International Conference on
CLIMATE CHANGE IMPACTS AND ADAPTATION FOR FOOD AND ENVIRONMENTAL SECURITY

Conference Summary Report

21-22 November 2012
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Los Baños, Laguna
Philippines

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January 2013

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EXECUTIVE SUMMARY

About 150 researchers, academicians, policymakers, and development workers representing 21 countries attended the **International Conference on Climate Change Impacts and Adaptation for Food and Environmental Security (ICCCIAFES)** held on 21-22 November 2012 at the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) in Los Baños, Laguna, Philippines.

The conference was jointly organized by SEARCA and the University of the Philippines Los Baños (UPLB) through its Interdisciplinary Program on Climate Change (IdPCC), with the Asia-Pacific Adaptation Network (APAN), supported by the Institute for Global Environmental Strategies (IGES) in Japan, as major sponsor. Additional partners included the Food Security Center (FSC) at the University of Hohenheim (UHOH), Germany and the German Academic Exchange Service (DAAD); Asia-Pacific Network for Global Change Research (APN); Economy and Environment Program for Southeast Asia (EEPSEA); United Nations World Food Programme (UNWFP); and the Philippine Climate Change Commission (PCCC) as supported by the German Agency for International Cooperation (GIZ).

Serving as a platform for exchange on the latest knowledge on climate change impacts and adaptation linked to food security and environmental sustainability, the scientific meeting had three plenary sessions and four parallel sessions on the following themes where a total of 44 papers were presented:

- Status, Prospects, and Practices on Climate Change Adaptation in Agriculture
- Climate Change Impacts and Vulnerability
- Climate Change Adaptation and Agriculture
- Institutional and Economic Aspects of Climate Change Impacts and Adaptation
- Systems and Tools for Analysing Climate Change Impacts and Vulnerability
- Regional and South-South Collaboration in Research and Development
- Networking for R&D and Capacity Building on Climate Change and Food and Environmental Security

The papers presented a wide range of new knowledge along with appropriate, indigenous or local technologies that can be used to address the impacts of climate change – not only as adaptation strategies, but also for mitigation and increasing resilience. The initiatives described likewise vary widely in methods and approaches (simulation/modeling by experts to highly participatory approaches with direct involvement of end users in the field); differences in ecological zones (tropical forests, agroforestry systems, irrigated lowlands, dryland farms, fishpens in lakes, to pelagic fisheries); and scale (breeding work/genetic level to household, community, up to regional in scope).

The aim is for lessons to be learned, good practices to be adopted or adapted and upscaled, and for new collaborative initiatives to be undertaken – that environmental and food security shall be ensured for the majority of Southeast Asia and other regions that are bearing the brunt of adverse impacts of climate change.

CONFERENCE BACKGROUND

Rationale

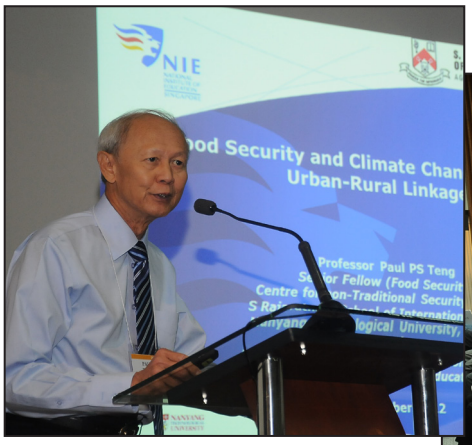
Climate change and climate variability are among the top issues facing the world today. They pose real threats to the environment and to human systems specifically agricultural production, biodiversity, and health, among others (IPCC, 2007). Extreme climatic events such as typhoons that are becoming more frequent and destructive, prolonged wet and dry seasons, and increased incidence of disease and pest outbreaks negatively affect agricultural production systems, leading to food and livelihood shortages – consequently threatening food and environmental security.

Growing evidence of climate change around the world and in Southeast Asia in particular compels all sectors to act to ensure sustainability of lifelines that include natural systems and food resources, rural livelihoods, and human resources. The Southeast Asian region is therefore challenged to increase its capacities and expertise to attain the set objectives of the Millennium Development Goals (MDGs), specifically those that pertain to eradicating extreme poverty and hunger and ensuring environmental sustainability.

