

- Making a Difference -

Scientific Capacity Building & Enhancement for Sustainable Development in Developing Countries

Final Report

Project Reference Number: CBA2014-12NSY-BORA-PARR

Capacity Building in Climate Change Mitigation through Precision Agriculture

The following collaborators worked on this project:

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2. Dr. Manzul Hazarika, Asian Institute of Technology, Thailand, manzul@ait.asia
3. Dr. Monjur Alam, Bangladesh Agricultural University, mmalam.bau@gmail.com
4. Dr. Debendra Baruah, Tezpur University, India, baruahd@tezu.ernet.in
5. Dr. Le Chau Ha, Vietnam Academy for Water Resources, lechauha@gmail.com



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CBA2014-12NSY-BORA:

“Capacity Building in Climate Mitigation through Precision Agriculture”

Final Report submitted to APN

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OVERVIEW OF PROJECT WORK AND OUTCOMES

Minimum 2pages (maximum 4 pages)

Non-technical summary

The project team organized four workshops cum training programs to build workforce to mitigate climate change and reduce greenhouse gas (GHG) emission through Precision Agriculture (PA) in Bangladesh, India, Thailand and Vietnam. Climate change adds several conflicting pressures to agricultural production causing tragic crop failures and reduced agricultural productivity. Precision Agriculture (PA) which is a management concept to recognize the variability of crop production potential of a field; optimizes the inputs such as fertilizer, chemicals, seeds and water through variable rate application; resulting increased crop yield with positive environmental impact. Precision farming practices also uses auto-guidance systems in tractor and harvester to reduce overlapping of machinery operation resulting in saving time and fossil fuel which directly contributes to mitigation of climate change. This not only decreases the input cost but also reduces greenhouse gas emission and in many cases sequester carbon.

Keywords:

Precision agriculture, climate change, optimal input use, regional cooperation and networking

Objectives

The main objectives of the project were:

1. To organize workshops and concurrent training program to enhance the capacity to adapt to precision agriculture to mitigate climate change, especially reducing greenhouse gas emission by variable rate application of fertilizer, chemicals and water in crop field
2. To transfer of technological knowledge and transfer of concept from practicing country like USA and customized to local conditions for South and South-east Asia
3. To enhance regional and international co-operation for global change and to develop a network of scientists, policy makers and progressive farmers of these countries

Amount received and number years supported

The Grant awarded to this project was: US\$ 35,000 for 1 Year.

Activity undertaken

The workshops were conducted in four countries for capacity building in PA techniques and transfer of concepts and knowledge (not technology) as most developed countries like USA has adopted PA. The technologies suggested are affordable, available and usable with ease by the local farmers. To facilitate these aspects, proper knowledge about PA, policies and encouragement for developing technologies is being initiated.

The workshops were attended by highest authority in the respective institutions. The workshop in Bangladesh was conducted on 10-12 March, 2015 at Bangladesh Agricultural University (BAU) in Mymensingh, Bangladesh. The workshop was attended by 33 participants from different background (list attached – Appendix 1) including Dr. Rafiqul Hoque, the Vice-Chancellor (Chief

Executive Officer), BAU and other leading policy makers, scientists, farm equipment manufacturer, farmers from Bangladesh. The field trip was organized on 12 March to Rubber Dam, Nalita Bari, Sherpur. The detailed agenda for the workshop is given in Appendix-II.

Tezpur University in Tezpur, India conducted the workshop cum training on 20-22 March, with 51 scientists, policy makers, farmers in attendance including 25 students and a scientist from University of Nottingham, United Kingdom. The inaugural session was addressed by Vice-Chancellors (Chief Executive Officer) of two universities, namely, Prof. Mihir Chaudhuri of Tezpur University and Dr. K. M. Bujarbaruah of Assam Agricultural University, Jorhat, India. The detailed agenda for the workshop and the list of participants are given in Appendix-III and IV respectively.

There were 30 participants, including representatives of Department of Science, Technology and International Cooperation; The General Department of Water Resources (GDWR) - Ministry of Agriculture and Rural Development (MARD); representatives from the Department of Agriculture and Rural Development, Hanoi, Bac Giang, Da Nang, World Bank, and scientists of the sub-institutions within Vietnam Academy of Water Resources (VAWR) at Hanoi, Vietnam in the workshop cum training organized in the campus of VAWR on 20-22 March, 2015. A field trip was conducted on 20th March to the rural areas and followed by the workshop on 21-22 March in Hanoi. Dr. Nguyen Vu Viet, the Director General of VAWR provided the opening remarks and was present both days in the workshop. The agenda for workshop and the list of participants are shown in appendix – V and VI.

The last of the four training cum workshop was held in Asian Institute of Technology (AIT), Klong Luang, Pathumthani Thailand on 25-26 May, 2015. The workshop was attended by 25 participants from different agencies in Thailand including Dr. Lal Samarakoon, the Executive Director of Geoinformatics Center, AIT, Thailand. Due to scheduling conflict, the workshop was arranged for 2 days with half day of visit to the agricultural farm of AIT. The agenda for workshop and the list of participants are shown in appendix – VII and VIII.

There was great enthusiasm among participants to implement precision agricultural techniques to increase environmental benefits as well as productivity. Though, Bangladesh and Vietnam was ahead of other two in implementation of PA, but advanced technology was available in India, especially in institutional level. Thailand is gifted by specialty crop such as fruits and vegetable in addition to rice and lacks technology but, concerned agencies are interested in developing the skills.

Appendices IX through XII shows different activities of the workshops in the four venues.

Results

Four workshops in four different countries were held in the months of March and May, 2015. The workshops were attended by scientists, policymakers, farmers, industry persons and agricultural students. Technical and policy presentations and discussions were held in the workshops. There were suggestions, recommendations of technology suitable for local adaptation for precision agriculture in order to optimize use of fertilizer, chemicals, irrigation water and seeds to minimize the use of inputs based on the potential of the land. This will increase the crop yield and decrease the environmental impact.

Relevance to the APN Goals, Science Agenda and to Policy Processes

The project organized workshop in Bangladesh, India, Vietnam and Thailand for capacity building to mitigate climate change and reduce greenhouse gas (GHG) emission (APN-Goal 1) using precision agricultural technology adopted locally with concept from developed country such as USA. Precision agricultural technology not only reduces the input cost but also reduces GHG by optimizing and reducing the use of agricultural inputs such as fertilizer, chemicals, seeds and irrigation water. The project initiated steps to transfer the concept of knowledge and technology, adapted in the developed countries to customize for developing countries by the scientists and policy makers of both developed and developing regions (APN-Goal 2 and 3).

Self evaluation

Each Institution in the four participating countries have initiated precision agricultural programs in order to achieve positive environmental impact. They have established network with the participants of the workshop as intra-country group. The project also established network among the collaborator from these five countries, namely, Bangladesh, India, Thailand, Vietnam and the USA. There is an attempt to continue the work.

