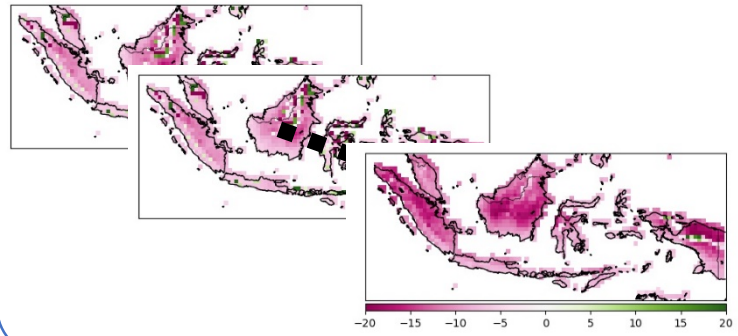
③Impact (no adapt.)

Change in rice yield [%]



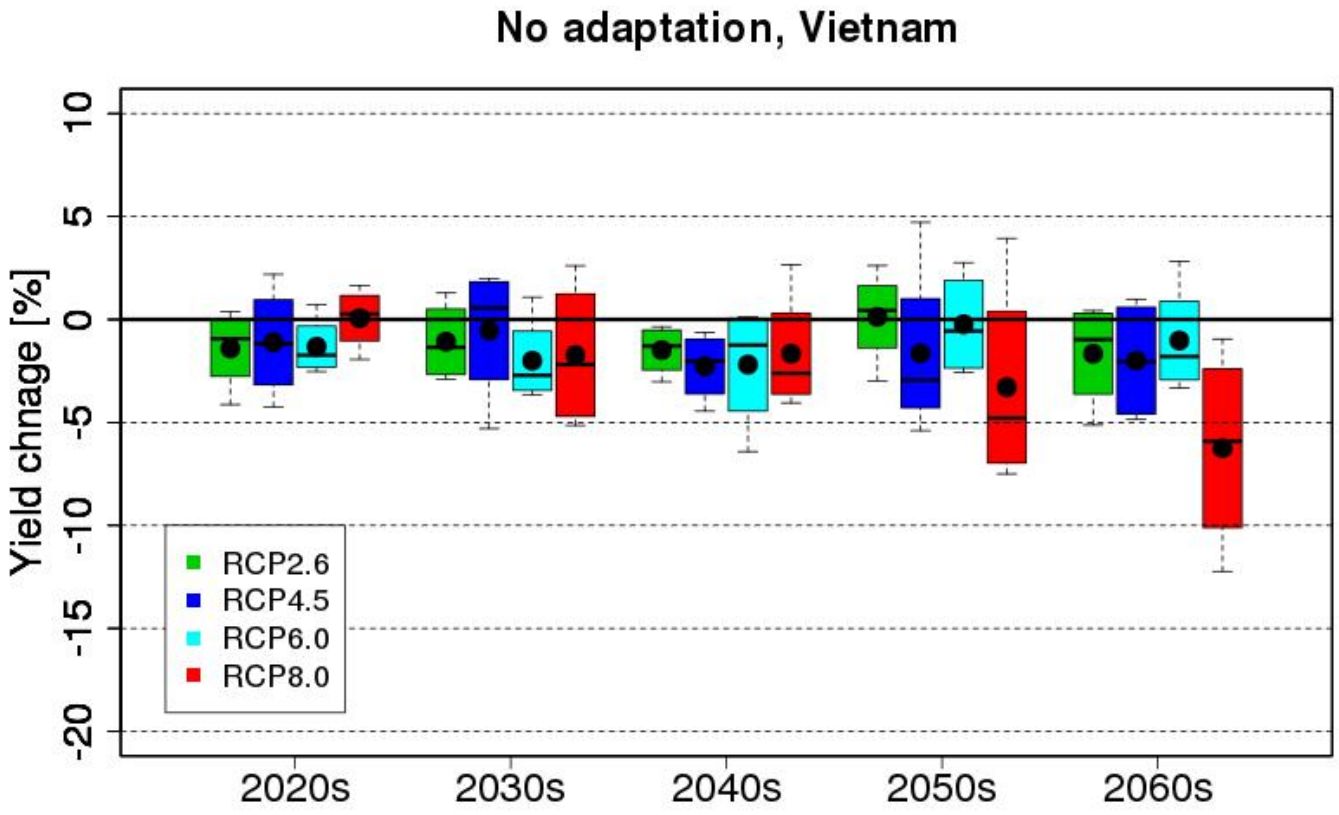
④Impact (with adapt.)