However, much of the research on climate change is conducted in fragmentary fashion in different countries by discipline and sector. This situation presents opportunities for developing multidisciplinary and multisectoral approaches. It is in this regard that the conference aims to provide a venue for promoting integrative partnerships toward convergence of ideas for holistic solutions to reduce the impacts of climate change on the region's food, environmental, nutritional and health security.

Objectives

ICCCIAFES' main goal is to bring together researchers, academicians, policy makers and planners, development workers, and other professionals in the region in a discussion forum to exchange information and forge linkages towards enhanced capacity to achieve food, environmental, nutritional and health security in the face of climate change.



Specifically, the conference aims to:

1. Exchange state-of-the-art knowledge on climate change science, adaptation strategies, disaster risk reduction, planning and management, and vulnerability and impact assessment tools among regional stakeholders specifically in the agriculture and environment sectors;
2. Gather scientific information and experiences into an integrative body of knowledge in order to identify knowledge gaps and common, urgent and emerging issues related to food and environmental security in the region;
3. Identify location-specific knowledge and adaptation strategies that may be upscaled to other regions; and
4. Promote partnerships and linkages among different sectors for collaborative activities on climate change adaptation.

Conference Coverage

The conference invited submission of abstracts on the following themes:

- Effects and impact of climate change on food and environmental security issues, including state-of-the art knowledge and assessment tools such as vulnerability assessment, risk characterization, risk analysis, and impact assessment.
- Institutional (policy, governance, culture) and economic aspects of climate change science and adaptation
- Country and regional collaborative experiences for climate change adaptation and disaster risk reduction
- Other climate change-related topics relevant to the conference theme

Knowledge Partners

The conference benefitted from the contribution of knowledge partners aside from those already mentioned in the Executive Summary. These partners include the Nanyang Technological University Rajaratnam School of International Studies- Centre for Non-Traditional Security Studies (NTU RSISCNTS), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) , University of Tokyo, GIZ Biodiversity and Climate Change Project, and Philippine Climate Change Adaptation Project (PhilCCAP).

OPENING PROGRAM

Welcome Messages

Dr. Gil C. Saguiguit, Jr., SEARCA Director, welcomed the participants and guests to the ICCCIAFES and to SEARCA, the host institution for the conference. He acknowledged key persons and institutions who provided support for the two-day scientific meeting - a platform for knowledge sharing and exchange towards keeping research, policies, and academic and action programs responsive to the issues and challenges posed by the threat of climate change. He stated that the agriculture sector is most vulnerable to climate change due to its heavy reliance on climate and weather; yet, it bears the main responsibility of feeding an ever-increasing population.

Dr. Saguiguit encouraged the participants to take advantage of the conference to share and learn from each other and urged institutions to collaborate by undertaking concerted rather than dispersed and fragmented efforts. He challenged everyone to help contribute to food and environmental security for all, most especially the vulnerable sectors of society. "We must strategically invest in initiatives that can generate the most synergistic results", he concluded.

