

Climate Change Affecting Land Use in the Mekong Delta: Adaptation of Rice-based Cropping Systems (CLUES)

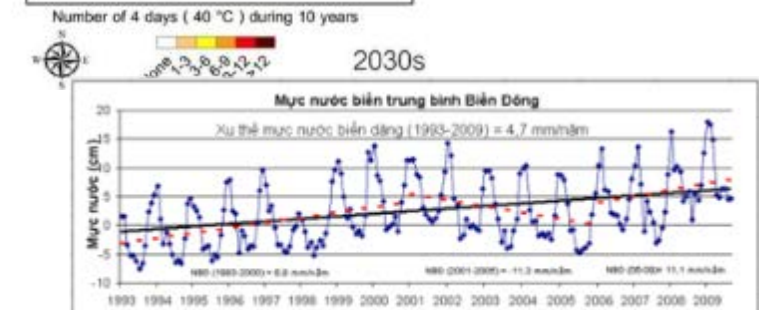
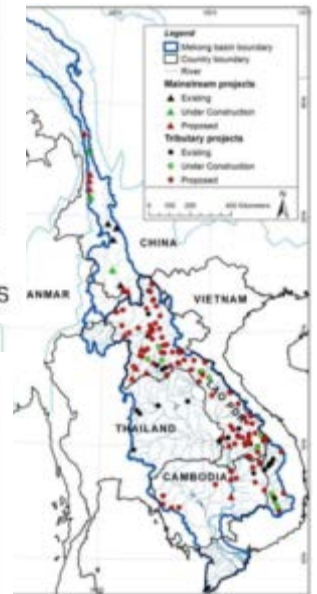
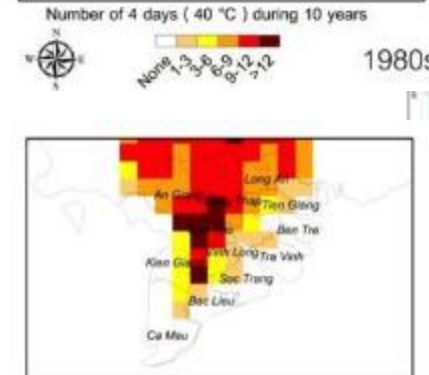
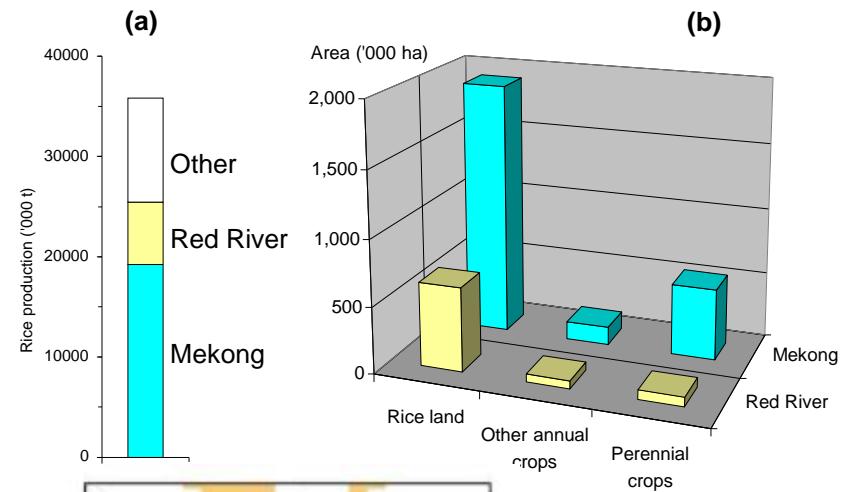
**Nguyen Hieu Trung,
Climate Change Research Institute
Email: nhtrung@ctu.edu.vn
Can Tho University**

**International Meeting on Land Use and Emissions in
South/Southeast Asia**

Ho Chi Minh , October 17-19, 2016

Why CLUES?

- **Main rice production:**
 - > 50% rice (~20 mil tons/year)
- **Threats**
 - Problem soils: 60 % (acid sulphate & saline soils)
 - Dry season:
 - Reduce fresh water resources
 - Local droughts
 - Salt water intrusion .
 - Rainy season:
 - tidal flooding
 - extreme weather events
 - Upstream development (more water uses, hydro-power dams)
 - Climate change and sea level rise





Climate Change Affecting Land Use in the Mekong Delta: Adaptation of Rice-based Cropping Systems (CLUES)

- Overall objectives is to increase the **adaptive capacity of rice production systems** in the Mekong Delta Region.
- Its immediate objective **the provision of technologies and knowledge to farmers and management agencies** that will improve food security in the Mekong Delta.

