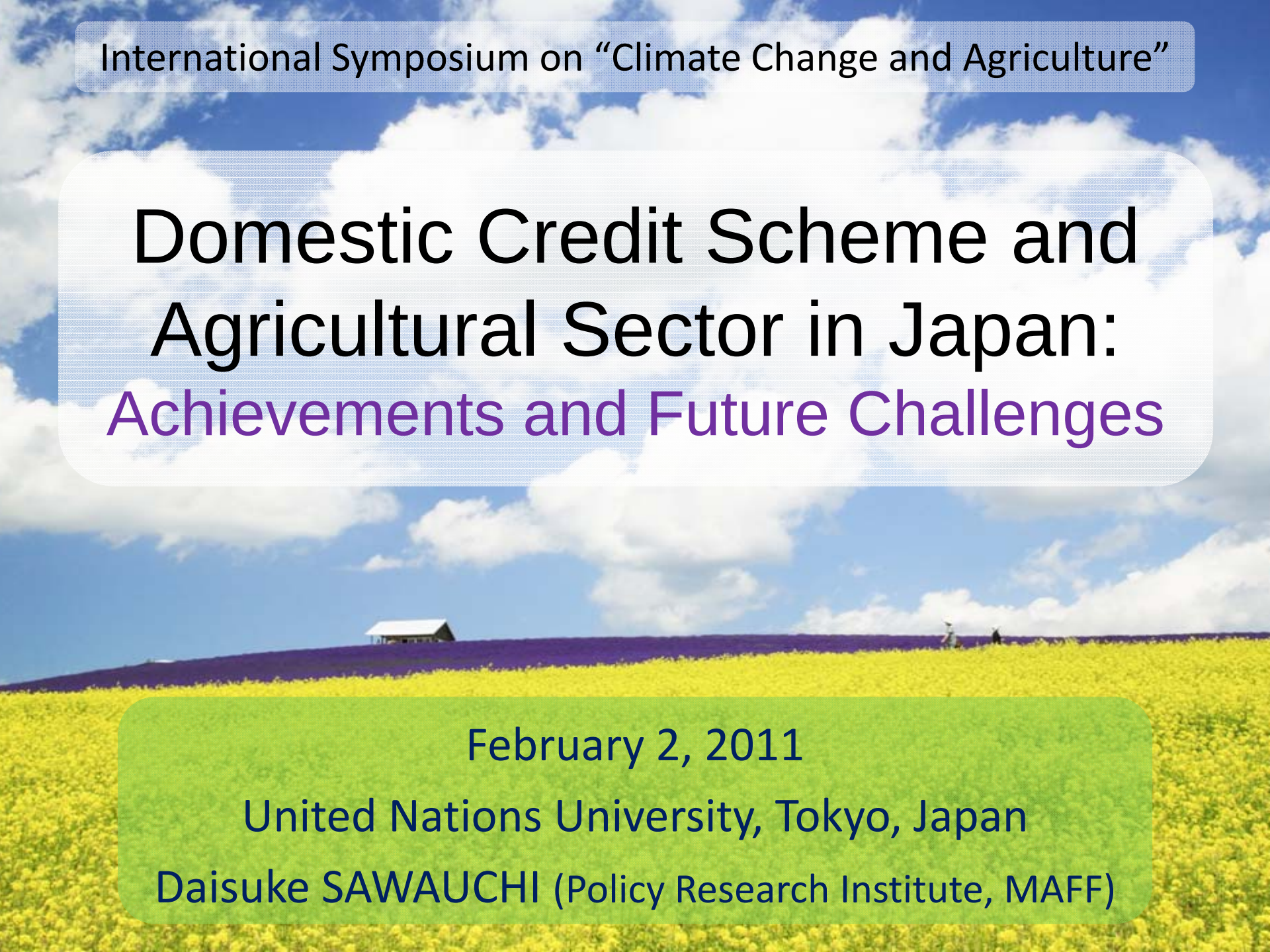
International Symposium on “Climate Change and Agriculture”

Domestic Credit Scheme and Agricultural Sector in Japan:
Achievements and Future Challenges