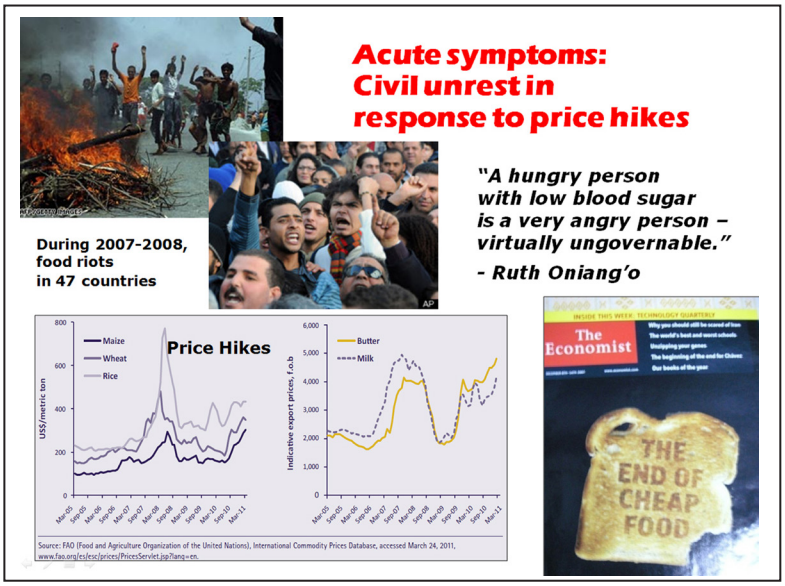
Dr. Rex Victor O. Cruz, UPLB Chancellor, welcomed the diverse range of participants who are leaders in their own fields. He also congratulated SEARCA for putting together the event with key international organizations working on climate change mitigation and adaptation. The Chancellor added that the participants would not be at the ICCCIAFES if they – like him - were not convinced that climate change is real, serious, urgent, and that it threatens the security and economy of all nations.

Concurring with Dr. Saguiguit, Dr. Cruz declared that agriculture has to cope with heightened climate variability and more extreme weather events that cause declines in crop and livestock production. Such occurrences further undermine food security - which often result in conflict in regions where hunger and famine already thrive. The Chancellor acknowledged that many countries have already taken bold steps to address climate change but that huge tasks ahead still need to be done. He urged everyone to share the science-based knowledge and practices in the areas of climate change mitigation and adaptation to help address issues of food and environmental security.

"Food security represents the biggest defining element of any civilization", asserted **Mr. Naderev M. Saño** in his welcome remarks. The Philippine Climate Change Commissioner explained that countries have collapsed because of food insecurity.

Commissioner Saño then talked about the significant role of seeds in society – calling a seed a small miracle where everything comes forth and elaborating how it embodies limitless potential. The seed also symbolizes the community's survival, sustenance, and continuity of life, he added. He related how seed saving is the people's duty and seed exchange, an age-old practice in many cultures, noting how a farmer says a prayer every time s/he sows a seed into the ground. To conclude, Commissioner Saño likened the ideas, analyses, and measures that will be discussed in the two-day event to seeds and asked everyone to protect these seeds that we "inherit" and in turn plant and nurture these seeds of change.

Keynote Speech



Slide No. 4 of the keynote speaker provided a graphic description of what could happen if food security is under threat. With his presentation, **Dr. Paul S. Teng,** Senior Fellow on Food Security at the Centre for Non-Traditional Security Studies of the Rajaratnam School of International Studies (RSIS) in Singapore, connected the many dots representing the complex set of issues surrounding climate change, giving a most fitting context for the conference. He underscored that it is **not** climate change per se that is of concern, but rather its **impact,** which is particularly felt in environmental and food security.

Food security, Dr. Teng explained, goes beyond food production. People have to have physical and economic access to food, which has to be in the right amount and quality to meet dietary needs and preferences. He cited a number of studies explaining the impacts - actual and anticipated (i.e., modeling) - of climate change on agriculture and food availability. He further stated that the world has become an urbanized society, and that climate change impacts in the rural areas also affect people in the cities because most of the food is grown in the countryside. Acute symptoms of such effects are the food riots, mostly in cities, brought about by shortages and price hikes in staple food products.

Dr. Teng declared that dealing with the effects and impacts of climate change especially on food security will require a multisectoral, multilateral, multidisciplinary, integrated approach. To underscore the urgency of the task at hand, he stressed that the time to act is now.

Conference Overview and Opening of Poster Exhibit

Dr. Felino P. Lansigan, who co-chairs the Interdisciplinary Program on Climate Change (IdPCC) at the University of the Philippines Los Baños (UPLB), provided an overview of the conference. He explained the rationale for ICCCIAFES, its objectives, mechanics for the different presentations, and the range of topics that will be covered during the two-day event. He also showed a slide outlining the number and composition of participants by continent or region. Dr. Lansigan thanked all the conference partner institutions, the participants, presenters, session chairs and rapporteurs, and the support team from SEARCA and UPLB.