March-2011 to Sep-2015

Field study sites

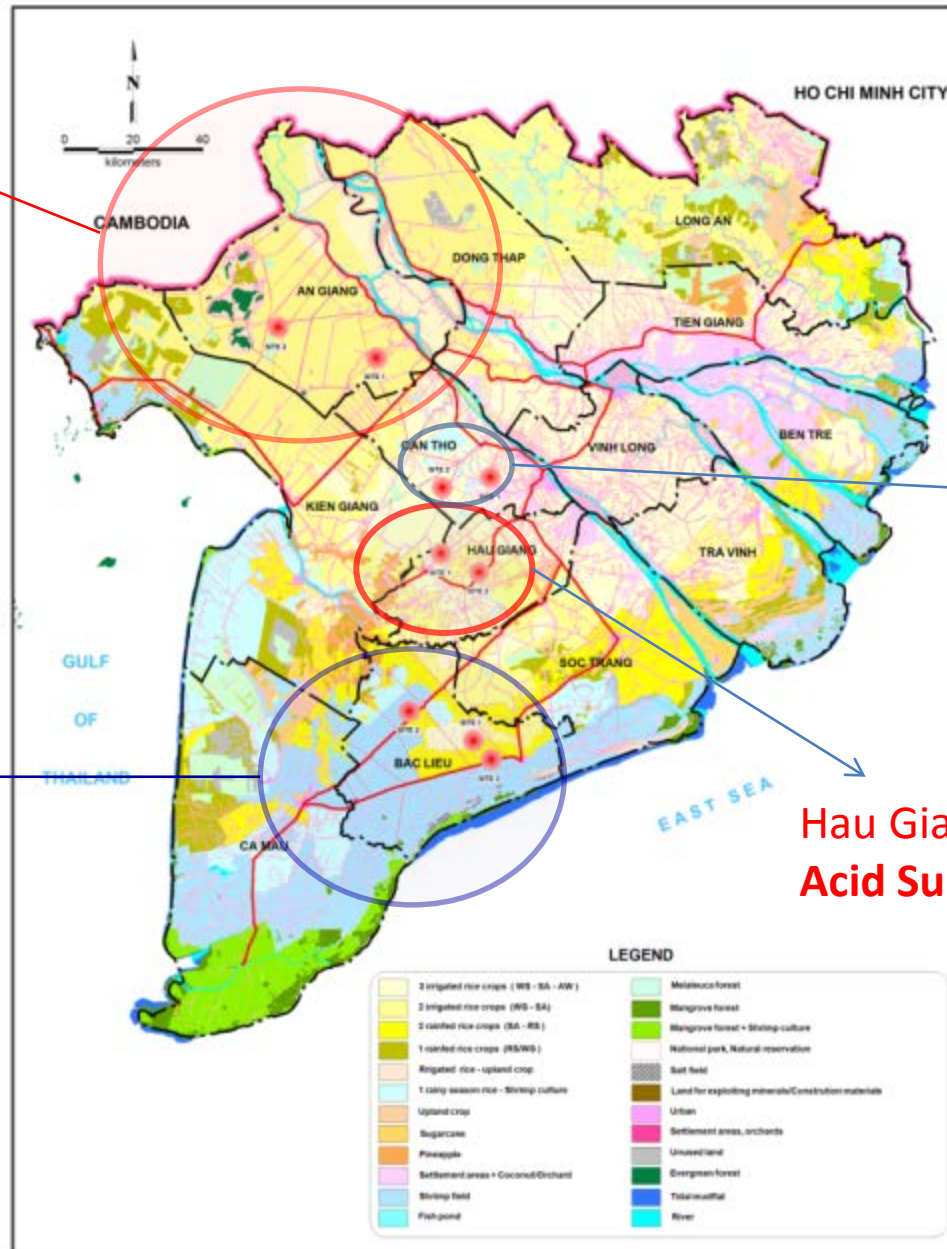
LAND USE MAP OF THE MEKONG DELTA 2010

An Giang:
Deep Flood Zone