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Content

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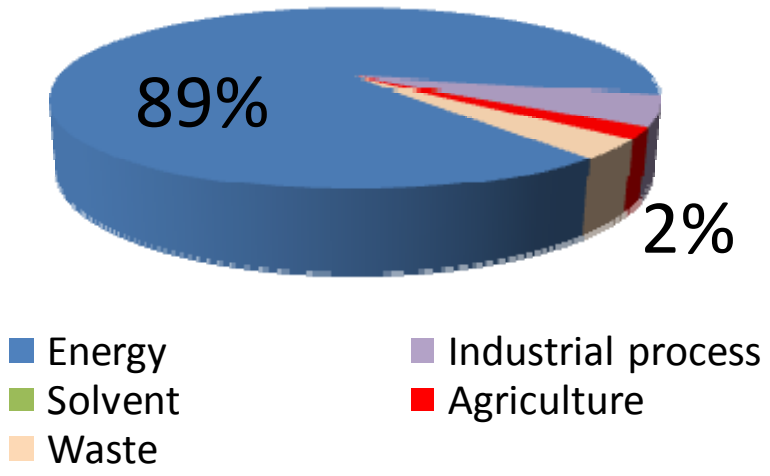
   - Achievements
   - Future Challenges

2. Economic Evaluations of Farmer's Energy Saving Investment
   - Investment and Uncertainty
   - Investment Promotion Effect of the Domestic Credit Scheme

EMISSIONS TRADING SCHEME & AGRICULTURE SECTOR IN JAPAN

GHG emissions from agriculture in Japan

Sectoral GHG emissions (2005)

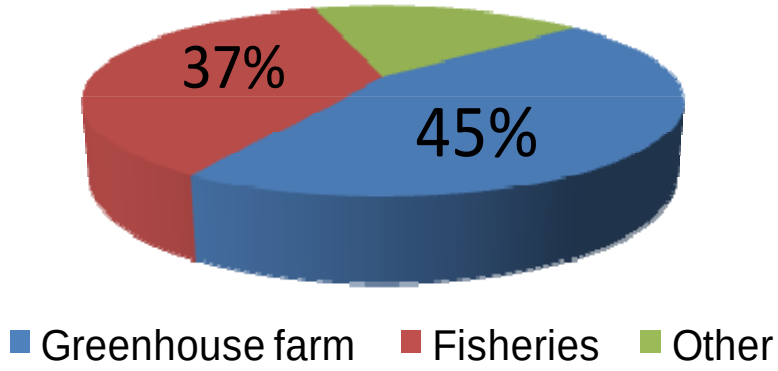


Source) Greenhouse Gas Inventory Office of Japan

- Agriculture accounts for 2% of total GHG emissions.
- Fossil energy use by farms accounts for 1% of total GHG emissions.

- Greenhouse farms accounts for 45% of total GHG emissions from energy use in AFF sector.
- Amount of emissions is increased by 219% from 1990 level.