Dr. Mariliza V. Ticsay, head of SEARCA's Knowledge Resources Unit, invited everyone to view the poster exhibits that were set up at the Drilon Hall Lobby. She encouraged participants to visit the exhibits during session breaks as these will be on display until the end of the conference. Poster presenters would be on hand to answer questions or comments about them.

CONFERENCE SESSION HIGHLIGHTS

Plenary 1
STATUS, PROSPECTS, and PRACTICES on CLIMATE CHANGE ADAPTATION in AGRICULTURE

Climate Change Impacts and Adaptation in the Semi-Arid Tropics

William D. Dar, PhD
Director General, ICRISAT

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) plays a key role in making agriculture climate-resilient in the semi-arid tropics (about >750 million hectares) where two billion people and most of the world's poor are found. This is because it is the only global agricultural institute serving the smallholder farmers and the poor in Asia and Africa.

The Institute's focus is not only on marginal areas, but also on marginalized crops or what Dr. Dar calls "orphan" crops such as sorghum, pearl millet, ground nut, pigeon peas, cowpeas, chick peas, and lentils. These are highly nutritious crops that do not get much attention because of governments' policies favoring mostly grain crops. Main points of his presentation include:

- The biggest challenge facing the region is a "rising perfect storm" as a result of the convergence and synergy of climate change and other factors. By the 2080s, climate change can reduce cereal yields down to 50% in many African countries, and to 30% in Central and South Asia. Models indicate that there will be a 10% increase of dryland areas in the world with climate change. Hence, this region is where the "war" is on climate change and best practices may be upscaled to other parts of the world.
- The current yields of farmers are lower by two- to five-folds compared to achievable yields; the vast potential of rainfed agriculture needs to be harnessed. **Note:** R&D resources favor irrigated against rainfed agriculture at 12:1 ratio.
- ICRISAT is using the 'power of science' to pursue four research themes, namely: adaptation to progressive climate change, adaptation through managing climate risks, pro-poor climate change mitigation, and integration of research results for decision making.

Escape to adapt: ICRISAT's drought-escaping groundnut

The Center is also pursuing supportive policy directions such as: 1) funding more R&D on climate-resilient agriculture; 2) consolidating and analysing various climate and production models; 3) using farmer-centered, science-based approaches; 4) ensuring technology options and farmers' access to knowledge and scientific research; and 5) linking farmers to markets.

Q: Timor Leste is surrounded by (sea) water but we do not have enough water for crops. What technologies and policies can you recommend?

A: There is no country with no rainfall; we highly advocate water harvesting (desalinating is too expensive). Reflect this in policy to enhance your agriculture. Also, adopt practices suitable to your conditions, e.g., plant/sow in the rainy season, and use the harvested water for crops planted in the dry season; choose suitable varieties or crops; try saline-tolerant varieties of sorghum and millet - Israel and some Middle East countries have done work on this.

Q: How do you upscale best practices?

A: Some programs that can be upscaled to other arid regions include: 1) the technology of planting climate-ready crops bred to be early-maturing, stress and salt-tolerant, and drought-escaping varieties (e.g., dryland cereals and tropical legumes like chickpeas, pigeon peas, and ground nuts), plus improved cultural practices; 2) for soil and water conservation, the implementation of community-level irrigation systems and rainfall harvesting for dry-season planting and recharging of aquifers; this can also be the entry point for introducing other technologies such as dryland-suitable varieties; 3) integration of all federal and state agricultural intervention projects and resources, policies, networks of stakeholders, and climate-ready varieties plus technologies to create a good delivery system to farmers; 4) making full use of farmers trainers with technical assistance from change agents as part of the extension system; and 5) working with private sector and civic organizations in upscaling and downstreaming research breakthroughs (e.g., varieties now being commercialized).

Q: How do you ensure sustainability of your efforts?

A: ICRISAT management planned for a systematic succession so that junior researchers can take the place of retiring scientists; we also build capacity with visiting scholars and research fellows. However, we may have problems with replacing human capital if we do not address some problems… For instance, where did the FFP[1] and 4H Club[2] go?... Enrollment in agricultural universities is declining… Also, current agricultural education is good but we are only producing think tanks; we also need to produce (agricultural) entrepreneurs to create jobs and wealth.