Change in rice yield [%]



- **Years**: 2010-2069
  Base years: 2010s
  Assessment years: 2020s, 2030s, 2040s, 2050s, 2060s
- **Future scenarios: 16 scenarios**
  - ✓ **4 RCPs**: RCP2.6, RCP4.5, RCP6.0, RCP8.5
  - ✓ **4 GCMs**:HadGEM2-ES, IPSL-CM5A-LR, MIROC5, GFDL-ESM2M

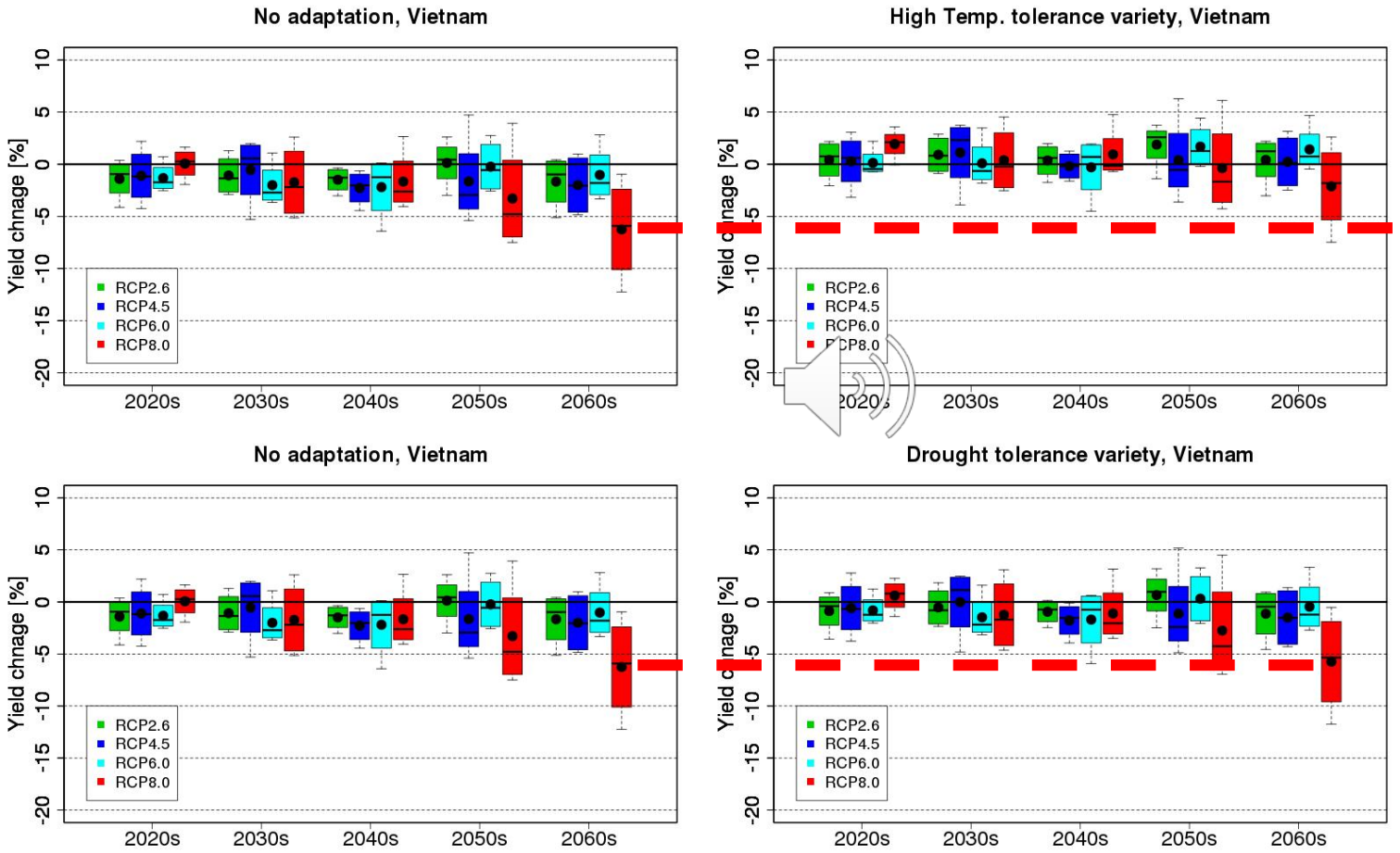
Results: No adaptation



Yield change from 2010s

- RCP8.5 scenario will have the largest yield loss in the 2060s.
- The other scenarios will have small but negative yield loss.
  - ✓ Adaptations should be taken to reduce the negative impacts.

Adaptation (High temp. and drought)



Large effect

Small effect

High Temp. tolerance variety will have a large effect to reduce negative impacts.