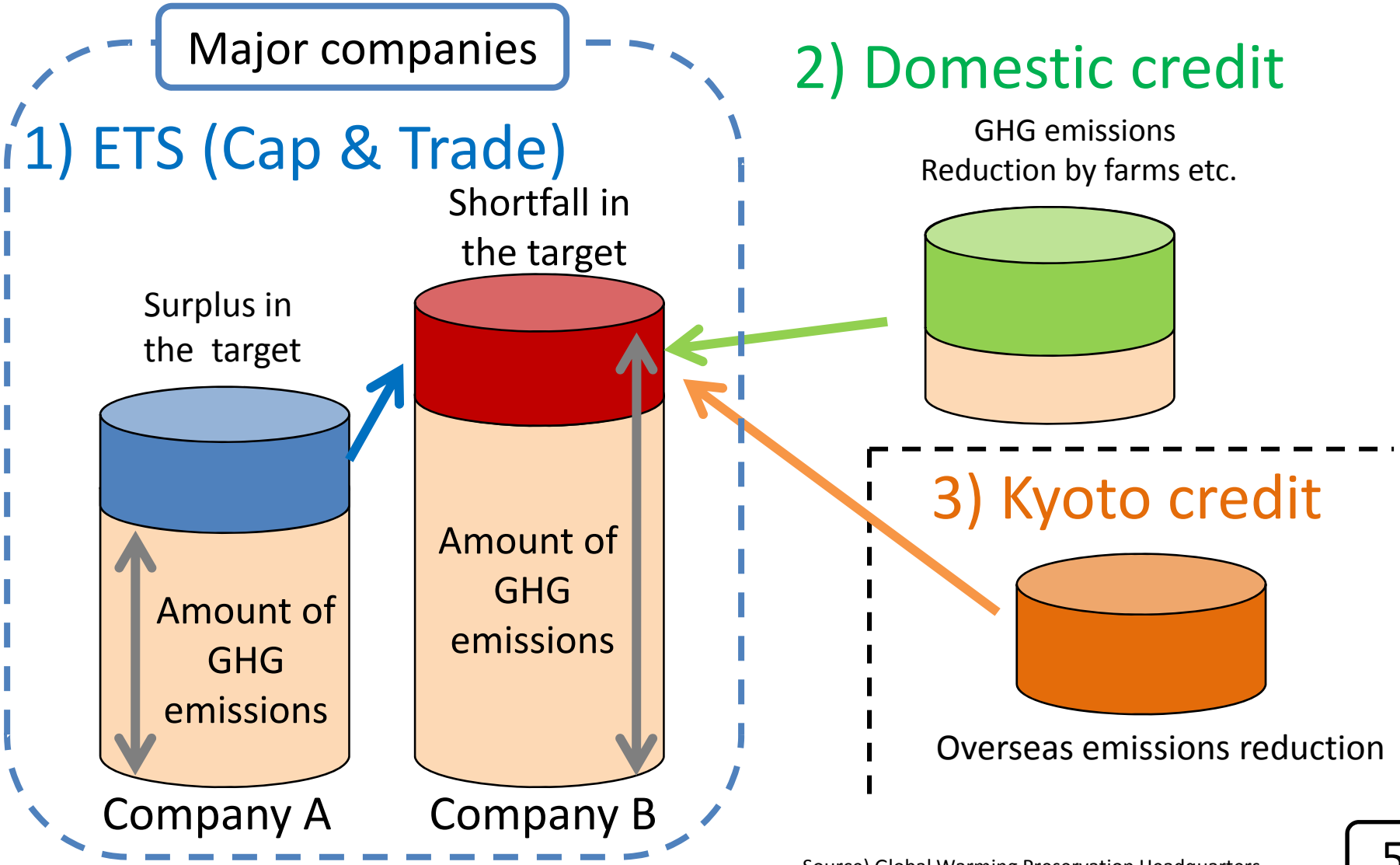
GHG emissions from fossil fuels use by agriculture, forestry and fisheries sector



Source) Oikawa (2007).

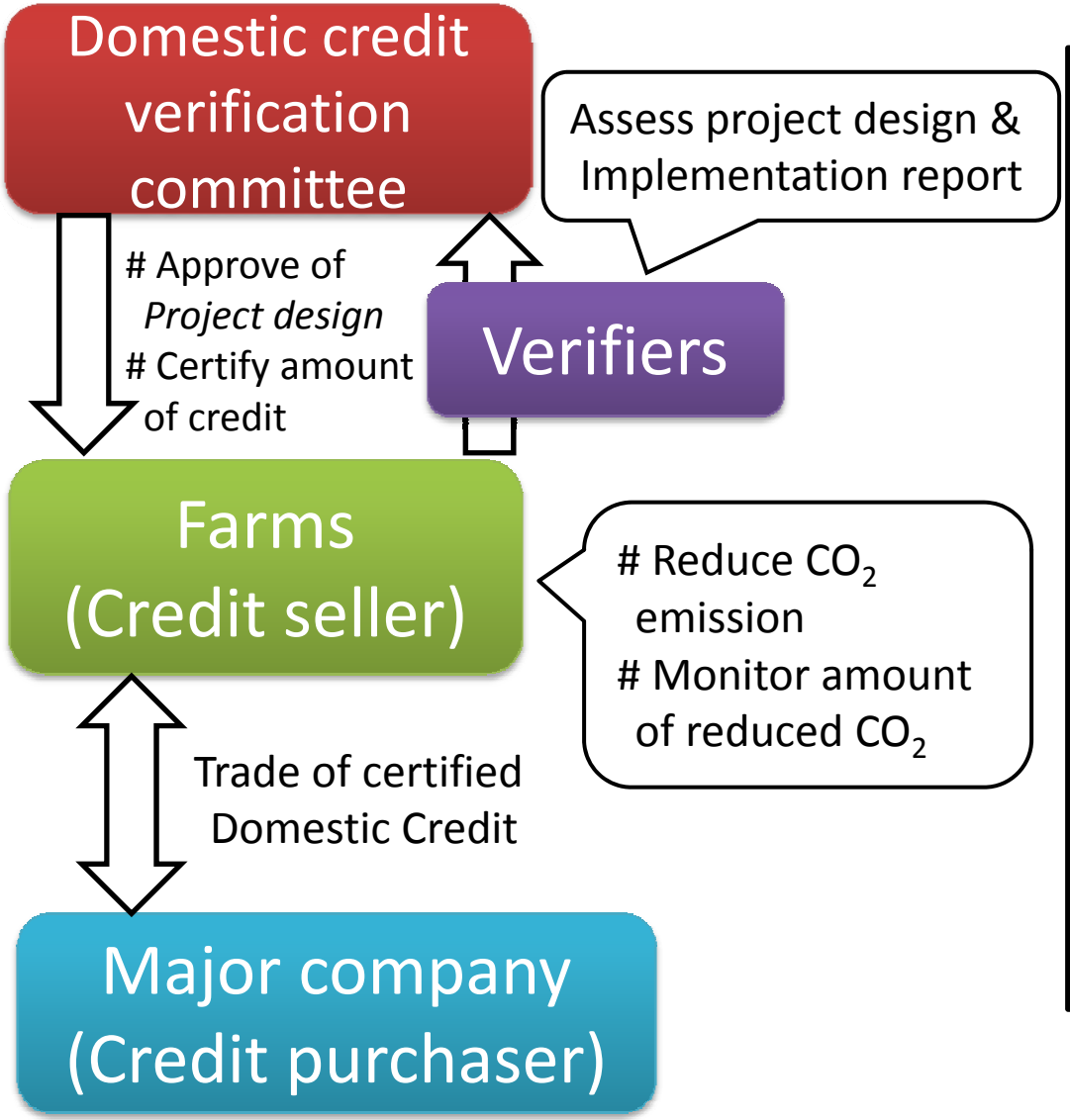
Integrated domestic market for emissions trading