Additional comment: Research at the village level on climate change adaptation and resilience should include networks of women, and results should be used as input for policy making.

[1] The Future Farmers of the Philippines (FFP) is a national organization of young men enrolled in agricultural high schools and colleges. It was established under the now defunct Bureau of Vocational Education (www.bilar.bisu-edu.ph/campus-life/future-farmers-of-the-philippines.php).

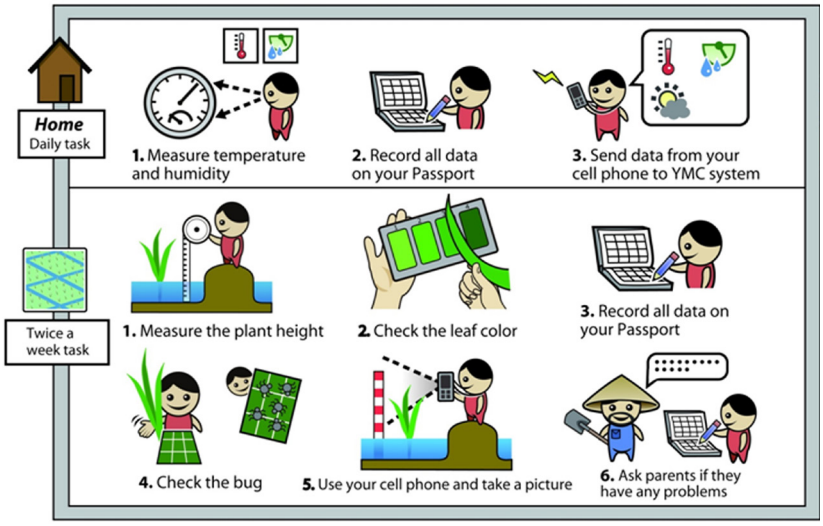
[2] 4-H in the United States is a youth organization that aims "to engage and develop the youth to reach their fullest potential". 4-H represents the organization's personal development areas of focus: head, heart, hands, and health. Today, 4-H and related programs exist in over 80 countries around the world (http://en.wikipedia.org/wiki/4-H). Called 4H Club in the Philippines, it is administered under the Department of Agriculture. It mainly serves the training and extension needs of out-of-school youth in a variety of areas: health and nutrition, agriculture and fisheries, income-generating activities, and entrepreneurship.

Agricultural Adaptation to Climate Change at the Grassroots Level and Use of Advances in Science and Technology

Seishi Ninomiya, PhD
Professor, University of Tokyo

Dr. Ninomiya outlined the challenges related to getting relevant information to farmers especially in developing countries: knowledge transfer to farmers is often insufficient; lack of agricultural extension staff; illiteracy which prevents proper knowledge transfer to farmers; and lack of quantitative information regarding cropping (e.g., site-specific meteorological and crop conditions are not adequately recorded or not being observed).

The professor added that in 21st century agriculture, technology literacy is important to access information and knowledge for sustainable farming. The Youth Mediated Communication (YMC) model tested in Vietnam involving 29 children may be adapted to bridge the information gap between experts and illiterate or older generation of farmers.



Simplified guide for children sensors' field monitoring tasks

In the model, farmers' children serve as messengers between their parents and remote experts using personal computers available in a village center. Main points of his presentation include:

- Instead of using a high maintenance equipment (fieldserver) to observe, record, and transmit data, children were recruited as youth "sensors". They were equipped with simple, low-cost, and maintenance-free tools for the job: tape measure, leaf color and insect plates, hand-held device to measure temperature and humidity, and a mobile phone to take field photographs and transmit data to the YMC system.
- Innovations of the model that facilitated the youth's participation included: 1) user- friendly software to ease information exchange among children and experts; 2) common Q&A sets to help the children make their queries; 3) graphical cards to help farmers' understanding; and 4) machine translator for foreign experts.
- Among the benefits of the model were: a) farmers were glad to have new knowledge and information; b) children were key in providing proper advice from experts to particular farmers and locations c) additional positive effects: communication between parents and children improved, and it fostered young people's renewed interest in agriculture.