Potential for further work

There has been local awareness for precision agriculture to decrease the environmental impact along with increasing crop productivity. The participants and the institutions have showed interest in continuation of the work. They have expressed implementation of precision agricultural technology in field, evaluate the savings of fertilizer, chemicals, water and seeds for a reasonable period.

Publications (please write the complete citation)

Adaptation of Precision Agriculture to Increase Crop Yield and Mitigating Climate Change in Developing Countries. By: Ganesh C. Bora, Deben Baruah, Peeyush Soni, Md. Monjurul Alam, Le Thi Chau Ha and Manzul Hazarika. Accepted for presentation in American Society of Agricultural and Biological Engineers (ASABE) international conference on "Engineering and Technology Innovation for Global Food Security" Oct 24-27, 2016 at Cape Town, Stellenbosch, South Africa.

Acknowledgments

The support and help of administration, faculty, staff and students of Bangladesh Agricultural University, Mymensingh, Bangladesh; Tezpur University, Tezpur, India; Vietnam Academy of Water Resources, Hanoi, Vietnam; Asian Institute of Technology, Bangkok, Thailand and North Dakota State University, Fargo, USA are duly acknowledged. We would also like to express our gratitude to all the resource persons presented in the workshops (their names are in the appendix).

Appendix

Appendix – 1: List of Participants (Bangladesh)

Workshop on Capacity Building for Mitigation of Climate Change by Use of Precision Agriculture in Bangladesh

Inaugural Session Participants

SL. No.	Name	Address	Cell phone
1.	Prof. Dr. Md. Rafiqul Islam Sarker	Department of Farm Power and Machinery, BAU, Mymensingh-2202	01711627834
2.	Prof. Md. Akhtaruzzaman	Department of Farm Power and Machinery, BAU, Mymensingh-2202	01711071190
3.	Prof. Dr. Md. AbdusSatter	Department of Farm Power and Machinery, BAU, Mymensingh-2202	01716411323
4.	Prof. Dr. Md. Mesbauddin Ahmed	Department of Irrigation and Water Management, BAU, Mymensingh-2202	01731307969
5.	Prof. Dr. Zahirul Haque Khandaker	Student Adviser, BAU	01913108088
6.	Prof. Md. Abdur Rashid	Department of Farm Structure and Environment, BAU, Mymensingh-2202	01712974647
7.	Prof. Dr. Md. Mosharraf Hossain	Department of Farm Power and Machinery, BAU, Mymensingh-2202	01712006283
8.	Prof. Dr. Md. Monjurul Alam	Department of Farm Power and Machinery, BAU, Mymensingh-2202	
9.	Prof. Dr. Murshed Alam	Department of Farm Power and Machinery, BAU, Mymensingh-2202	01674112386
10.	Prof. Dr. Md. Ashraful Haque	Department of Farm Power and Machinery, BAU, Mymensingh-2202	01710893515
11.	Prof. Dr. M. A. Salam	Professor, Department of Aquaculture, BAU, Mymensingh-2202	01711024408
12.	Prof. Dr. Md. Abdul Awal	Department of Farm Power and Machinery, BAU, Mymensingh-2202	01710987258
13.	Prof. Dr. Md. Harur-ur-Rashid	Prctor, BAU	
14.	Prof. Dr. A. K. M. Adham	Department of Irrigation and Water Management, BAU, Mymensingh-2202	01712634374

15.	Prof. Dr. Mohammad Gulzarul Aziz	Department of Food Technology and Rural Industries, BAU, Mymensingh-2202	01922173917
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16.	Dr. Chayan Kumar Saha	Department of Farm Power and Machinery, BAU, Mymensingh-2202	01715626517
17.	Dr. Md. Ashik-E-Rabbani	Department of Farm Power and Machinery, BAU, Mymensingh-2202	01712634354
18.	Dr. Zahida Muyen	Head, Department of Farm Structure and Environment, BAU, Mymensingh-2202	01789442297
19.	Dr. Md. Shahadat Hossain	Associate Professor, Department of Environmental Science, BAU, Mymensingh-2202	01718028558
20.	Dr. Md. Atikur Rahman	Associate Professor, Department of Irrigation and Water Management, BAU, Mymensingh-2202	01816695240
21.	Dr. Md. Hamidul Islam	Department of Farm Power and Machinery, BAU, Mymensingh-2202	01712863879
22.	Dr. Mohammad Abdur Rahman	CSO and Head, Farm Machinery and Postharvest Technology Division, BRRI, Gazipur-1701, Bangladesh	01552495512
23.	Dr. Md. Ayub Hossain	PSO, Farm Machinery and Postharvest Process Engineering Division, BARI, Gazipur-1701, Bangladesh	01716979034
24.	Dr. Md. Asgar Ali Sarkar	Director (Admin. & Support Service), Bangladesh Institute of Nuclear Agriculture (BINA), BAU Campus, Mymensingh-2202, Bangladesh	01715998145
25.	Dr. Md. GolamFaruque	Director, Agriculture and Fisheries Division, CEGIS, Gulshan-1, Dhaka 1212	01715126819
26.	Md. Golam Kibria Bhuiyan	SSO, Farm Machinery and Postharvest Technology Division, BRRI, Gazipur-1701, Bangladesh	01717902516
27.	Mr. Sk. Md. Nazim Uddin	Project Director, Enhancing Crop Production through Farm Mechanization Project, DAE, Khamarbari, Dhaka	01913380460
28.	Md. Lutfor Rahman	Deputy Chief Engineer (MI), BADC, KrishiBhaban, Dhaka 1000	01727451746
29.	Mr. Rajesh Nandi	Department of Farm Power and Machinery, BAU, Mymensingh-2202	01689816890
30.	Ms. Mahjabin Kabir	Department of Farm Power and Machinery, BAU, Mymensingh-2202	01738035056

31.	Mr. ImanunNabi Khan	CEO, AgroMech, Dhaka	01712918342
32.	Md. AbdusSamad	Proprietor, Uttaron Engineering, Kalitala, Dinajpur	01729219946
33.	Md. Solaiman,	Secretary, Adarsha Chashi UnnayanSangstha, Charfasson, Bhola and Convener, Sara Bangla KrishakJote (South)	01724323253

Workshop on Capacity Building for Mitigation of Climate Change by Use of Precision Agriculture in Bangladesh