Start from Oct. 2008



Source) Global Warming Preservation Headquarters

Credit trade (example)



Note: The project must

- ✓ be assessed by verifier
- ✓ reduce CO_2 from energy use (N2O and CH4 is planned to be built in)
- ✓ be based on the stated *methodologies*

Overview of farmer's application

As of Jan. 27, 2011

Number of farmer's applications: 55

(Total number of application: 716)

- Cut flower (e.g. cut rose) farm's applications account for about 40%
  - Mainly large-scale farms or production organizations of greenhouse farms
- Among others include vegetable (tomato, melon, etc.) and livestock farms
- About 50% of purchasers are electric power companies

Source）http://www.maff.go.jp/j/kanbo/kankyo/seisaku/s_haisyutu/zisseki.html
http://jcdm.jp/

Farmer's CO_2 reduction methodologies

- Introduction of Heat pump: 60%
  - Reduce CO_2 emissions by 66% (450 tCO_2/year/application) on an average
- Introduction of wood biomass boiler: 20%
  - Reduce CO_2 emissions by 98% (610 tCO_2/year/application) on an average
- Among others include the use of livestock biomass and LED lamps

Source）http://www.maff.go.jp/j/kanbo/kankyo/seisaku/s_haisyutu/zisseki.html
http://jcdm.jp/

Future Challenges

MAFF study group's report (2009)

- Current situation of Farmer's GHG emissions
  - Large uncertainty in farmer's GHG emissions
  - Small amount of GHG reductions per a farm
  - Small scale of farm operation
- Future effort
  - Making GHG emissions from agriculture (CH_4 and N_2O) eligible for trade
  - Creation of aggregators
  - Matching between farmers and credit purchasers

Measures for standard farmers' applications are needed

ECONOMIC EVALUATIONS OF FARMER'S ENERGY SAVING INVESTMENT

Overview

<Purpose>

- Evaluate the impact of the Domestic Credit price on the farmer's investment in energy saving equipment

<Case>

- Cut rose farm with standard size and technology
- Introduction of heat pump

<Methodology>

- Real options (RO) analysis

Domestic credit scheme and farmer's investment

Investment step	Investment cost and returns
Introduction of energy saving equipment	○Purchase the equipment ○Reduce in energy cost
Application to domestic credit scheme	○Pay application fee （e.g. verification fee etc.） ○Income from credit sales