Q: What is the impact of using youth as sensors?

A: Youth sensors in the villages can provide spatially high density weather information. The data they collect can be used for an early warning system; and long-term observation can lead to better inputs for decision-making.

Q: You mentioned that the young people involved in the project are from 9-14 years old (school-going age). How do you ensure balance between their school attendance and their field monitoring tasks?

A: We discuss with their parents and ask for their permission. Some of the tasks do not take a lot of time (e.g., recording the temperature needs only a few minutes); the others do not need to be done daily. We are careful that their field monitoring do not interfere with their schooling.

Q: How do you ensure sustainability?

A: By tapping the youth, we are getting the children interested (again) in agriculture. Farmers are growing old; who will feed the world when they go? However, capacity building is a key intervention to ensure sustainability, hence it should be done not just for young people only; older farmers must also be engaged in lifelong learning.

Q: How do you check/monitor the data collected by the children (i.e., ensure quality control)? This is important because decisions will be based on these data.

A: The children were given basic training on how to use the tools they were provided. Outliers (data from the youth sensors) are excluded. Averaging the figures would result in acceptable data as long as we have a sufficient number of observations. Occasionally we request the facilitators to take the same measurements and the results are very similar.

Parallel Sessions 1
CLIMATE CHANGE IMPACTS and VULNERABILITY

Parallel Session 1A

Unavoidable Global Warming Commitment and Its Food Security, Impacts and Risks, Implications Focused on Southeast Asia

Peter Carter, MD
Climate Emergency Institute, Canada

To frame his presentation, Dr. Carter provided a summary of most recent facts and figures on climate change, with special emphasis on global warming – its causes/sources and associated effects. He cited data from international research organizations and scientists who are actively engaged in the field, including the World Bank and Asian Development Bank. Main points of his presentation include:

- Extent of the effect of multiple impacts of climate disruption and global warming are not seriously acknowledged and therefore not properly addressed.
- If emission pledges to the United Nations remain unmet, a 4°C warming could occur by the 2060s, with dire consequences. Moreover, there are agreements but there are no specific plans (policy recommendations).
- Food production will be greatly affected/reduced by global climate change which is irreversible. According to models, we can expect yields of major cereals/staple crops to drop (wheat 32%-44%; rice 14%-20%; sorghum 9%-18%; maize 2%-5%), and their prices to rise accordingly. This poses a grave threat to food security.
- Planning for future food should consider the following:
  - Plan according to committed unavoidable warming.
  - Climate-crop model results are underestimates; not considered in the equation are responses to insects and pathogens, soil salinization, floods.
  - Plan for adaptation.
  - Assume world food prices will keep on increasing due mainly to increasing trend of northern hemisphere drought.
  - Assess first by extreme weather events such as more droughts and more floods.

Dr. Carter asserted that we are being confronted by a food emergency that affects food producers and consumers alike. In closing, he stated that the situation requires a united global emergency response because we are **all** in this emergency together.

An Analysis of the Impacts of Climate Change on Crop Yields and Yield Variability: the Ethiopian Case

Mr. Zerihun G. Kelbore
PhD Candidate, University of Trento, Italy

Only about 5% of cultivated lands in Ethiopia are irrigated. The remaining lands largely depend on rainfall. Change in climate or weather patterns which affect availability of rainwater for irrigation can result in lower production.

Mr. Kelbore's presentation discussed the impacts of climate change on mean variance of crop yields (teff wheat, and maize) in Ethiopia over a period of 28 years.

Stochastic production function was used to estimate the effects of *belg* (short and moderate rainy season from Feb- May) and *kiremt/meher* (long and heavy rainy season from June-Sept, corresponding to the main growing season) on changes in crop yields. Three climate models (CGCM2, PCM, and HadCM3) were used in the study to analyse the effects of future climate on mean crop yield and its variances.

Although impacts vary across different crops and regions, model simulation shows that by 2050, serious damage is seen on the yield of teff and wheat while maize will relatively increase.