Participants Attendance

SL. No.	Name	Address	Cell phone
1.	Dr. Mohammad Abdur Rahman	CSO and Head, Farm Machinery and Postharvest Technology Division, BRRRI, Gazipur-1701, Bangladesh	01552495512
2.	Dr. Md. Ayub Hossain	PSO, Farm Machinery and Postharvest Process Engineering Division, BARI, Gazipur-1701, Bangladesh	01716979034
3.	Dr. Md. Asgar Ali Sarkar	Director (Admin. & Support Service), Bangladesh Institute of Nuclear Agriculture (BINA), BAU Campus, Mymensingh-2202, Bangladesh	01715998145
4.	Mr. Sk. Md. Nazim Uddin	Project Director, Enhancing Crop Production through Farm Mechanization Project, DAE, Khamarbari, Dhaka	01913380460
5.	Mr. Md. Lutfor Rahman	Deputy Chief Engineer (MI), BADC, KrishiBhaban, Dhaka 1000	01727451746
6.	Dr. M. A. Salam	Professor, Department of Aquaculture, BAU, Mymensingh-2202	01711024408
7.	Prof. Dr. Md. Abdul Awal	Professor, Department of Farm Power and Machinery, BAU, Mymensingh-2202	01710987258
8.	Dr. Md. Golam Faruque	Director, Agriculture and Fisheries Division, CEGIS, Gulshan-1, Dhaka 1212	01715126819
9.	Dr. Chayan Saha	Associate Professor, Department of Farm Power and Machinery, BAU, Mymensingh-2202	01715626517

10.	Mr. MacksoodAlam Khan	Deputy Director, Rural Development Academy (RDA), Bogra	01713259350
11.	Mr. Md. Golam Kibria Bhuiyan	SSO, Farm Machinery and Postharvest Technology Division, BRRI, Gazipur-1701, Bangladesh	01717902516
12.	Dr. Md. Shahadat Hossain	Associate Professor, Department of Environmental Science, BAU, Mymensingh-2202	01718028558
13.	Dr. Md. Atikur Rahman	Professor, Department of Irrigation and Water Management, BAU, Mymensingh-2202	01816695240
14.	Dr. Md. Hamidul Islam	Assistant Professor, Department of Farm Power and Machinery, BAU, Mymensingh-2202	01712863879
15.	Mr. ImanunNabi Khan	CEO, AgroMech, Dhaka	01712918342
16.	Md. AbdusSamad	Proprietor, Uttaron Engineering, Kalitala, Dinajpur	01729219946
17.	Md. Solaiman	Secretary, Adarsha Chashi Unnayan Sangstha, Charfasson, Bhola and Convener, Sara Bangla Krishak Jote (South)	01724323253

Appendix – II: Schedule of Workshop and Training (Bangladesh)

Title: *Capacity Building for Mitigation of Climate Change by use of Precision Agriculture*

Venue: Precision Agriculture Lab, Department of Farm Power and Machinery,
Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

Time: March 10 to 12, 2015

Day 1 (10 March 2015)

Time	Event	
9:00 -10:00	Registration	
Inaugural session (10:00-12:00)		
Chair	Professor Dr. Md. Monjurul Alam, Chairman, Local Organizing Committee-PA workshop and Co-Project Leader: Asia-Pacific Network for Global Change Research project	
Chief Guest	Professor Dr. Md. Rafiqul Hoque Honorable Vice-Chancellor, BAU	
Guests of Honor	Professor Dr. Mesbauddin Ahmed Convenor, Dean Council, BAU Dr. Md. Wais Kabir, Ex-Executive Chairman, BARC and Consultant-FAO BD Professor Dr. Lutful Hasan Director, BAURES, BAU Professor Md. Abdur Rashid Director, Planning and Development, BAU	
10:00 -10:10	Welcome address	Professor Dr. Md. Monjurul Alam
10:10 – 10: 50	Introduction on <i>Capacity Building for Mitigation of Climate Change by use of Precision Agriculture</i>	Dr. Ganesh C. Bora, Project Director , APN project on Climate Change and Precision Agriculture, NDSU
10:50 -11:30	Speech –Guests of Honor	
11:30 – 11: 45	Speech-Chief Guest	
11:45– 12: 00	Closing Remarks from the Chair	

Day 1 (10 March 2015)

Time	Event	Presenter	Venue
13:00 -14:30	Lunch		BAU guest house
14:30 – 14:35	Introduction on the workshop by session Chair	Dr. Md. Monjurul Alam Dept of FPM, Mymensingh	PA Lab, FPM
14:35 – 15:05	Agricultural Engineering Approaches to Mitigate Affects of Climate Change of Bangladesh Agriculture	Dr. Chayan Kumer Saha Dept of FPM, Mymensingh	PA Lab, FPM
	Mitigation of Climate Change using Conservation and Precision Agriculture: The Role of BARI"	Dr. Md. Ayub Hossain PSO, Farm Machinery and Post harvest Process Engineering Division, BARI	PA Lab, FPM
	Inter Annual Variation of CO ₂ Flux of Rice Paddy	Dr. Md. Shahadat Hossen, Department of Environmental Science BAU, Mymensingh	PA Lab, FPM
15:05 – 15:20	Discussion on presentations		PA Lab, FPM
15:20 -15:40	Tea Break		PA Lab, FPM
15:40 – 17:30	Field Lab Visit		BAU Farm
19:00 – 20:00	Dinner		BAU guest house

Day 2 (11 March 2015)

Time	Event	Presenter	Venue
07:30 -08:30	Breakfast		BAU guest house
09:00 -9:20	Overview and guideline of the workshop	Dr. Ganesh C Bora NDSU, USA	PA Lab, FPM
09:20 -10:20	Present Status of Modern Irrigation Activities Implementing through BADC	Md. Lutfor Rahman Deputy Chief Engineer (MI), BADC Krishi Bhaban	PA Lab, FPM
	Emerging agribusiness clusters in climatically fragile areas and status of precision agriculture	Mr. Imanun Nabi Khan CEO, AgroMech, Dhaka	PA Lab, FPM
	Mechanization initiative on	Mr. Sk. Md. Nazim Uddin	PA Lab, FPM