Economic Efficiency is the key to investments and GHG reductions

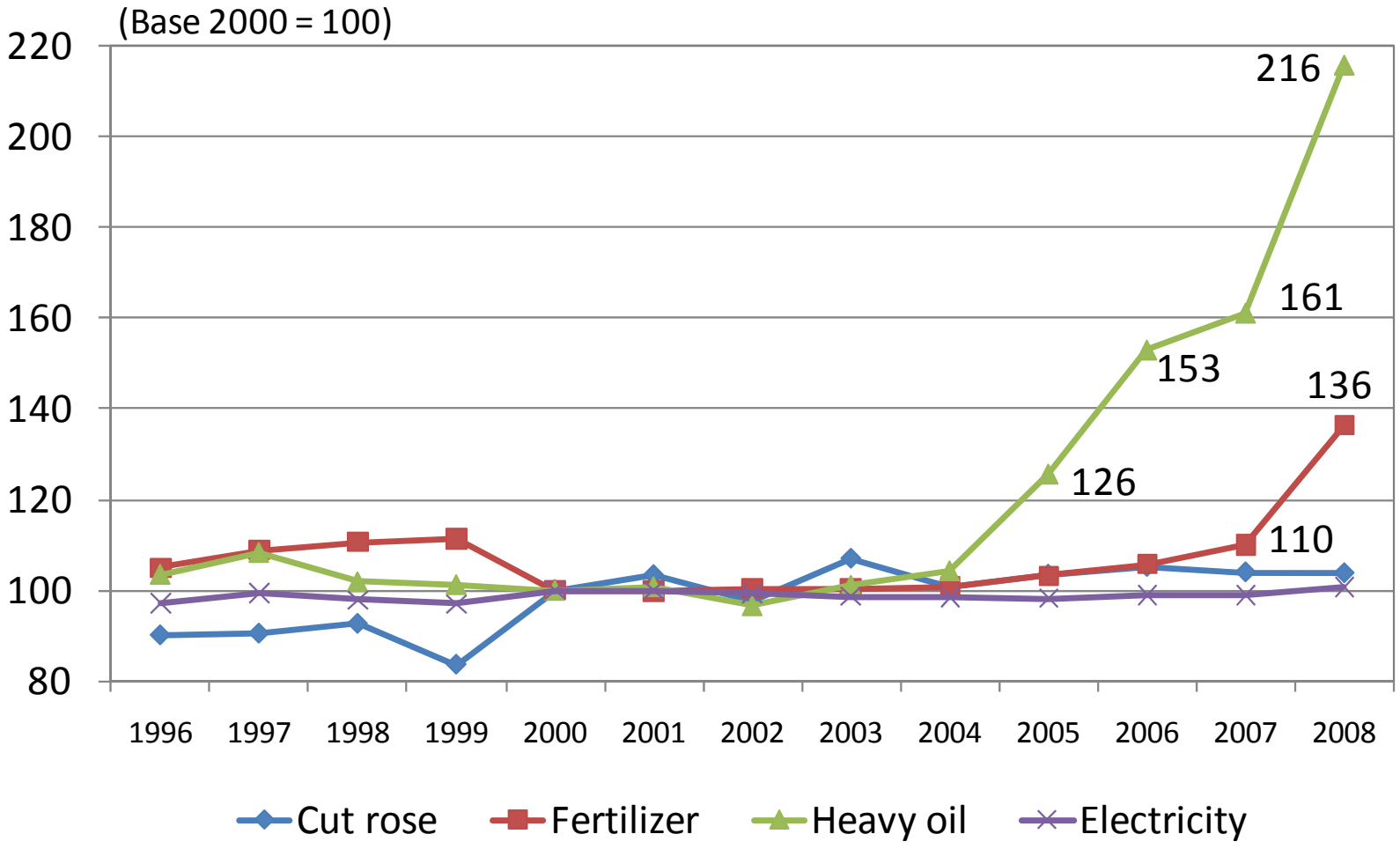
Returns from investment

	Before investment	After investment
Cost of investment	— —	Purchase of equipment ***Application fee***
Expenditure	Seed and seedling ・・・ Energy Electricity Heavy oil Other materials Labor Other cost	Seed and seedling ・・・ Energy Electricity(increase) Heavy oil(decrease) Other materials(increase?) Labor Other cost
Revenue	Cut rose sales	Cut rose sales(increase?) ***Credit sales***

Uncertainty in expenditure and revenue
↓
Returns from investment

Returns from investment
= Increase in (Revenue-Expenditure)

