

The 7th GEOSS Asia-Pacific Symposium 26-28 May 2014



Climatic Changes and their effects on agriculture in Asian monsoon region

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What is **GRENE**?



- Green Network of Excellence program (GRENE)
 - has started from 2011
 - under the Ministry of Education, Culture, Sports,
 Science and Technology (MEXT)
 - Based on "the new growth strategy" which was approved by the Cabinet of Japan in June 2010
- Objectives of the program
 - the domestic leading universities work together to share research resources and research goals

- Environmental Information is selected as one of them Climatic Changes and Evaluation of Their Effects on Agriculture in Asian Monsoon Region

History of GRENE







The CAAM is one of GRENE-ei





Climatic changes and evaluation of their effects on Agriculture in Asian Monsoon region

Background of CAAM project



- Asian monsoon region
 - Large population (more than 60 % in the world)
 - Many agricultural countries
 - Rapid development
 - Rapid change in land use
- Need for adaptation and mitigation strategies in agriculture
 - against the predicted climatic changes
 - Control of GHG from agricultural fields
- Problem
 - Lack of agro-meteorological and climatological data-bases

Climatic Changes and Evaluation of Their Effects

Project aims of CAAM



- To improve the reliability of future climate prediction
- To develop the information platform

 will be useful to design adaptation and mitigation strategies in agriculture against the predicted climatic changes in Asian monsoon region



Objectives



1. Development of information system on agrometeorological and climatological data in Asian monsoon region

 – that can be utilized in DIAS (Data Integration and Analysis System)

2. Evaluation of land surface conditions on climate characteristic in Asian monsoon region

- by utilizing climate model outputs available in DIAS

Climatic Changes and Evaluation of Their Effects

Objectives



3. Elucidation of climate changes on major crops in Asian monsoon region

- by field surveys and development of evaluation
 system utilizing meteorological data and crop models
- 4. Development of information platform to design adaptation strategies of major crops
 - against the predicted climatic changes
 - to evaluate the mitigation potential
 - by reducing green house gasses from agricultural sector in Asian monsoon region



International workshop of CAAM



March 3-5, 2012 in Thailand March 4-6, 2013 in Philippines March 17-19, 2014 in Indonesia March, 2015 in Vietnam 2016 in Japan



Benefits of CAAM



- 1. Development of basic environmental information and its application to decision-making in the Asian monsoon region
- 2. Training of young researchers to lead the study of global warming mitigation measures and adaptation research and climate change
- 3. Construction of information infrastructure for the realization of global warming adaptation and mitigation measures for agricultural sectors

Climatic Changes and Evaluation of Their Effects

Climatic changes and evaluation of their effects on agriculture in Asian monsoon region (CAAM)

Leader: Masaru Mizoguchi (The University of Tokyo)

Climatic Changes and Evaluation of Their Effects on Agriculture in Asian Monsoon Region

Aims 1. To improve the reliability of future climate prediction, 2. To develop the information platform which will be useful to design adaptation and mitigation strategies in agriculture against the predicted climatic changes in Asian monsoon region



- 1. Development of basic environmental information and its application to decision-making in the Asian monsoon region
- 2. Training of young researchers to lead the study of global warming mitigation measures and adaptation research and climate change
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Ground observation system



Introduction



- Field monitoring is important for agricultural production in Asia monsoon region
 - Weather (air temp, precipitation, solar radiation, wind)
 - Soil (moisture, temp, nutrition)
 - Crop (growth, color)
 - Environment (radioactive material?)
- Agricultural field is not in the city
 No electrical power, no WiFi
- Sensor networking for agriculture is needed

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FieldRouter

- Status lamp
- USB modem
- Status display
- Timer
- Micro-PC
- Battery
- Charge controller
- Web camera

(38 cm x 25 cm x 10 cm)





Setup images of FMS







Nagano

Soil sensor

We Measure the World

- Soil moisture sensors measure
 - volumetric water content accurately and economic.
 - the dielectric permittivity of the soil
- Benefits include:

FCAGON

DEVICES

- TDR-level performance at a fraction of the cost
- Very low power requirement
- Easy installation at any depth and orientation









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Climatic Changes and Evaluation of Their Effects on Agriculture in Asian Monsoon Region Http://www.iai.ga.a.u-tokyo.ac.jp/mizo/edrp/

View of individual site





• Weather and soil data can be downloaded in CSV format

Climation the data can be processed freely using EXCEL

Calendar view

-ei





Quasi-real time Field monitoring in Asia



Installation of FMS together with local young students

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Cropping systems in rain-fed area, Thailand



Cassava in upper Paddy after rice



Source: Anan P. and G. Marten (1986)

Cassava was protected from water logging by field monitoring!







Application of ground observation data



Simulator for Cultivation Possibility of Ricein DIAS research (2006-2010)



Structure of Evaluation System for the Effects of Climate Change on Agriculture in the Asian Monsoon Region



GRENE-ei

Meteorological Data



- Northeastern Thailand (100 × 120 points)
- 0.05 degree grid
- Spatial interpolated data against to actual data



Simulation Result





Rice (transplanting date: Aug 1, max cultivation period: 4 months)



Climatic Changes and Evaluation of Their Effects on Agriculture in Asian Monsoon Region



Cassava (starting date: Dec 1, harvest date: Jun 15)

Decision Support System for Sustainable Crop Simulator

http://localhost/dss4scs/

P-BCX

DSS4SCS





Conclusion





- Ground observation is important for agriculture.
- We need precise Global/Local Data for Climatic Changes and Evaluation of Their Effects on Agriculture

Climatic Changes and Evaluation of Their Effects on Agriculture in Asian Monsoon Region



ありがとうございました

ขอบคุณคุณ Terima kasih salamat sa inyo Cảm ơn bạn 谢谢 Thank you