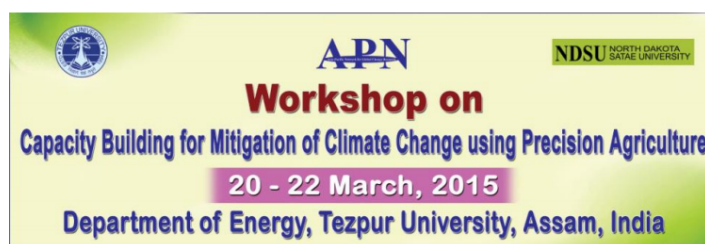
	the way of Precision Agriculture under DAE	Project Director Enhancing Crop Production through Farm Mechanization Project, DAE	
	Boost up nutrition and food security in the country to address climate change through innovative initiatives	Dr. M A Salam Professor, Department of Aquaculture, BAU, Mymensingh	PA Lab, FPM
	BIRRI Developed Agricultural Machinery for Sustainable and precision Agriculture to combat climate change	Dr. Mohammad Abdur Rahman CSO and Head, and Mr. Md. Golam Kibria Bhuiyan, SSO, Farm Machinery and Postharvest Technology Division, BIRRI	PA Lab, FPM
10:20 -10:30	Discussion on Presentations		PA Lab, FPM
10:30 – 10:50	Tea Break		PA Lab, FPM
11:00 -13:00	Precision Agriculture for Sustainable Development : Bangladesh Perspective	Dr. Md. Abdul Awal Professor, Department of FPM, BAU, Mymensingh	PA Lab, FPM
	Precision Agriculture Decision Making	Dr. Md. Golam Faruque, Chief Specialist and Director, Agricultural and Fisheries Division, CEGIS	PA Lab, FPM
	Activities of Rural Development Academy, Bogra	Mr. Macksood Alam Khan Deputy Director, RDA, Bogra	PA Lab, FPM
	Uses of GIS in precision farming for irrigation water management	Dr. Md. Atikur Rahman Department of Irrigation and Water Management, BAU	PA Lab, FPM
	Visible-Near Infrared (VIS-NIR) Spectroscopy: A sensing Tool for Sustainable Agricultural and Environmental Management	Dr. Md. Hamidul Islam Assistant Professor, Department of Farm Power and Machinery, BAU, Mymensingh	PA Lab, FPM

	BINA	Dr. Md. Asgar Ali Sarkar Director (Admin. & Support Service), BINA, Mymensingh 2202, Bangladesh	PA Lab, FPM
	Manufacturers View	Md. Abdus Samad Proprietor, Uttaron Engineering, Kalitala, Dinajpur	PA Lab, FPM
	Farmers View	Md. Solaiman, Secretary, Adarsha Chashi Unnayan Sangstha, Bhola and Convener, Sara Bangla Krishak Jote (South)	PA Lab, FPM
13:00 -14:30	Lunch		BAU guest house
14:30 – 16:00	Mitigation measures by precision agriculture in Bangladesh (using participatory tool)	Dr. Md. Monjurul Alam	PA Lab, FPM
16:00 – 16:20	Tea Break		PA Lab, FPM
16:20 – 16:50	Keynote presentation: <i>Capacity Building for Mitigation of Climate Change by use of Precision Agriculture</i>	Dr. Ganesh C. Bora Project Director of the APN project on Climate Change and Assistant Professor, North Dakota State University, USA	PA Lab, FPM
16:50 – 18:00	Concluding session		PA Lab, FPM
19:00 – 20:00	Dinner		Hotel Sharinda

Day 3 (12 March 2015)

Time	Event	Venue
07:00 -07:30	Break fast	BAU guest house
08:00 -13:00	Field Trip	Rubber Dam, Nalita Bari, Sherpur
13:00 -14:00	Lunch	Rubber Dam, Nalita Bari, Sherpur
14:00 -17:00	Field Trip	Modhutila, Nalita Bari, Sherpur
20:00 -21:00	Dinner	BAU guesthouse

Appendix – III : Agenda (India)



Day 1 Friday 20 March, 2015

- Inaugural Session 15:00 – 16:15 Council Hall, Tezpur University**
- 15:00-16:00
- Welcome address: D C Baruah, Workshop Coordinator, TU
 - Address: Prof D Deka, HoD, Department of Energy, TU
 - Inaugural Address: Professor Mihir K Chaudhuri, Vice Chancellor, TU
 - Address by Chief Guest: Dr K M Bujarbaruah, Vice Chancellor, Assam Agricultural University
 - Vote of thanks: Dr Ganesh Bora, Workshop Coordinator, NDSU
- 16:00-16:15 Refreshment
- Workshop Session I 16:15 – 18:00 Council Hall, Tezpur University**
- Chair: Prof C L Mahanta, Dean R&D, Co-Chair: Dr Pradip K Bora, CAU, Shillong*
- 16:15-16:45 Present status and future strategy of Precision Agriculture for Climate Change Mitigation: *Dr Ashwani Kumar, Ex-Director ICAR-Indian Institute of Water Management*
- 16:45-17:15 Precision Agriculture - Global Scenario: *Dr Ganesh Bora, Asst Prof and Interim Director, NDSU, USA*
- 17:15-17:45 Smart Technology for Precision Agriculture: *Prof M Bhuyan and Mr R Chutia, Dept of ECE, TU*
- 17:45-18:00 Discussion, Wrapping up
- Tea & Group Activity 18:00-19:00 ECL Laboratory, Department of Energy**
- 18:00-19:00 Introduction and grouping of Participants as per specified PA domains viz., (a) Crop establishment including land preparation, (b) irrigation and water management, (c) crop care, (d) harvesting and post harvest Planning Group Responsibility
- 19:00 Local sight-seeing followed by Dinner