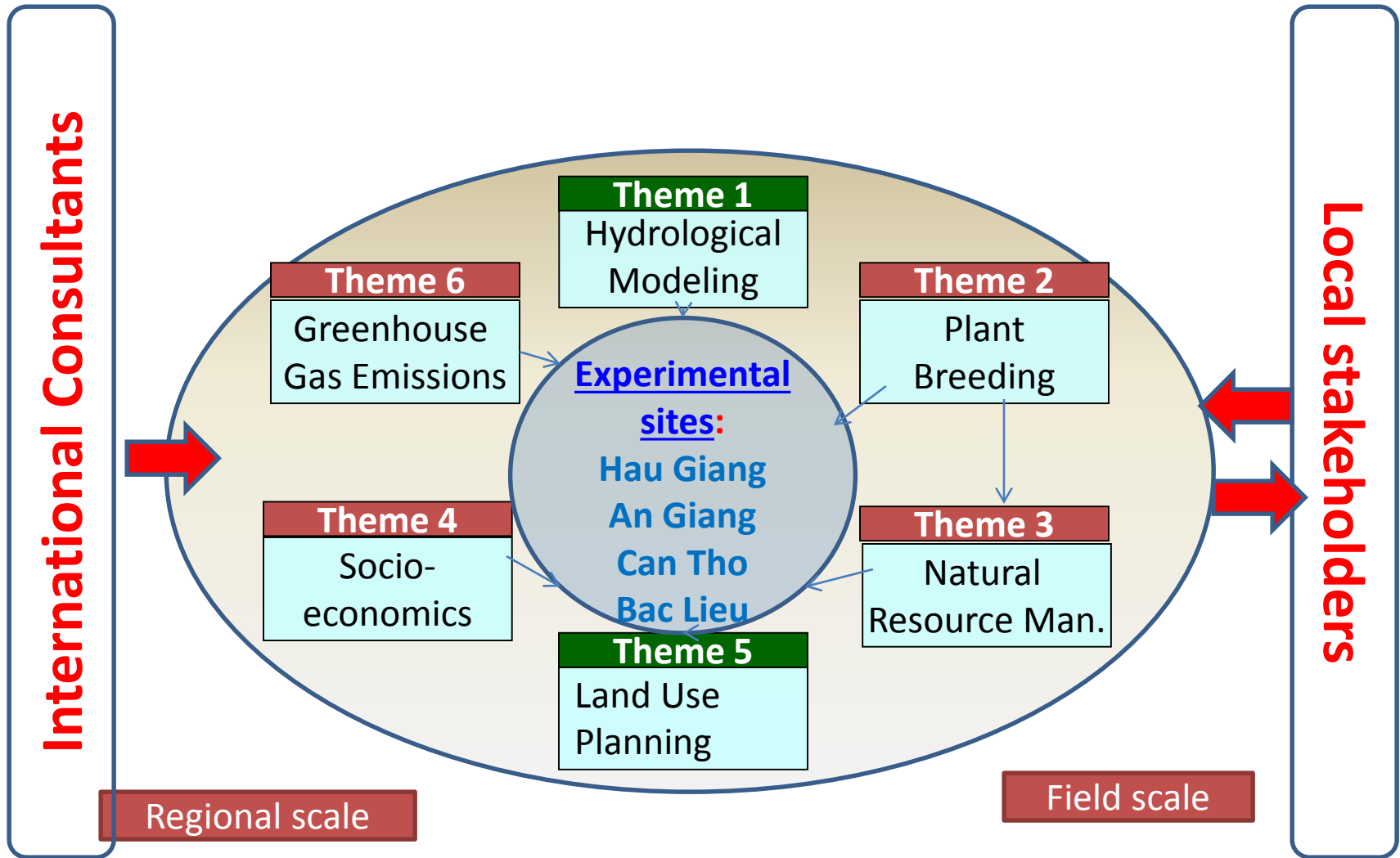
Bac Lieu:
Saline Zone

Can tho:
Alluvial soil

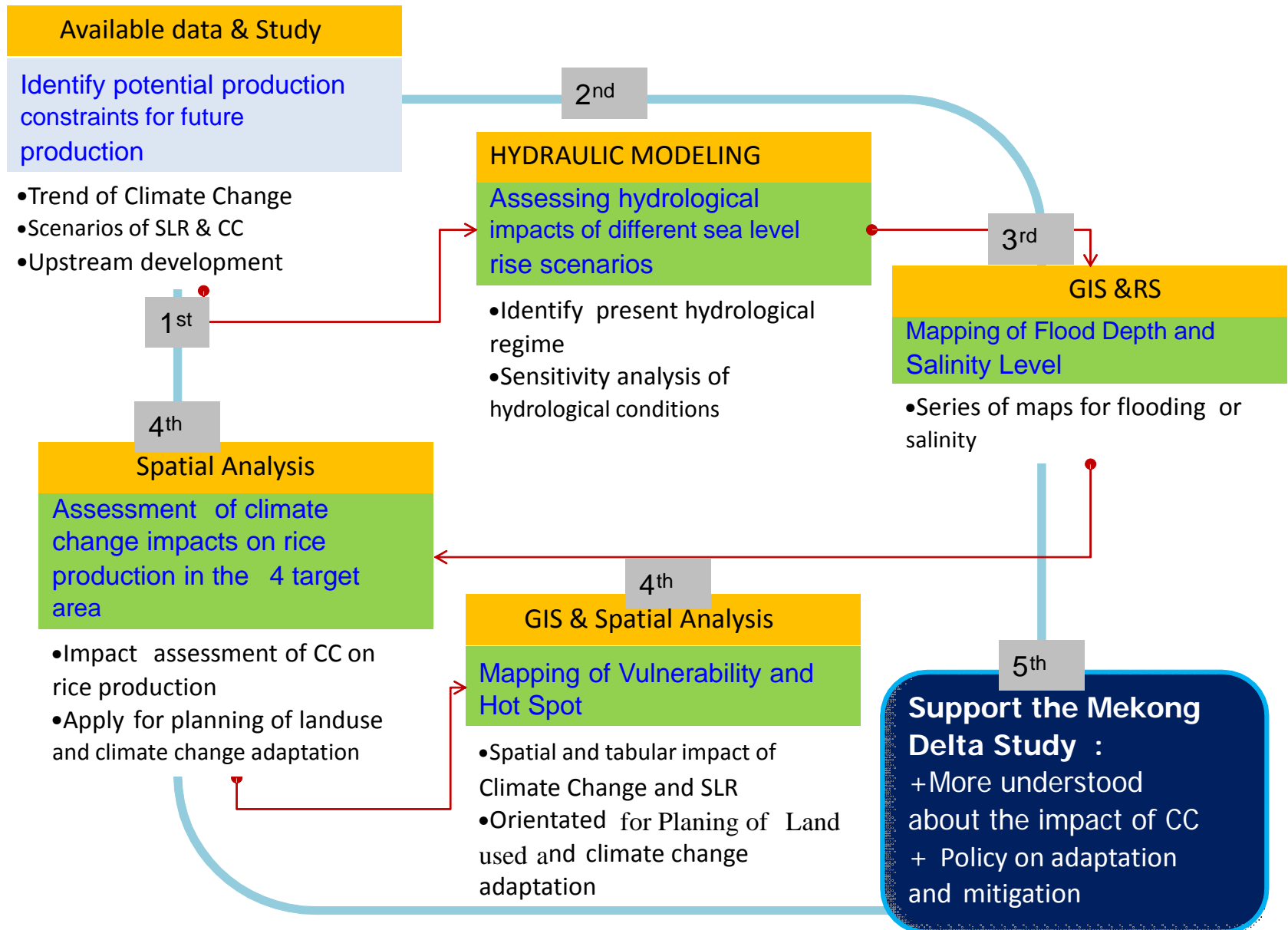
Hau Giang:
Acid Sulphate soils



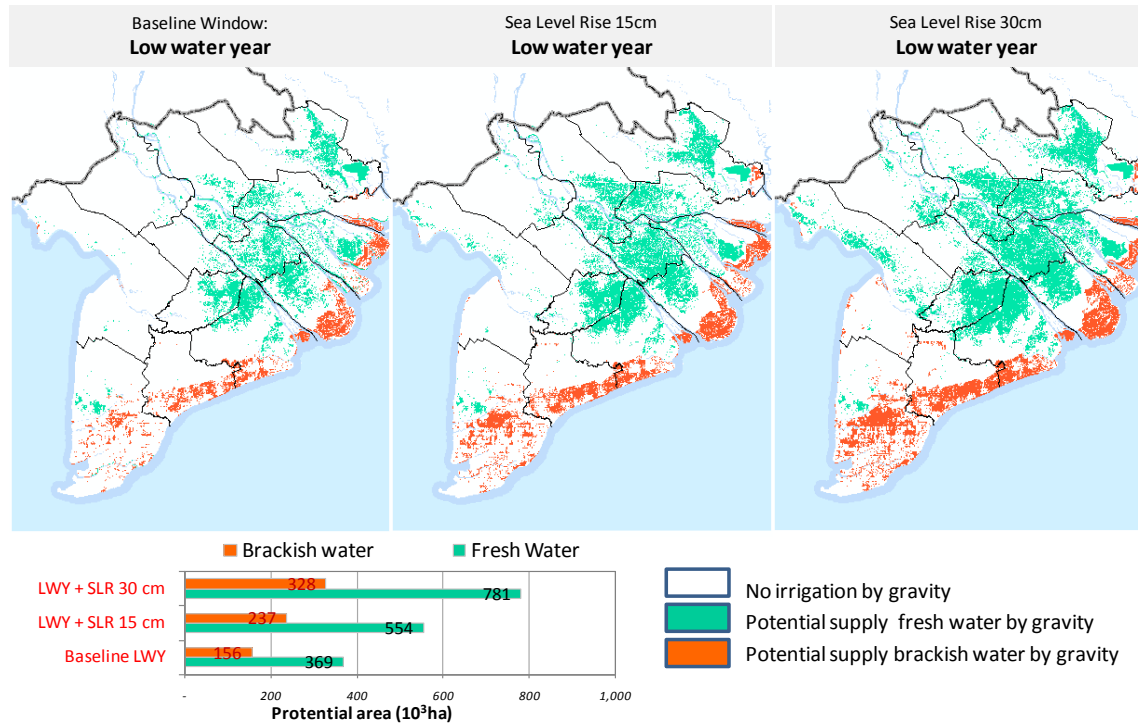
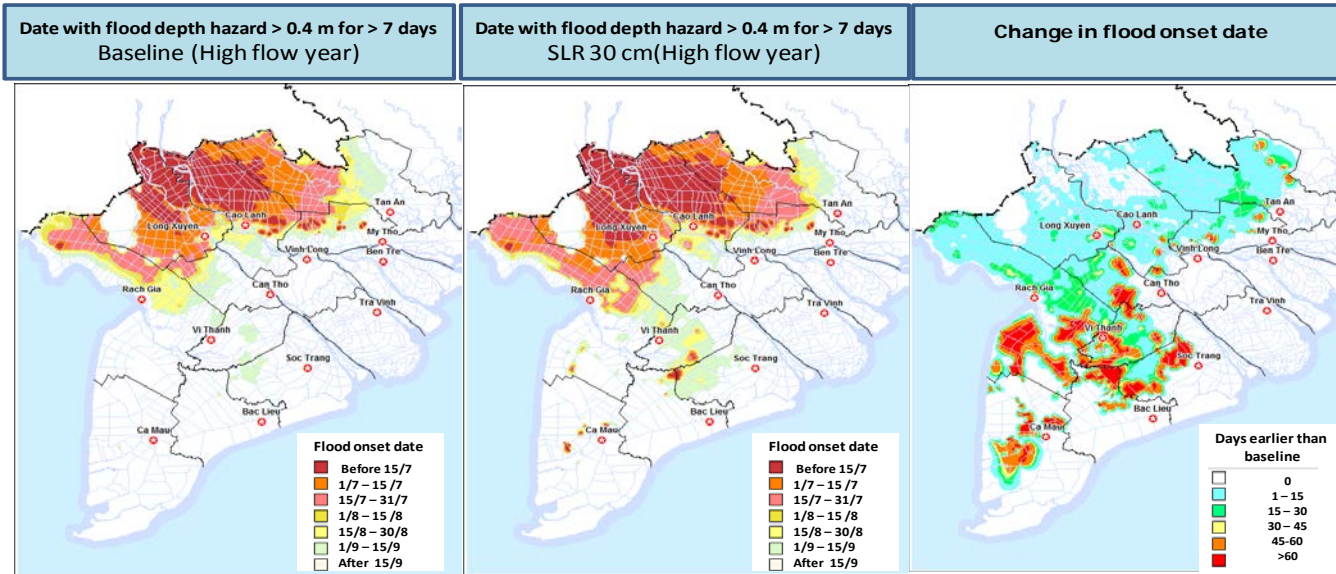
Disciplinary Fields in CLUES