Uncertainty in farmer's investment

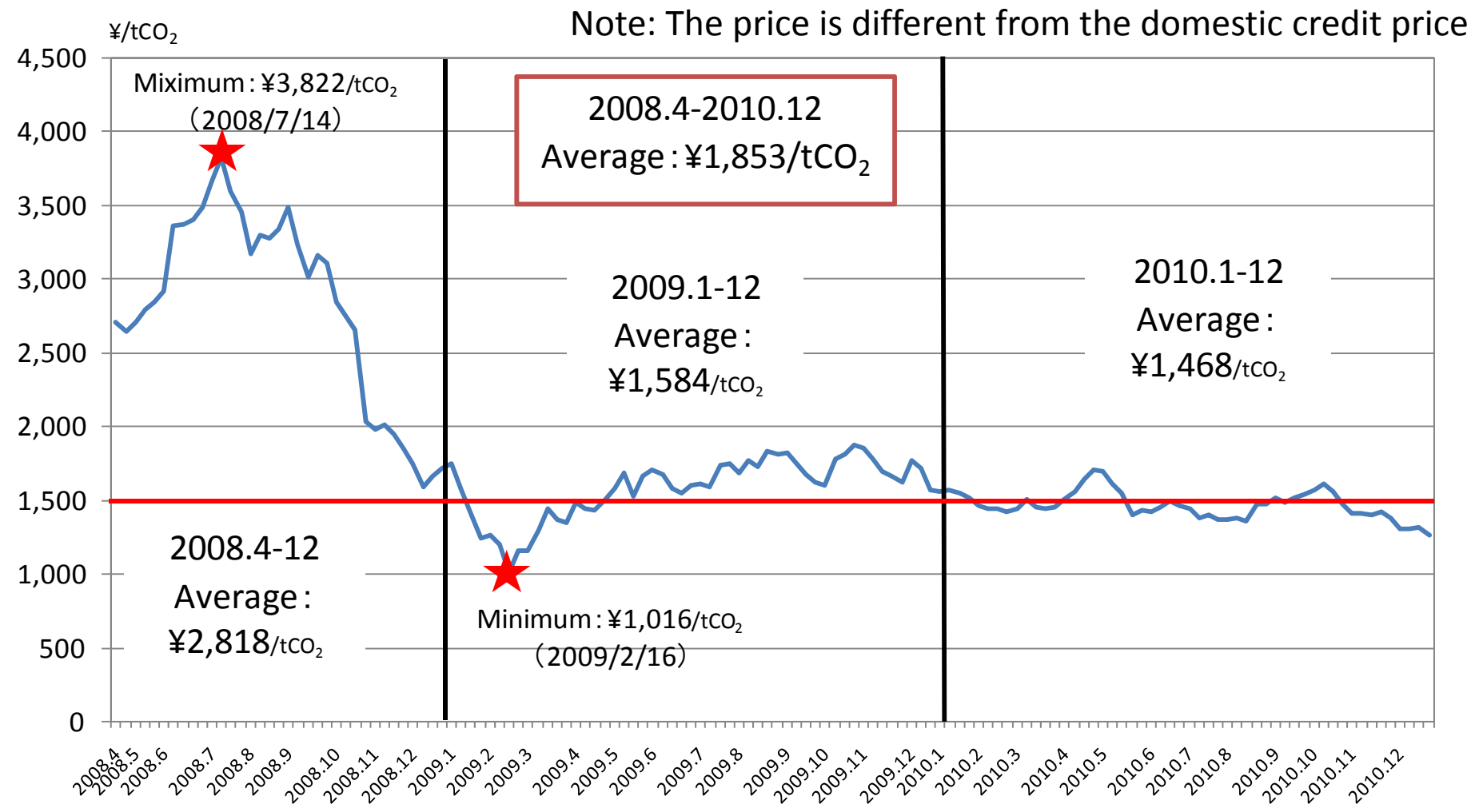


Heavy oil price in 2008 doubles from 2000

Source) MAFF statistics division

Price of Kyoto Credit

(Source: http://www.joi.or.jp/carbon/h_index.html)