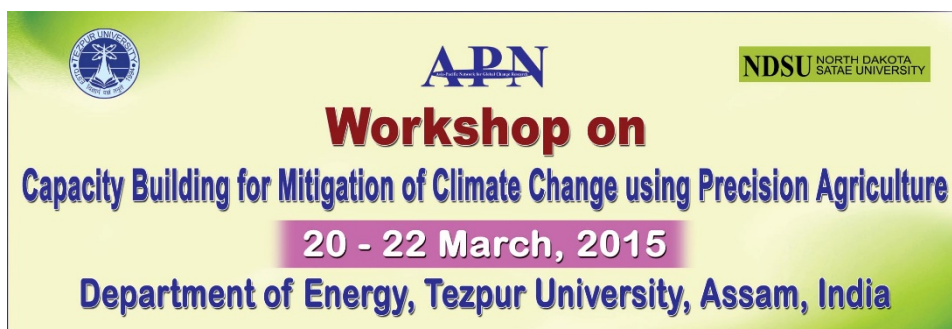
Day 2 Saturday 21 March, 2015

- 07:30-08:30 Breakfast, TU Guest House
- Workshop Session II 08:30-11:00 Conference Room, TU Guest House**
- Chair: Sri D Talukdar, Chief Engineer (Agri) (Retd), Govt of Assam; Co-Chair: Dr S Hazarika, PS, ICAR, Shillong*
- 08:30-08:45 Site specific nutrient management for precision Agriculture- Regional perspective: *Dr S Hazarika*
- 08:45-09:00 Precision tillage and crop establishment– An overview: *Dr K N Dewangan*
- 09:00-09:15 Climate smart Agriculture – saving water and energy through micro irrigation: *Dr P K Bora*
- 09:15-09:30 Status of Precise technologies in Crop care activities: *Dr G V Prasanna*
- 09:30-09:45 Precision agriculture: Challenges in Harvest and post-harvest operations: *Dr M K Hazarika*
- 09:45-10:00 Climate Resilient Agriculture in India- experiences of NICRA implemented in Assam: *Dr Prasanta Neog*
- 10:00-10:15 Geospatial tool and techniques to support Precision Agriculture: *Dr B K Handique*
- 10:15-10:30 Precision Water management - An Industrial experience: *Er H K Baruah*
- 10:30-11:00 Discussion, Wrapping up & tea/coffee
- Parallel Group Activity 11:00-15:00 Conference Room, TU Guest House**
- Crop establishment including Land preparation
 - Irrigation and Water management
 - Crop care
 - Harvesting and Post-harvest handling
- 11:00-13:30
- 13:30-15:00 Working Lunch & Preparation of domain specific reports and power point presentations
- Workshop Session III (presentation of Group Reports) 15:00-19:30 Conference Room, TU Guest House**
- Chair: Dr Ashwani Kumar, Co Chair: Dr M K Hazarika, Head & Assoc Prof, FET, TU*
- 15:00-15:45 Group I: PA in crop establishment including land preparation
- 15:45-16:30 Group II: PA in irrigation and water management
- 16:30-17:15 Group III: PA in crop care
- 17:15-18:00 Group IV: PA in harvesting and post harvest
- 18:00-18:30 Climate Change: Regional and global dimension: *Prof Michele Clarke*
- 18:30-19:30 Outlining future road map for PA in India - Wrapping up: *D C Baruah*
- 19:30 Preparation of draft report followed by Dinner

Day 3, Sunday 22 March, 2015

- 05:00-09:00 Field trip (Optional)
- 09:00-09:30 Working breakfast
- 09:30-10:30 Valedictory programme

Appendix III: Workshop Brochure (India)



Preamble

Precision Agriculture (PA) is a system approach to ensure rational application of materials and energy to support the potential level of production. In crop production system, PA results reduction of chemicals, water and energy consumptions, thereby, reducing the potential greenhouse gas emission. Comprehensive understanding of soil-water-plant system enables to achieve the objectives of PA through the intervention of new tools, technologies and practices. PA can also be viewed as smart farming as it involves application of smart gadgets to enable to complete intended job precisely at temporal and spatial scales.

PA is an emerging subject of recent origin and has drawn worldwide wide attention. However, PA seems to be in its nascent state in India. Augmentation of understanding amongst the major stakeholders is essential for wider application of PA in India which is characterized by vast range of issues and wide range of diversity.

It is, in this context, a three days capacity building workshop “Mitigation of Climate Change using Precision Agriculture” is organized in Association with the North Dakota State University, USA also with the sponsorship of Asia-Pacific Network for Global Change Research, Japan as per the programme provided below.

Venue & Dates

Department of Energy Tezpur University Assam India

20-22 March, 2015

Tezpur University

Tezpur University was established by an Act of Parliament in 1994 in Tezpur. Tezpur is situated on the northern bank of river Brahmaputra in Sonitpur district of Assam. The city is considered to be the cultural capital of Assamese culture. Kaziranga National Park which is famous for its one horned Rhinoceros is only 81 km away from the city.

Tezpur University is seated on a sprawling 262 acre campus amidst the serene surroundings of Napaam on the outskirts of the Middle Assam’s historic town of Tezpur. Over the years, the University has played a leading role in transforming the higher education scenario in the Northeast India through innovative, employment driven and interdisciplinary academic programs with transparent and scientific evaluation system and strong work ethics. The University has presently 19 Academic Departments under 4 Schools offering 63 academic programmes.

How to reach Tezpur University

Tezpur can be reached both by roadways and airways. Tezpur is well connected via road to the other parts of Assam. From Guwahati, one can reach Tezpur in 3 hours 30 minutes by road (approx.205 km) via National Highway 37 (NH37). Flights are also available from Guwahati and Kolkata on some selected days of a week. One can reach Tezpur University from Tezpur by two roads i.e. either via NH37-Dolabari-Panchmile (8.5 km) or via NH37-Porua Chariali-Napaam (9 km).

Themes of the Workshop

Present status of Precision Agriculture and future strategy for Climate Change Mitigation with special reference to Indian Agriculture will be deliberated covering four specific areas:

- Land preparation operations
- Irrigation and water management

- Crop care activities
- Harvesting and post-harvest operations

Participation

The participation is open for PA interested scientists, teachers, policy makers, government officials, farmers and social workers. There is no registration fee for participation and local hospitality will be provided. Bus fare/rail fare may also be reimbursed to limited number of participants based on the availability of fund. Interested participants may send their willingness to the Workshop Coordinator (baruahdeben@gmail.com) using Registration form provided in this Brochure on or before March, 5, 2015.

Organization Committee

Chief Patron	Prof Mihir K Chaudhuri, Vice Chancellor, Tezpur University
Advisors	Prof Amarjyoti Choudhury, Pro Vice Chancellor, Tezpur University Prof Ashok Kumar, Dean, School of Sciences, Tezpur University Prof D K Bhattacharya, Dean, School of Engineering, Tezpur University Prof S Sarkar, Dean, School of Management Sciences, Tezpur University Prof P J Mahanta, Dean, School of Humanities & Social Sciences, Tezpur University Prof C L Mahanta, Dean, Research & Development, Tezpur University Dr Biren Das, Registrar, Tezpur University Mr. T K Barua, Chief Engineer, Department of Agriculture, Govt. of Assam Dr. P K Pathak, Associate Director of Research, AAU, Jorhat Dr. K N Dewangan, Head, Department of Agricultural Engineering, NERIST, Nirjuli,
Arunachal Pradesh	Dr. Manzul Hazarika, Associate Director, Geoinformatics Center (GIC), AIT, Bangkok
Chairman	Prof D Deka, Head, Department of Energy, Tezpur University
Coordinators	Prof D C Baruah, Professor, Department of Energy, Tezpur University Dr. Ganesh Bora, Assistant Professor and Interim Director, NDSU, USA
Members	Dr. Rupam Kataki, Department of Energy, Tezpur University Dr. M K Hazarika, Department of FET, Tezpur University Dr. Samarendra Hazarika, ICAR-NEH Region, Shillong Dr. Pankaj Barua, Department of Agricultural Engineering, AAU, Jorhat Mr. Sadhan Mahapatra, Department of Energy, Tezpur University Dr. Pradip Bora, College of Post Graduate Studies, Central Agricultural University,
Shillong	
Shillong	Dr. Dipali Mazumdar, College of Post Graduate Studies, Central Agricultural University, Mr. P K Chodhury, Department of Energy, Tezpur University Dr. P Kaliita, Department of Energy, Tezpur University Dr. B K Kakati, Department of Energy, Tezpur University Dr. N Sarmah, Department of Energy, Tezpur University Mr. Arvind Kumar, ICAR-NEH Region, Shillong Mr. B Gogoi, Department of Energy, Tezpur University