Theme 1: Location-specific impact and vulnerability assessment

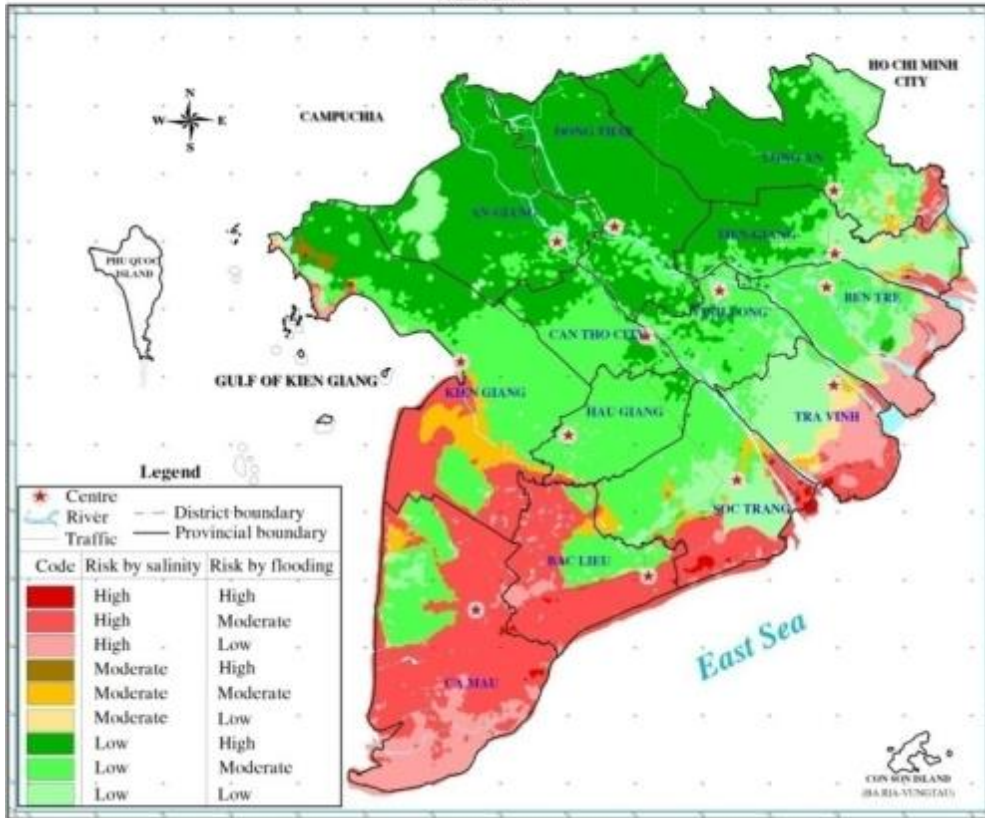


Effect of Sea Level Rise 30 cm on changed in flood onset date

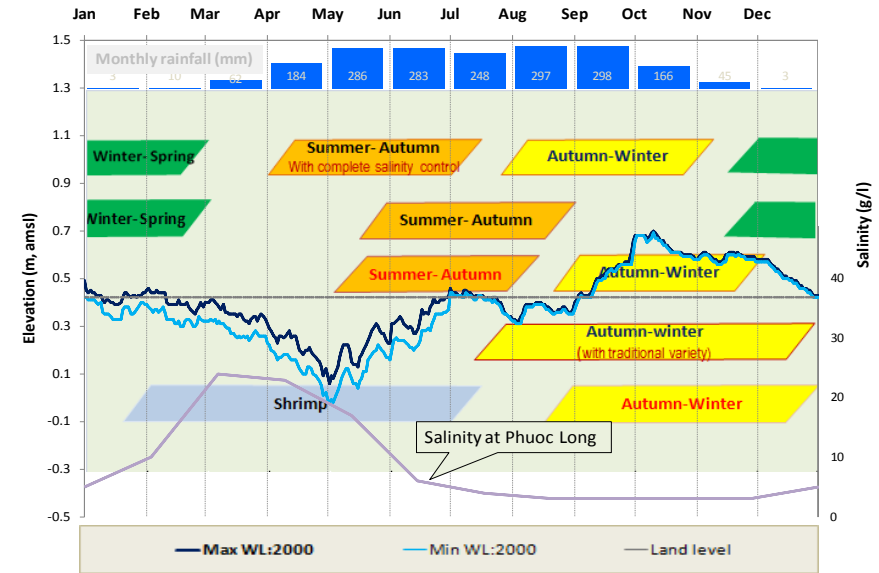


HOT SPOT MAP BY SALINITY AND FLOODING OF HIGH WATER YEAR 2000 WITH BOTH SCENARIOS OF SEA LEVEL RISE AND CLIMATE CHANGE IN THE YEAR OF 2030 OF MEKONG DELTA

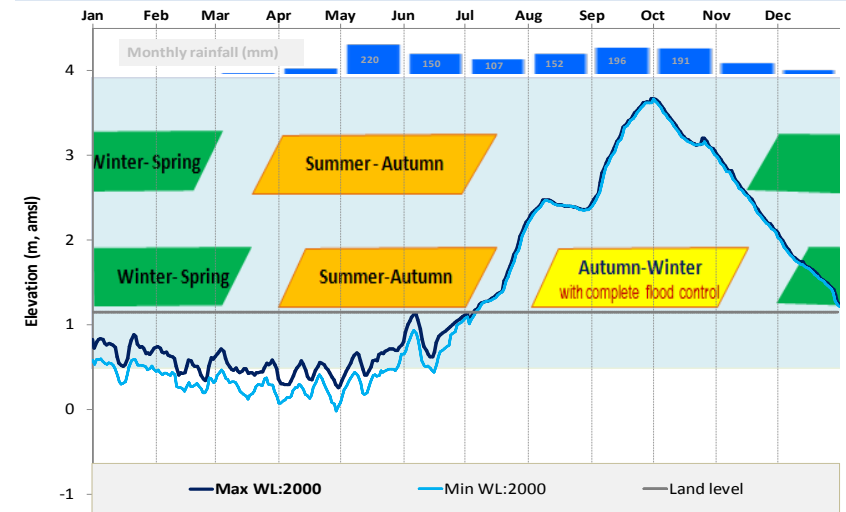
SCALE: 1:250,000



Hydrology - cropping systems in salinity-risk zone



Hydrology - cropping systems in flood-risk zone



Theme 2. Improvement of salinity and submergence resilience of locally-adapted rice varieties and elite lines

To improve tolerance of rice germplasm to a variety of direct and indirect impacts of climate change

Fact Sheet 2.1 Climate Change affecting Land Use in the Mekong Delta: Adaptation of Rice-based Cropping Systems

Stress Tolerant Rice Varieties in An Giang Province

Name	Characteristics
OM8108 (Origin of M362/A3996)	Duration: 85-105 days Plant height: 110-115cm Amylase content: 24.2% Scent: Scale 0 BPH tolerance: Scale 0 Blast tolerance: Scale 0 Yield: 7-8 tons/ha Tolerance: Stagnant flooding and salt stress EC: 8dS/m
OM10041 (Origin of D23/C56)	Duration: 85-90 days Plant height: 100-105 cm Amylase content: 26.8% Scent: Scale 1 BPH tolerance: Scale 3 Blast tolerance: Scale 5 Yield: 6-8 tons/ha Tolerance: Stagnant flooding
OM4900 (Origin of C33/Jasmine85)	Duration: 95-10 days Plant height: 100 cm Amylase content: 16.2% Scent: Scale 1 BPH tolerance: Scale 3-5 Blast tolerance: Scale 5 Yield: 6-8 tons/ha Tolerance: Stagnant and salt stress EC: 8 dS/m
OM10040 (Origin of D23/C25)	Duration: 85-90 days Plant height: 100-105 cm Amylase content: 19.2% Scent: Scale 0 BPH tolerance: Scale 5 Blast tolerance: Scale 3 Yield: 6-8 tons/ha Tolerance: Stagnant flooding