Adaptation assessment

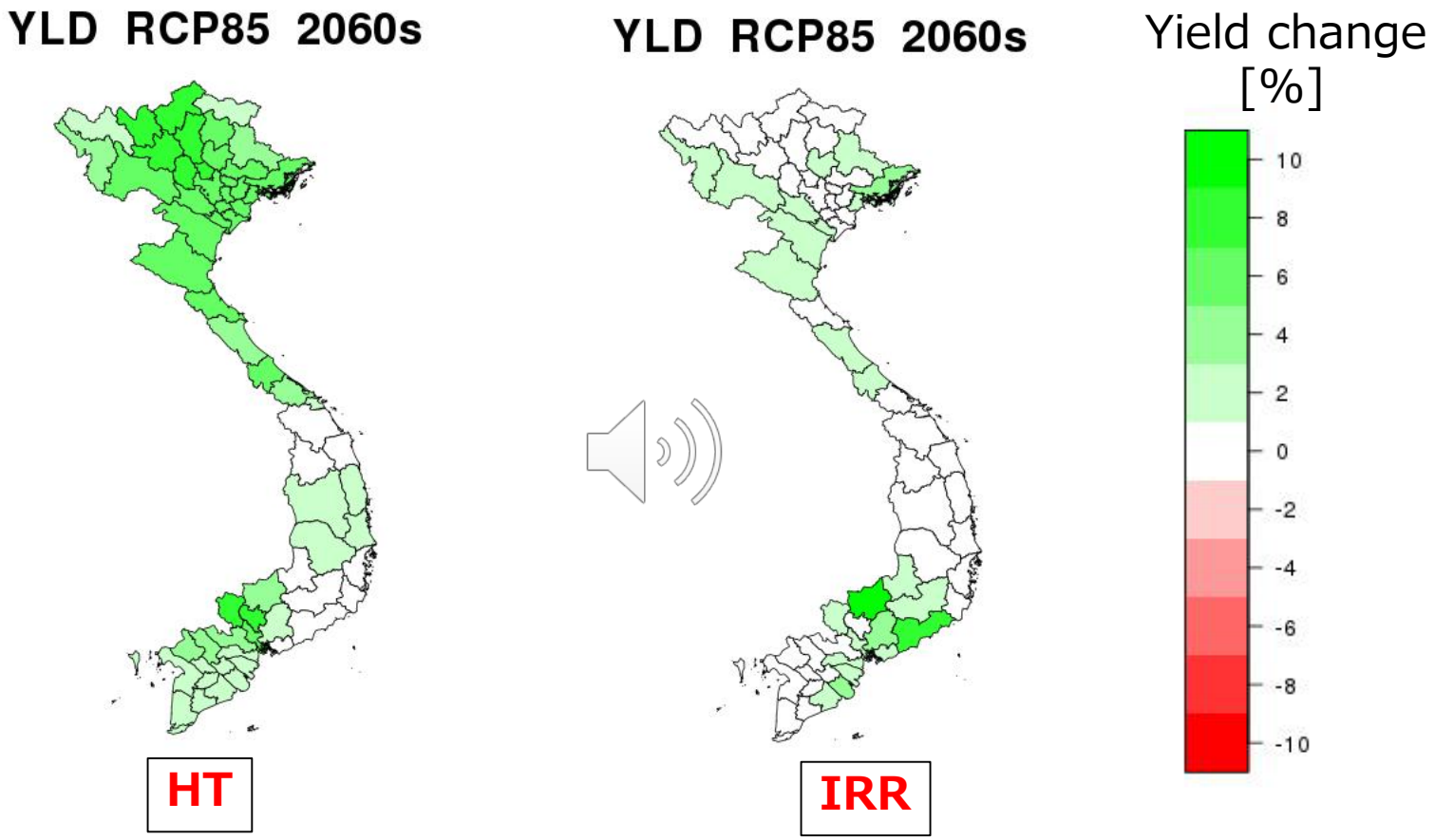
Yield increase by each adaption

RCP	ADPT	2020s	2030s	2040s	2050s	2060s
RCP2.6	HT	1.8	2.0	1.8	1.8	2.1
	DT	0.5	0.6	0.5	0.5	0.5
	IRR	1.3	1.4	1.4	1.3	1.3
RCP4.5	HT	1.4	1.7	2.1	2.0	2.2
	DT	0.5	0.5	0.5	0.5	0.5
	IRR	1.3	1.4	1.3	1.3	1.3
RCP6.0	HT	1.5	2.1	1.9	1.9	2.4
	DT	0.5	0.5	0.5	0.5	0.6
	IRR	1.3	1.3	1.3	1.4	1.4
RCP8.5	HT	1.9	2.1	2.6	2.9	4.1
	DT	0.6	0.5	0.5	0.5	0.5
	IRR	1.4	1.3	1.4	1.4	1.3

HT: High temp. tolerant
DT: Drought tolerant
IRR: Irrigation system

High Temp. tolerant variety will have a large effect to reduce negative impacts.

Adaptation (High temp. vs IRR)



- Effects of adaptations are different among provinces.
- Irrigation will have large effect in some provinces.

Summary

- RCP8.5 scenario will have the largest yield loss in the 2060s. The other scenarios will have small but negative yield loss in the 2060s.
  - ➢Adaptations should be taken to reduce the negative impacts.

- High Temp. tolerant variety will have a large effect to reduce negative impacts.

- Effects of adaptations are different among provinces.
  - ➢**It is necessary to identify and take effective adaptative options by provinces.**

Thank you for your attention.