Registration form

SI No	Particulars
-------	-------------

1. **Name:**
2. **Designation:**
3. **Organization:**
4. **Work experiences in Farming/Precision farming/Climate Change mitigation (Provide details):**
5. **Choice of sub-theme (refer the list provided in the Brochure)**
6. **Willingness to contribute as a participant (*Participants will be required to contribute as per their field/sub theme of Choice during the Workshop and therefore, if selected, it is expected to come prepared*)**
7. **TA required/Not Required**
8. **Recommendation from the Head of the Organization (Optional)**

Address for Communication

Debendra Chandra Baruah

Professor, Department of Energy, Tezpur University

Phone: 03712 267275307; Fax: 03712 267005 (Attention: DC Baruah)

Appendix – IV: List of Participants in India

Sl.No	Name	Designation
1.	Prof Mihir K Chaudhuri	Vice Chancellor, Tezpur University, Tezpur, India
2.	Dr. K M Bujarbaruah	Vice Chancellor, Assam Agricultural University, Jorhat, Assam, India
3.	Prof. D. Deka	Prof and Head, Deptt. of Energy, Tezpur University, Tezpur, India
4.	Baruah, Prof. D C	Professor, Department of Energy, Tezpur University
5.	Bora, Dr. Ganesh	Assistant Professor and Interim Director, NDSU, USA
6.	Bhuyan, Prof. Manabendra	Professor, Department of Electronics & Communication Engineering, Tezpur University
7.	Bora, Dr. Pradip	Assoc Prof, College of Post Graduate Studies, Central Agricultural University, Shillong, India
8.	Chutia, Mr. Riku	Asst. Prof. Department of Electronics & Communication Engineering, Tezpur University
9.	Clarke, Prof. Michele	Asst Pro VC, University of Nottingham, United Kingdom
10.	Dewangan, Dr. K. N.	Associate Professor & Head, Dept of Agricultural Engg, NERIST, Nirjuli, India
11.	Dutta, Dr. Partha	Assoc. Prof. Department of Mechanical Engineering, Tezpur University

	Pratim	
12	Gogoi, Dr. Nirmali	Asst Prof. , Department of Environmental Science, Tezpur University
13	Handique, Dr. B.K.	Sientist, North Eastern Space Application Centre, Department of Space, Government of India, Umiam, Meghalaya, India
14	Hazarika, Dr. Manuj K.	Assoc Prof. , Department of Food Engineering & Technology, Tezpur University
15	Hazarika, Dr. Samarendra	Principle Scientist, ICAR Research Complex North East Hill Region, India
16	Kalam, Dr. M.A.	Professor, Department of Sociology/Social Work, Tezpur University
17	Kumar, Dr. Ashwani	Ex-Director ICAR-Indian institute of Water Management, India
18	Neog, Dr. Prasanta	Assoc Professor, Biswanath College of Agriculture, Biswanath Chariali, Assam, India
19	Sarmah, Mr. Kushal	Biswanath Nath Chariali Agriculture College, Biswanath Chariali, Assam, India
20	Pathak, Dr. P. K.	Associate Director of Research, Assam Agricultural University, Jorhat, Assam, India
21	Prasanna, Dr. G. V.	Professor & Head, Dept of Agricultural Engineering, Assam University, Silchar, India
22	Talukdar, Mr. Dipok	Chef Engineer (Retd), Govt of Assam, India
23	Borah, Dr Nilay	Senior Scientist, Assam Agriculture University, Jorhat
24	Mr. Pramod Deka	Krishi Vigyan Kendra, Sonitpur, Assam, India
25	Patowary, Mr Rupam	Ph.D. Scholar, Department of Energy, Tezpur University
26	Patowary, Mr Dipam	Ph.D. Scholar , Department of Energy, Tezpur University
27	Borah, Mr Doljit	Project Fellow, Department of Energy, Tezpur University
28	Kataki, Ms Sampriiti	Ph.D. Scholar , Department of Energy, Tezpur University
29	Saikia, Ms Biplob	M.Tech Student, Department of Energy, Tezpur University
30	Das, Mr Dhruvajyoti	Project Fellow, Department of Energy, Tezpur University
31	Bezbaruah, Mr Parag	M.Tech Student, Department of Energy, Tezpur University
32	Gogoi, Mr. Bhaskarjit Baruah	M.Tech Student, Department of Energy, Tezpur University
33	Gogoi, Mr. Samarjit	M.Tech Student, Department of Energy, Tezpur University
34	Das, Mr. Sanjay	M.Tech Student, Department of Energy, Tezpur University
35	Buragohain, Mr. Deep	M.Tech Student, Department of Energy, Tezpur University
36	Boruah, Mr. Saurav	M.Tech Student, Department of Energy, Tezpur University
37	Paul, Ms. Sreyashi	Ph.D. Scholar, Dept. of Environmental Science, Tezpur University
38	Borah, Ms. Pallabi	Ph.D. Scholar, Dept. of Environmental Science, Tezpur University
39	Borowa, Ms. Bhaswati	Ph.D. Scholar, Dept. of Environmental Science, Tezpur University
40	Trinavee, Ms.Kumari	M.Tech Student , Dept. of Mechanical Engineering, Tezpur University
41	Das, Mr. Ashutosh	M.Tech Student , Dept. of Mechanical Engineering, Tezpur University
42	Mazumdar, Mr.Numan S	M.Tech Student , Dept. of Mechanical Engineering, Tezpur University
43	Ahmed, Mr. Hilal	Ph.D. Scholar, Department of Food Engineering & Technology, Tezpur University
44	Rajkhowa, Ms. Susmita	Faculty, Army School, Guwahati, India
45	Kalarivayil, Mr. Rajesh	Assistant Professor, Department of Social Work, Tezpur University
46	Paul, Ms. Ankita	Ph.D. Scholar, Dept. of Environmental Science, Tezpur University
47	Saikia, Ms. Parijat	Ph.D. Scholar, Dept. of Environmental Science, Tezpur University
48	Kuma, Mr. Sonu	B.Tech Student, Department of Civil Engineering, Tezpur University

49	Aman, Mr. Kumar	B.Tech Student, Department of Civil Engineering, Tezpur University
50	Kumar, Mr. Roshan	B.Tech Student, Department of Civil Engineering, Tezpur University
51	Kumar, Mr. Manish	B.Tech Student, Department of Civil Engineering, Tezpur University

Appendix V: Agenda for Workshop (Vietnam)