With about two-thirds of total produce being consumed domestically, this represents food security issues for the country. Decline in crop yields may also drive prices up, likewise putting local consumers at a disadvantage.

The author recommends that adaptation strategies to climate change need to take into account regional realities and possible changes in cropping season, with reservations that results may change when temperature variable is considered; emission scenarios change; and if downscaled climate change projections are used.

Climate Changes in Cambodia, Philippines and Vietnam: A Vulnerability Analysis at Commune and Household Levels

Bui Dung The, PhD
Director, Office of Science-Technology, International Cooperation and Graduate Education
Hue University, Vietnam

Dr. The presented results of vulnerability analyses at the commune and household levels of selected provinces in Cambodia, Philippines, and Vietnam particularly those located in the lowland and coastal areas with relatively high poverty incidence, large areas of land devoted to agriculture, and poor social infrastructure facilities. Vulnerabilities were assessed considering the spatial and social dimension (exposure, sensitivity and adaptive capacities) using participatory approaches.

[3] Teff (*Eragrostis tef*) is an annual cereal crop native to Ethopia that provides grain for human consumption and fodder for cattle. It can thrive in marginal soils and in drought conditions. However, teff is most commonly grown in the Ethopian highlands (http://www.agmrc.org/commodities_products/grains_oilseeds/teff/).

The study found the following contributors to climate change vulnerabilities:

For Laguna, Philippines: sensitivity and low adaptive capacity (e.g., unpreparedness, fragile location, lack of amenities, limited information on climate change and its impacts)
For Thua Thien Hue, Vietnam: high exposure to hazard, low adaptive capacity, and lack of long-term planning perspective on adaptation
For Kampong Speu, Cambodia: low adaptive capacity was identified as the dominant determinant to vulnerability

The study sites in the three countries

Vulnerabilities to climate change were likewise found to differ across local contexts. However in general, the elderly and children, disabled, women and women-headed households, and poor people are more vulnerable.

Poor infrastructure, lack of alternative livelihoods, and inadequate attention to climate change issues are constraints to the improvement of communities' resilience.

The researcher stressed that vulnerability analysis and mapping supports decision making. Local government unit (LGU) staff can be effectively involved in vulnerability indexing and mapping. He encouraged the use of interdisciplinary and participatory approaches in the process.

Carbon Sequestration and Climate Change Impact on the Yield of Bagras (*Eucalyptus deglupta* Blume) in Corn-based Boundary Planting Agroforestry System in Northern Mindanao, Philippines

Mr. Richmund A. Palma
Assistant Professor
MIsamis Oriental State College of Agriculture and Technology, Philippines

The prediction model for yield and biomass expansion factor (BEF) of Bagras *(Eucalyptus deglupta)* in corn-based boundary planting in the provinces of Misamis Oriental and Bukidnon in Northern Mindanao, Philippines used multiple linear regression analysis of a set of key variables. It also assessed the impact of future climate change on agroforestry systems. The PRECIS model of PAGASA was adopted.

The site index equation developed based on the measured parameters showed that an increase in aspects results to an increase in total height of Bagras. The yield prediction model likewise reflected that an increase in site index resulted to an increase in timber yield. Based on the model, every unit increase in site index brings about a 2.15 increase in the predicted yield. Conversely, planting Bagras on poor sites will yield lower wood volume. The researcher predicted that yield of Bagras will increase per year in 2020 and 2050.

Aside from the timber/wood products, Bagras also provides environmental services through carbon sequestration. Using Butthep et al procedure (2008), rate of carbon sequestration with boundary planting of Bagras is about 26.75 Mg/ha/yr.

Q: How can we (as researchers) make a case for having a stronger interdisciplinary. interagency, or intergovernmental commitment to climate change adaptation?

A: (Dr. The) The task is challenging but such collaborative approach needs to be in place. In our project, we have team members from the social, natural, and crop sciences. If you want to work with local governments, find out what they need and explain what concrete outputs will come out of the project. You also have to have a clear framework for working together, and specify what input/ contribution is expected from each partner.