Stress Tolerant Rice Varieties in Can Tho City

Name	Characteristics
Can Tho 2 (Origin of Basmati/Jasmine 85)	Duration: 85-100 days Plant height: 100-105cm Amylase content: 16-18% Scent: Scale 1 BPH tolerance: Scale 3 Blast tolerance: Scale 3 Yield: 6-8 tons/ha Tolerance: Drought, stagnant flooding
OM 7347 (Origin of KhaoDawkMali/BL)	Duration: 85-100 days Plant height: 110-112 cm Amylase content: 16-17% Scent: Scale 1 BPH tolerance: Scale 3-5 Blast tolerance: Scale 1-5 Yield: 6-9 tons/ha Tolerance: Drought, salt stress EC: 4dS/m
OM 4488 (Origin of Hue lai/Basmati)	Duration: 85-90 days Plant height: 95-105 cm Amylase content: 17-18% Scent: Scale 1 BPH tolerance: Scale 3 Blast tolerance: Scale 3 Yield: 5-7 tons/ha Tolerance:
OM 8928 (Origin of OM 3336/A3996)	Duration: 80-95 days Plant height: 85-100 cm Amylase content: 24-25% Scent: Scale 1 BPH tolerance: Scale 3 Blast tolerance: Scale 3 Yield: 6-8 tons/ha Tolerance: Light acid sulfate soil, stagnant flooding and salt stress

For more information, please contact:

Prof. Dr. Nguyen Thi Lang
 Genetics and Plant Breeding Department
 Cuc Long Delta Rice Research Institute, Vietnam
nguyenthi.lang@clri.vn

Other related fact sheet of rice varieties can be found at:
 Fact sheet 2.2 - Stress Tolerant Rice Varieties in Hau Giang
 Fact sheet 2.6 - Stress Tolerant Rice Varieties in Bac Lieu

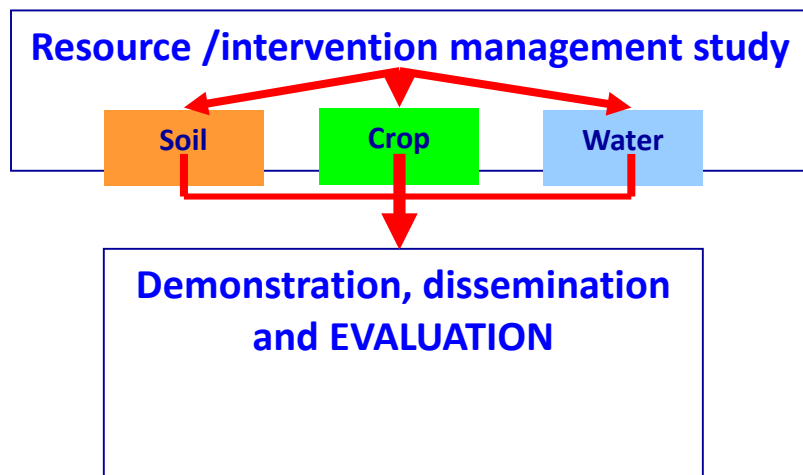
IRRI
 Climate Change Affecting Land Use in The Mekong Delta: Adaptation to the Rice-based Cropping Systems (CLUES)

CLUES Project Office, Can Tho University, Campus 2, 8/3 Street, Huu Khanh Ward, Ninh Kieu District, Can Tho City, Vietnam.
 Tel: +84 7102 734 511
 Fax: +84 7102 734 588
 Email: clues@ctu.edu.vn
 Website: <http://www.cluesproject.com/>
<http://climatechange.ctu.edu.vn/>



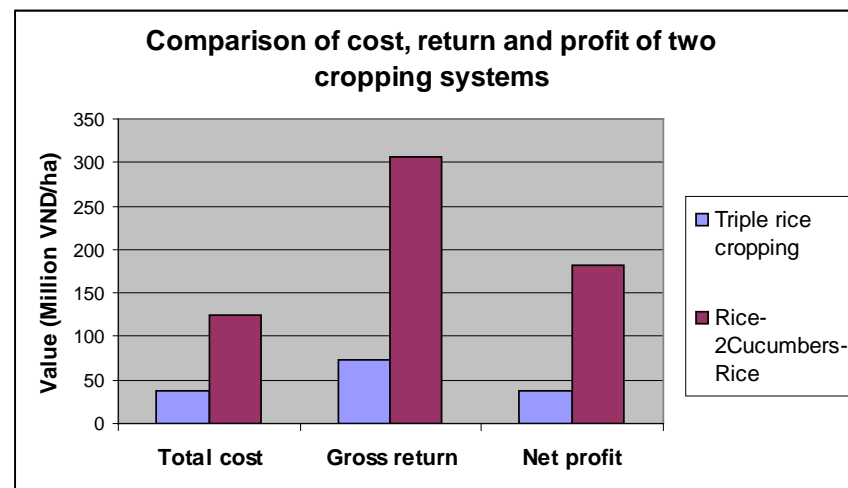
Theme 3: Managing resources for resilient rice-based systems coping with rapidly changing environments

- Developing / refining farming management options for different agro-ecological zones
- Improved understanding of element cycling, soil-plant and cropping systems responses to altered hydrology (including impacts of CC and SLR).