WORKSHOP PLAN

Precision Agriculture approach under Climate change adaptation in Vietnam

20-22/5/2015

a. Time/Date	b. Content	c. Host/speakers
d. Ngày Thứ nhất: 20/5/2015		
8h45' - 9h00'	Participant registrations	VAWR
9h00'- 9h15'	Welcome address – Dr. Nguyen Thanh Bang, Dept. of Science and Technology – VAWR Opening speech of Prof. Dr. Nguyen Vu Viet, Director General of VAWR	Dept. of Science and Technology – VAWR
9h15'- 9h30'	Introduction of APNetwork and Project “Capacity Building for Mitigation of Climate Change by use of Precision Agriculture”	Dr. Ganes Bora – North Dakota University, Fargo, USA
9h30'- 10h30'	Advanced water-saved irrigation technology in Agriculture activities of Vietnam	Institute For Water And Environment (IWE)
10h30'- 11h00'	Discussion (question and answer) on water-saved irrigation technology Giải đáp ý kiến thắc mắc về Công nghệ Tưới tiết kiệm nước tại Hội nghị	All participants
11h'00-11h30'	Short speech of Dr. Ganesh Bora on summary of all discussions	DR. Ganesh Bora
11h30'- 13h45' Lunch break		
14h00'- 14h15'	Introduction of workshop plan	Dept. of Science and Technology
14h15'- 15h15'	Discussion: demand and capacity to apply advanced technologies in Agriculture	Participants
15h15'- 16h15'	Dr. Ganesh Bora speaks	Dr. Ganesh Bora
16h15'-16h45'	Summation of the section	Dept. of Science and Technology
Second day: 21/5/2015		
9h00'- 9h30'	Introduction of workshop plan	Dept. of Science and Technology

9h30'- 10h30'	Applied Remotely Sensed data in agricultural disease management	Centre of Water Resources Software
10h30'- 11h00'	Discussion on Applications of RS	Participants
11h'00-11h30'	Summaries	Dr. Ganesh Bora
11h30'- 13h45' Lunch break		
14h00'- 14h15'	Introduction of workshop plan	Dept. of Science and Technology
14h15'- 15h15'	Discussion: demand and capacity to apply advanced technologies in Agriculture	Đại biểu tham dự
15h15'- 16h15'	Dr. Ganesh Bora speaks	Dr. Ganesh Bora
16h15'-16h45'	Summation	Dept. of Science and Technology
Third day: 22/5/2015		
9h00'- 9h30'	Introduction of workshop plan	Dept. of Science and Technology
9h30'- 10h30'	Livelihood changes due to implication of "Large Farm" program in Agriculture development of Vietnam	CTIC – Centre for Training and International Cooperation
10h30'- 11h00'	Question and Answer	Participants
11h'00-11h30'	Dr. Ganesh Bora speak	Dr. Ganesh Bora
11h30'- 13h45' Nghỉ trưa		
14h00'- 14h15'	Introduction of workshop plan	Dept. of Science and Technology
14h15'- 15h30'	Discussion	Dr. Ganesh Bora
15h15'- 16h15'	Propose for research funding	Participants
16h15'-16h45'	Workshop closing – report	Ban KHTH

Appendix V: List of Participants (Vietnam)



VIỆN KHOA HỌC THỦY LỢI VIỆT NAM
VIETNAM ACADEMY FOR WATER RESOURCES



ASIA-PACIFIC NETWORK FOR
GLOBAL CHANGE RESEARCH

DANH SÁCH ĐẠI BIỂU

Tham dự Hội thảo Quốc tế: Tiếp cận Nông nghiệp chính xác Thích ứng biến đổi khí hậu ở Việt Nam

Thời gian : Từ 20- 22/5/2015

Địa điểm : Viện Khoa học Thủy lợi Việt Nam – 171 Tây Sơn – Đống Đa – Hà Nội

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VIỆN KHOA HỌC THỦY LỢI VIỆT NAM
VIETNAM ACADEMY FOR WATER RESOURCES

NDSU

NORTH DAKOTA
STATE UNIVERSITY

APN

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GLOBAL CHANGE RESEARCH

DANH SÁCH ĐẠI BIỂU

Tham dự Hội thảo Quốc tế: Tiếp cận Nông nghiệp chính xác Thích ứng biến đổi khí hậu ở Việt Nam

Thời gian : Từ 20- 22/5/2015

Địa điểm : Viện Khoa học Thủy lợi Việt Nam – 171 Tây Sơn – Đống Đa – Hà Nội

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VIỆN KHOA HỌC THỦY LỢI VIỆT NAM
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STATE UNIVERSITY

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Tham dự Hội thảo Quốc tế: Tiếp cận Nông nghiệp chính xác Thích ứng biến đổi khí hậu ở Việt Nam

Thời gian : Từ 20- 22/5/2015

Địa điểm : Viện Khoa học Thủy lợi Việt Nam – 171 Tây Sơn – Đống Đa – Hà Nội

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22	Nguyễn Thanh Hiền	CTC	0945003971	thanhhiens1287@gmail.com
23	Lê Chí Kiên Cường	Vụ KHCN	0913344697	lechi@vnu.com
24	Nguyễn Hồng Trường	TT PIM	0912965168	nguyenhongtrung.hq@vnu.com
25	Đinh Vũ Thủy	TTPIM	0988157308	lvthuy48n1@gmail.com
26	Nguyễn Văn Khắc	TT PIM	0922915846	nguyenvanhan1602@gmail.com
27	Nguyễn Thanh Bằng	Ban KHTH - Viện KHTL Việt Nam	0977086166	thanhbangvnu@gmail.com



VIỆN KHOA HỌC THỦY LỢI VIỆT NAM
VIETNAM ACADEMY FOR WATER RESOURCES

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STT	Họ và tên	Đơn vị công tác	Số điện thoại	Email
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29	Lê Anh Tuấn	XB	0983.272.249	leanhluan.hp@gmail.com
30	Lê Thanh Chi	General Planning Dept. MARD	098911.1618	lehanhchi@gmail.com

Appendix VII: Agenda for Workshop (Thailand)



WORKSHOP		
ON		
CAPACITY BUILDING FOR CLIMATE CHANGE MITIGATION USING PRECISION AGRICULTURE		
<i>25-26 May 2015</i>		
<i>Venue: Geoinformatics Center, Asian Institute of Technology</i>		
Day 1		
9.30 - 10.00	Registration	
Opening Ceremony		
10.00 – 10.10	Welcome address	Dr. Lal Samarakoon, Director, Geoinformatics Center, AIT.
10.10 – 10.20	Inaugural Address	Prof. Voratas Kachitvichyanukul, Dean, SET, AIT.
10:20 – 10:25	Brief Introduction about the Workshop	Dr. Ganesh C. Bora, Assistant Professor, NDSU, USA.
10:25 – 10:30	Vote of thanks	Dr. Peeyush Soni, Assistant Professor, SERD, AIT.
10.30 – 11.00	<i>Group Photo and Tea/Coffee Break</i>	
Technical Session		
11.00 – 11.45	Present status and future strategy of Precision Agriculture for Climate Change Mitigation	Dr. Ganesh C. Bora, Assistant Professor, NDSU, USA.
11.45 – 12.15	Smart Technology for Precision Agriculture	Dr. Peeyush Soni, Assistant Professor, SERD, AIT.
12.15 – 13:15	<i>Lunch Break</i>	
13.15 – 13.45	Climate smart Agriculture	To be confirmed
13.45 – 14.15	Geospatial tool/techniques for Precision Agriculture	To be confirmed
14.15 – 14.45	<i>Tea/Coffee Break</i>	
14:45 – 16.30	Visit to Agriculture Farm at AIT	
Day 2		
09:00 – 10.00	Round Table Discussion	
10:00 – 10.30	<i>Tea/Coffee Break</i>	
10:30 – 12.00	Round Table Discussion and Closing	
12:00 – 13.00	Lunch	