- Fluctuating around ¥1,500/tCO_2 in recent years

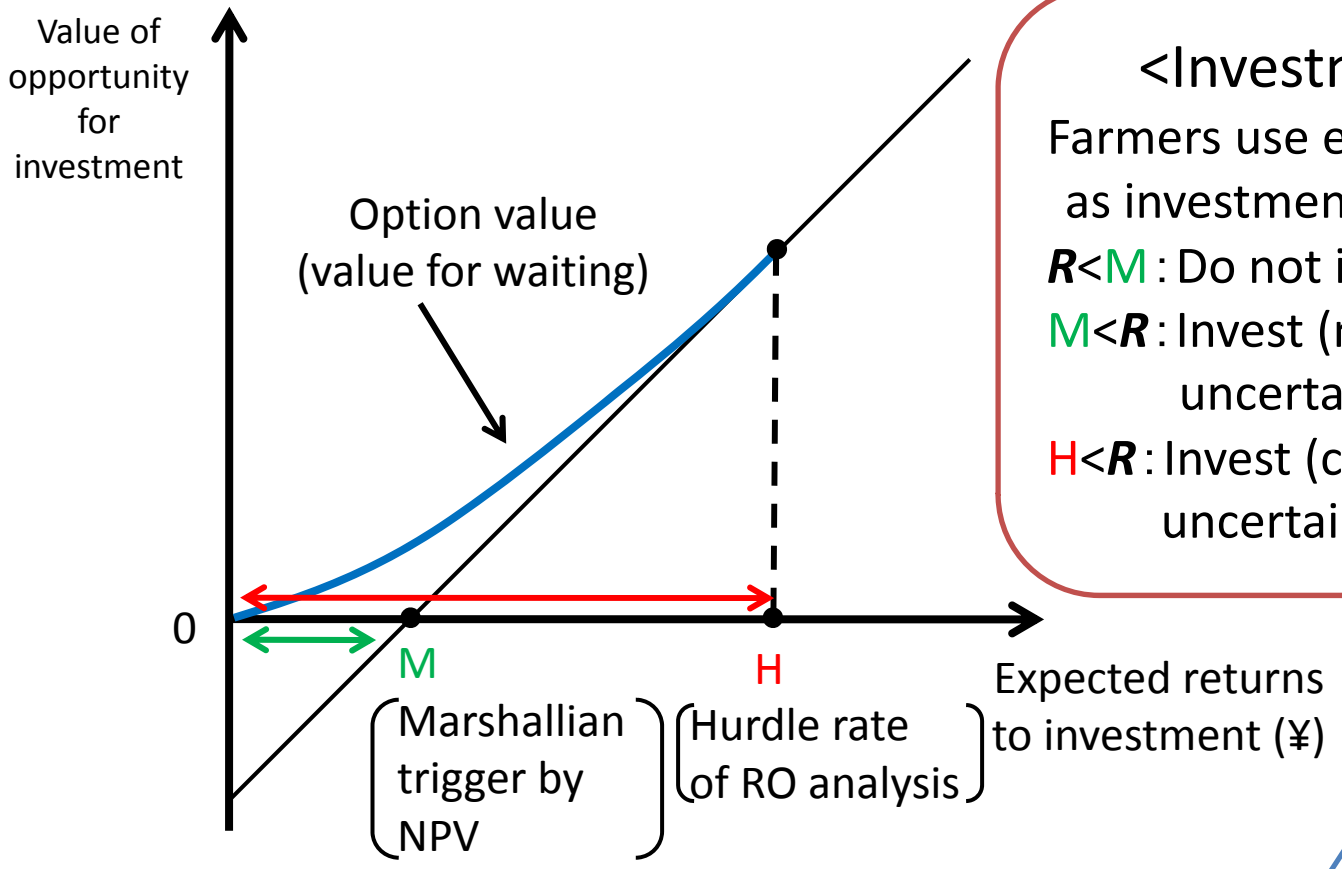
Response to Uncertainty

- Waiting for investment has value under uncertainty

- If the price of heavy oil
  - rise, heat pump is efficient
  - fall, heavy oil boiler is efficient

→Large uncertainty may disturb farmer's investment

Overview of the RO analysis



<Investment decision>

Farmers use expected returns (***R***) as investment decision criteria

R<M : Do not invest

M<***R*** : Invest (not considering uncertainty)

H<***R*** : Invest (considering uncertainty)