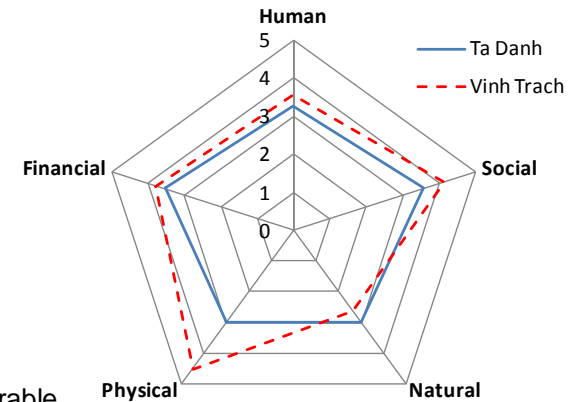
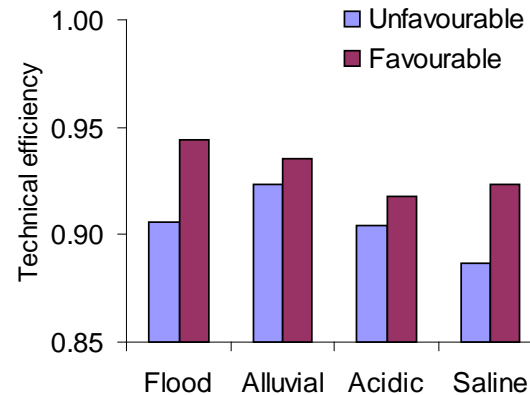
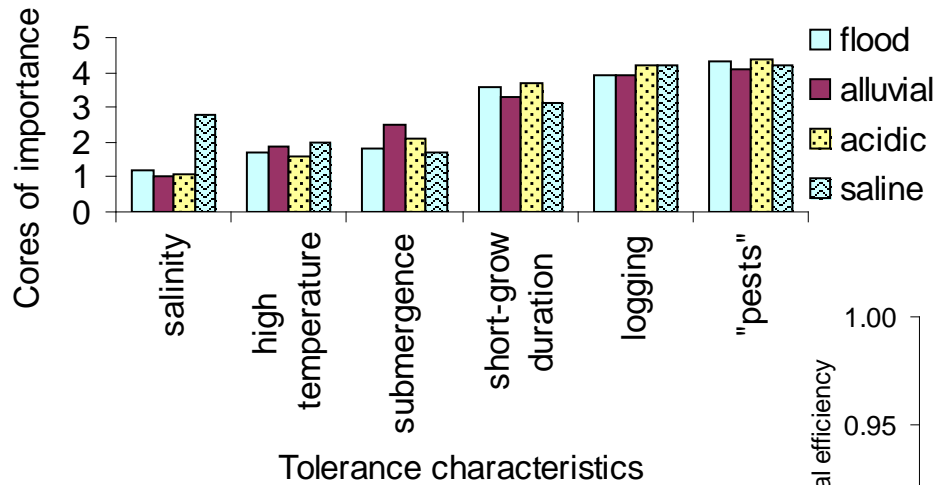
Applying of promising techniques:

- Alternate wet and dry (AWD)
- Reduced Phosphorus
- Cropping system of Rice+ upland crop, rice (short-duration, high yield) – shrimp.



Theme 4: Analysis of farming systems and socio-economic settings in rice farming households

- identify the biophysical, social and economic factors determining the capacity of farmers to adapt to CC.
- understand the role of key institutions in influencing farmers' decisions and capacity to adapt, and
- evaluate the benefits of the new rice varieties in terms of the extent of adaptive capacity they are likely to confer under projected future CC and socio-economic conditions.



Theme 5: land use planning → An integrated approach with stakeholder engagement

Acts. 5.1, 5.2, 5.3: Biophysical condition mapping (Soils, water management)

Available Area

	Jan	Feb	Mar	Apr	Me
TPBaLieu	2240772	2240772	2240772	2240772	2
HongDan	6588481	6588481	6588481	6588481	6
PhuocLon	5883447	5883447	5883447	5883447	6
VinhLai	5541905	5541905	5541905	5541905	5
Hoabinh	5286551	5286551	5286551	5286551	5
GiaRai	7092498	7092498	7092498	7092498	5
DongHai	7042176	7042176	7042176	7042176	2

Act 5.4. Biophysical Land Evaluation

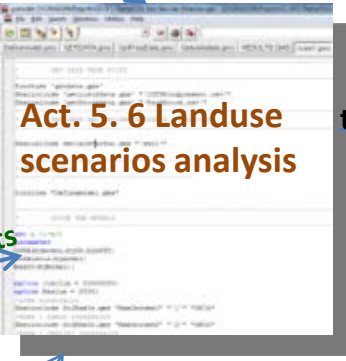
LMU

Suitability and yield/LMU

	LUT1	LUT2	LUT3	LUT4	LUT5	LUT6
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0

Land constraints

Act. 5.6 Landuse scenarios analysis



LUT outputs

LUT inputs

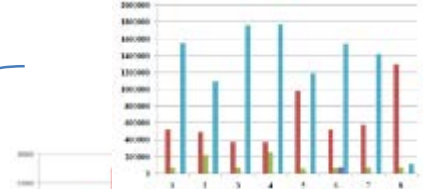
LUTs' cost/LMU

	LUT1	LUT2	LUT3	LUT4	LUT5	LUT6
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0

Available capital
Available labor

Labor	90000
Capital	10000
Tomato	100000
Cash	100000
Oil	30000
Meat	700

Act. 5.7: Lesson learned for a new CCA land use strategy approach

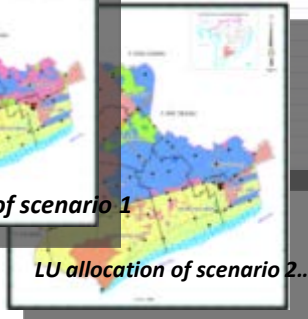


Decision support information (graphs, maps, tables, reports)

Model	Max benefit	Rice	Shrimp	Salt	Vegetable	Req lab	Req Ca
1	15,966,180,000	544,649	83,261	-	1,499,814	119,378,570	11,289
2	16,861,130,000	371,725	83,261	-	1,767,568	123,693,791	11,283
3	17,756,080,000	200,000	83,261	-	2,035,322	128,009,012	11,277
4	18,651,030,000	30,000	83,261	-	2,303,076	132,324,233	11,271
5	15,049,270,000	875,000	73,990	-	1,363,488	116,975,242	11,292
6	14,144,220,000	513,017	79,413	134,000	1,448,793	120,033,006	11,288
7	14,144,220,000	513,017	79,413	134,000	1,448,793	120,033,006	11,288
8	14,144,220,000	513,017	79,413	134,000	1,448,793	120,033,006	11,288



LU allocation of scenario 1



LU allocation of scenario 2...