Appendix VIII: List of Participants (Thailand)

Registration
 Workshop on Capacity Building for Mitigation of Climate Change by use of
 Precision Agriculture
 Asian Institute of Technology, Bangkok, Thailand
 May 25 – 27, 2015






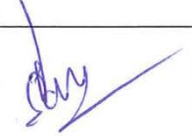

S N	Name, Address and Phone	E-mail	Signature
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2	KHONGPAN RUNGPRATEERTHANORN NECTEC	khongpan@ gmail.com	
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4	Dr. Anshit Chamsing ARI, DOA, MORE	achamsing@hotmail.com	
5	Assist Prof. Dr. Griangjai Samseemung	kkriankkai@ hotmail.com	
6 ✓	Dr. Kittisak Sangpradit	K.Sangpradit @gmail.com	
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9	Phung Duc Luc	phung duc luc 0305 @gmail.com	

Registration



Workshop on Capacity Building for Mitigation of Climate Change by use of Precision Agriculture

Asian Institute of Technology, Bangkok, Thailand

May 25 – 27, 2015

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12	Brian Gomez, Intern at GIC, Faculty of Geomatics, Sabaragamuwa University of Sri Lanka, +94775217830	bjgomez89@ yahoo.com	
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14	Firman Hadi, Program Specialist, Geoinformatics Center - AIT	firmanhadi@ ait.asia	
15	Lakmal Deshapriya, Research Associate, Geoinformatics Center, AIT 085 146 3063	lakmal@ ait.asia	
16	Vinayak Phulekar, Senior Researcher AIT	vinayak@ guelphu	
17	Lal Samarakoon Director, Geoinformatics Center AIT	lal@ait.asia	
18	Manzul Kumar Hazarika Associate Director, Geoinformatics Center	manzul@ait.asia	

Registration
Workshop on Capacity Building for Mitigation of Climate Change by use of
Precision Agriculture
Asian Institute of Technology, Bangkok, Thailand
May 25 – 27, 2015

SN	Name, Address and Phone	E-mail	Signature
19	Ganesh Bora NDSU, Fargo, ND, USA	ganesh.bora @ ndsu.edu	
20	Peejush Soni Agricultural Systems & Engineering AIT, Bangkok	soni @ ait.asia	

Appendix IX: Photographs of the Workshop Activities (Bangladesh)



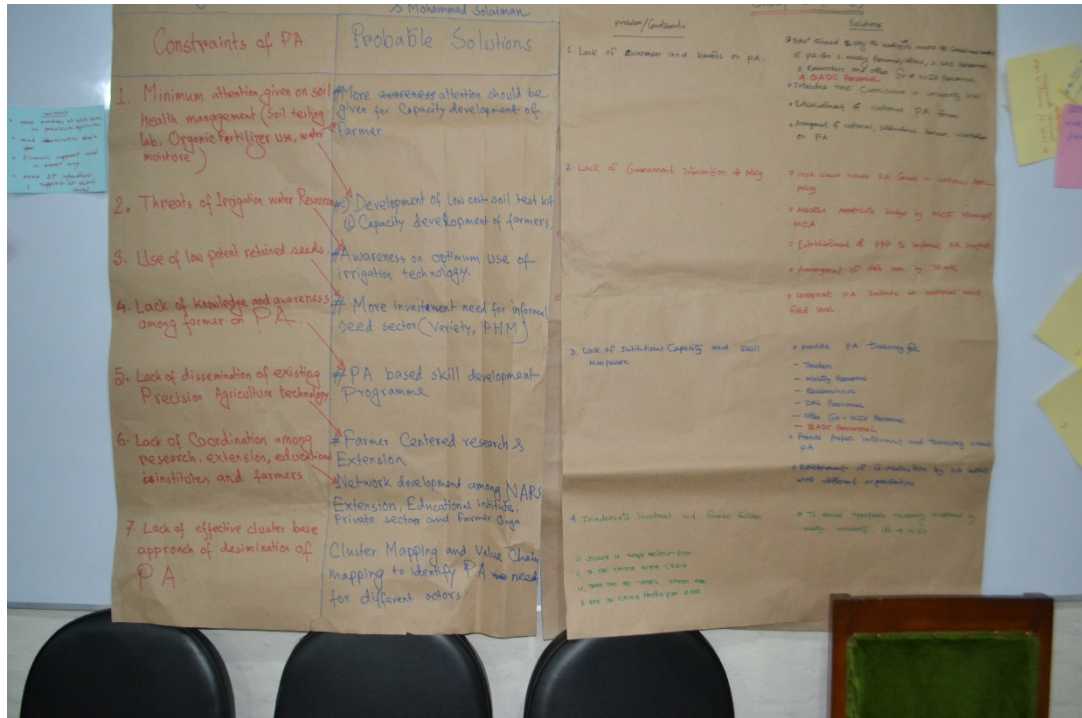
Group Photo participants (Bangladesh)



Inaugural address by Bangladesh Coordinator Dr. M. M. Alam



Field lab visits (Bangladesh)



Flip chart and notes during group discussions (Bangladesh)

Appendix X: Photographs of the Workshop (India)



Group Photo participants (India)



Day 1 Inaugural Session (India)



Day 2 Technical Session (India)



Group Activity (India)

Appendix: XI: Workshop Activities at VAWR at Hanoi, Vietnam



Group photo of the workshop at Hanoi, Vietnam



Group at the technical sessions (Vietnam)



Le Anh Tuan – Agriculture and Environment specialist at the World Bank, presenting



Dr. Tran Thi Dinh presenting (Vietnam)



Dr. Nguyen Dang Vy giving presentation



Prof. Nguyen Vu Viet, Director General of VAWR providing the opening speech



Dr. Ganesh Bora giving the presentation (Vietnam)



Discussion at the field (Vietnam)

Appendix XII: Photos of the Workshop Activities (Thailand)



Group photo of the participants in Thailand



Discussion among the participants (Thailand)



Queries from the participants (Thailand)



Presentation by the project coordinator (Thailand)



Demonstration of crop sensors used to optimise agricultural input resources (Thailand)



Working of crop sensors (Thailand)