Previous studies show 2-5

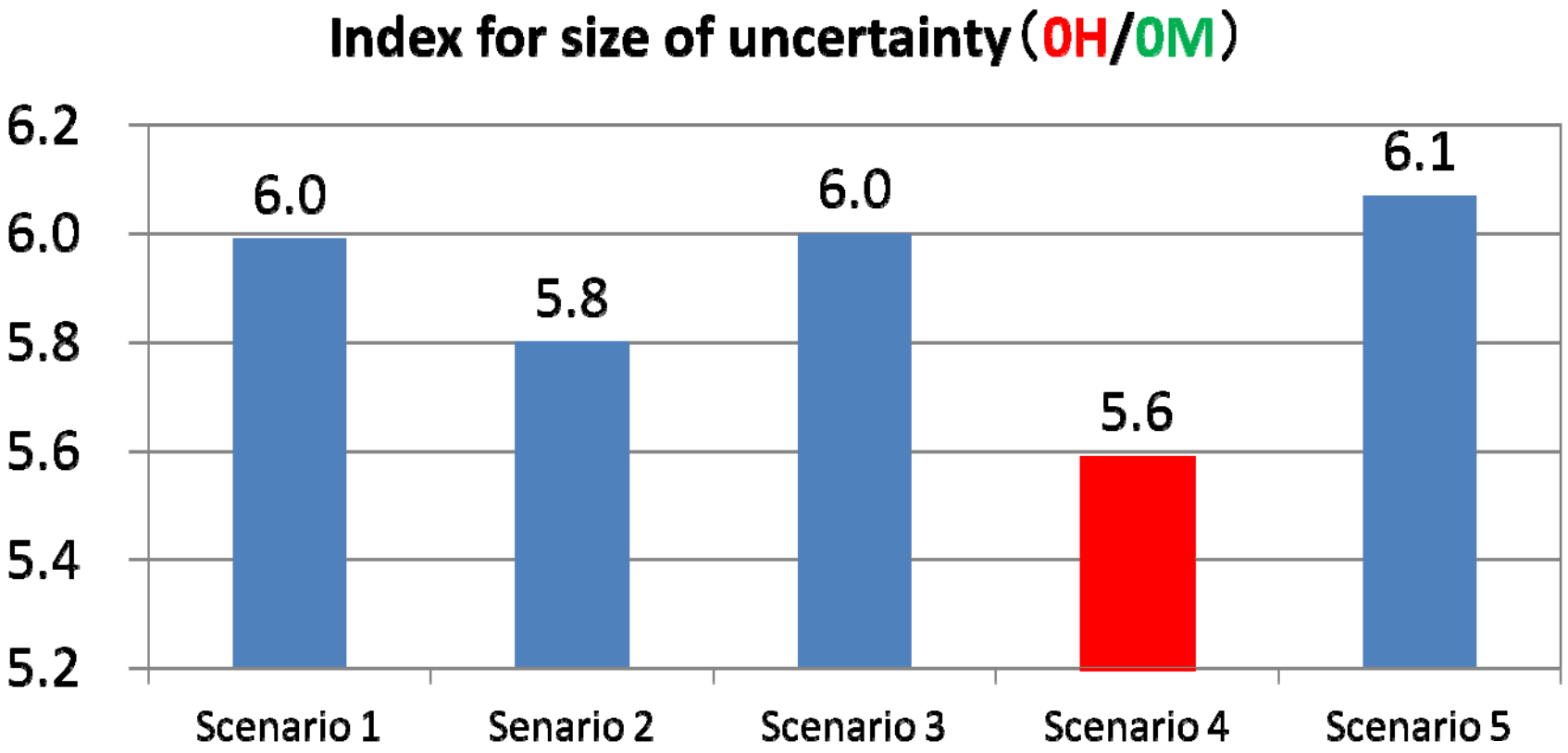
- Index for size of uncertainty : **0H/0M**
- Large index means large uncertainty

Scenarios

	Description	Credit price (per 1tCO_2)
Scenario 1	Credit price has same fluctuation as Kyoto credit	¥1,300～¥1,700 (Ave. ¥1,500)
Scenario 2	Credit price is twice as Kyoto credit price and has fluctuation	¥2,600～¥3,400 (Ave. ¥3,000)
Scenario 3	Credit is traded in the fixed price	¥1,500(fixed)
Scenario 4	Credit is traded in the fixed high price	¥5,000(fixed)
Scenario 5	Farmers don't apply to the scheme	—

- Assuming uncertainty on oil price, cut rose price, etc.
- Farm account data is mainly based on Kanagawa prefecture (2002) but partially updated by using current statistics

Results



Uncertainty shows smallest at Scenario 4

Discussion

- Mature investment decision is needed
  - All scenarios show larger **0H**/**0M** than previous studies
- Domestic credit scheme would be effective to promote farmers energy-saving investment
  - Fixed (and high) credit price policy shows the best contribution to the farmer's investment
- Accumulation of the case studies are needed
  - E.g. wood biomass boiler, GHG reductions from livestock and paddy field, etc.

Summary

1. Emissions Trading Scheme and Agriculture Sector in Japan
   - Installation of heat pump by large scale cut rose farmer
   - Treatment for agriculture GHGs and standard individual (small scale) farmers

2. Economic Evaluations of Farmer's Energy Saving Investment
   - Mature investment decision is needed
   - Domestic credit scheme would be effective to promote farmers energy-saving investment

Thank you for your kind attention