Current agriculture land use



Act. 5.5. Socio-economic, policy analysis

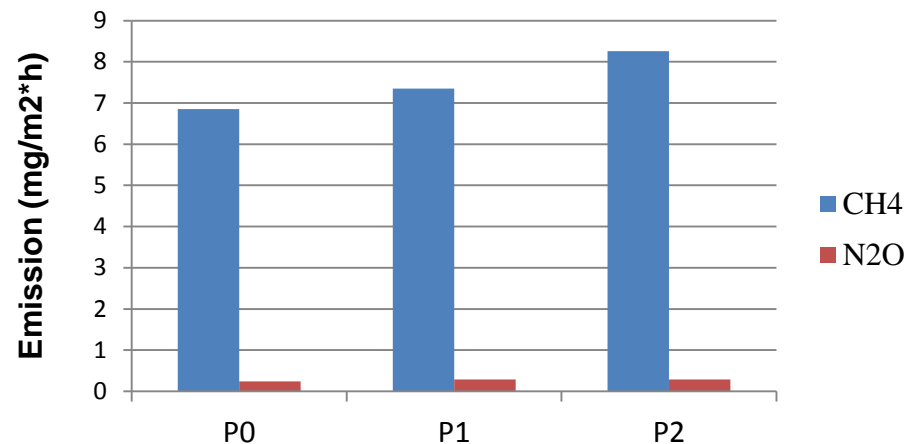
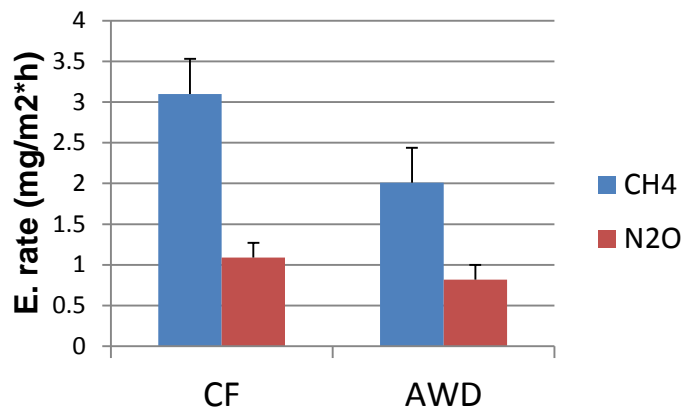
Goals
Gov's production target

- Scenarios: Current, future (normal, dry, wet years), technical levels
- Obj functions: Regional income
- Constraints: Land, capital, labor
- Market limitation: Vegetable (≤ local consumption)
- Production targets: Rice, shrimp, salts production

Theme 6. Assessing GHG emissions and Capacity building

- Record baseline emissions from conventional management and adaptation technologies.
- Provide training and scientific infrastructure facilitating initial GHG emission measurements in rice systems.

parameters	Methodology	Notes
Water management	AWD CF	
P rates (P2O5)	P0 P1 (37,5) P2 (75)	P omission 1/3 Farmer dosage 2/3 Farmer dosage



Lessons learned

- Participatory approach → increase acceptability and applicability of the project outputs → reduce risks to the local people livelihoods.
 - Farmers: Participatory Variety Selection (Theme 2), Testing of new varieties, new farming techniques (theme 2, 3, 4), land use strategy for CCA (theme 5).
 - Seed companies (Theme 2 and 3).
 - Agriculture extension services (Theme 2, 3, 4, và 5).
 - DARD and DONRE (All themes).



Lessons learned

- Integrated approach → increase credibility of the project outputs including information to support decision making in management, planning, and policy.
 - Multi- disciplinary: Natural (theme 1 and 2), environment (theme 6), socio-economic (theme 3,4, and 5). All aspects (theme 5).
 - Trans-boundary impacts (theme 1)
 - Agro-ecological specific of the MD.
 - Short term- Long term: Farming techniques at community, households (autonomous adaptation, short term) and provincial CCA land use strategy (planned adaptation, long term)

Lessons learned

- Capacity building:
 - Capacity for multi-disciplinary project management to coordinate different national and international research institutions.
 - Appropriate research approach, methodologies, and facilities for Vietnamese research university and institutes.
 - Strengthening the collaboration among Vietnamese and International research institution for further research in the Mekong Delta in specific, Vietnam in general.
 - Local stakeholders: knowledge on CC and CC's impacts (theme 1, 4, and 5), new farming technology (theme 2, 3), CCA land use analysis tools (theme 5)

Climate Change Affecting Land Use in the Mekong Delta: Adaptation of Rice-based Cropping Systems (CLUES)

Reports: <http://aci.gov.au/publication/fr2016-07>

Final Report for SMCN/2009/021: Climate change affecting land use in the Mekong Delta: Adaptation of rice-based cropping systems (CLUES)



 [smcn-2009-021](#) _

Final Report for SMCN/2009/021: Climate change affecting land use in the Mekong Delta: Adaptation of rice-based cropping systems (CLUES)

Publication Code: FR2016-07

ISBN: 978-1-925436-36-5

Date Released: 17/03/2016

Author(s):

Ngo Dang Phong, Postdoc Fellow, IRRI, Reiner Wassmann, Senior Scientist, IRRI Le Quang Tri, Director, Climate Change Institute, CTU Nguyen Xuan Hien, Director, SIWRP Nguyen Thi Lang, Head of Plant Breeding, CLRR Le Van Hoa, Dean of Faculty of Agronomy and Applied Biology, CTU Dang Kieu Nhan, Vice Director, Institute of Mekong Delta Research, CTU

Contact: nhtrung@ctu.edu.vn

Thank you for your attention