(Dr. Carter) More work is needed on a regional basis; employ science that is directed, e.g., reports (research results) submitted to local governments should be transformed into policy recommendation; risk assessment should be undertaken on a regional basis using interdisciplinary approaches.

Q: Can you comment/give your opinion on the need for quantifying the uncertainty factor in model predictions?

A: (Mr. Palma) In order to plan for becoming more adaptive and resilient to negative effects of climate change, we need to quantify the risks.

(Mr. Kelbore) We can never avoid uncertainties, but it is important to capture these especially in climate science. Whenever making projections or suggesting policies, it is better to use sensitivity analyses.

Comment: (for Mr. Palma) Only the yield of Bagras was presented; yield of maize which was part of the agroforestry system should have been reported also.

Parallel Session 1B

Climate-driven Variations in Small Pelagic Fisheries Production in Northern Zamboanga and Bohol Sea: Potential Impact, Vulnerability, and Local Adaptive Capacity

Asuncion B. de Guzman, PhD
Professor, Mindanao State University at Naawan, Philippines
(presented for Prof. de Guzman by Ms. Katrina Lynn B. de Guzman)

This study is among the pioneering projects in the Philippines that systematically analyses the potential effects of climate change on coastal fisheries production, particularly for small pelagic fishes in selected fishing grounds in Northern Mindanao.

Although results of the study show that changes in fishery productivity are affected by climate-driven factors, it is difficult to differentiate which one between **climate** and **overexploitation** serves as the main factor contributing to productivity changes of pelagic species as these factors work synergistically.

Climate influence on small pelagic fisheries is most apparent in Dipolog- Sindangan and Butual Bay where fisheries production is much higher during the northeast monsoon (NEM) than during the southwest monsoon (SWM).

Upwelling during the NEM, which is associated with high rainfall that induces large nutrient influx, resulted in higher productivity of sardines and other small pelagics due to elevated chlorophyll levels and low sea surface temperature (SST).

In addition to climatic factors, Dr. de Guzman recommended that compounding issues that exist such as encroachment and equity concerns also need to be addressed.

Vulnerability and Adaptive Capacity of Pastoral Communities under Climate Change in the Hindu Kush Himalayan Region

Srijana Joshi Rijal, PhD
Consultant, International Center for Integrated Mountain Development (ICIMOD)

Highlighting the existing knowledge gaps on the potential impacts of climate change on the range of ecosystem services provided for by rangeland ecosystems, the study determined the climate change vulnerability and adaptive capacity of pastoral communities in the Hindu Kush Himalayas (HKH).

Pastoralism as a livelihood and a way of life

Pastoralism remains as a main source of livelihood in the HKH region. However, on the average, household income is very low among mountain

pastoralists who are likewise deprived of basic facilities in education, health and infrastructure, which affect their overall adaptive capacity.

Age, level of education, and literacy rate of pastoralists were found to be the main factors influencing their households' likely ability to adopt diversified strategies, particularly concerning change and new technologies.

Migration has long been an important adaptation strategy for mountain pastoralists. Other strategies include: use of drought resistant seeds, livelihood diversification, and use of energy- saving devices. All of these were found to reduce pressures to rangeland ecosystems which in turn reduce the communities' vulnerability to climate change in the long run.

Recommendations of the study include: developing alternative energy sources, improving water facilities, improving control over pastoral land, controlling predatory wildlife, and generally improving the socio-economic condition of the communities. Additional studies to better understand the fragility of rangeland ecosystems is particularly needed in Bhutan.

Status of Native Forest Managed by *Mataqali* Under Anthropogenic Pressure - A Case from Sote Village, Nukurua, Tailevu, the Fiji Islands

Mr. Maika Tabukovu
Lecturer, Fiji National University

Mr. Tabukovu claimed that this is the first study in Fiji Islands that analyses the condition of native forests managed under communal ownership (*mataqali*) that needs to be enhanced given its potential carbon sequestration service. Three study sites were identified and compared based on their accessibility (remote location, near a river, and near a road).

Results show that accessibility of the forest is a crucial factor that affects the mean basal area of forest trees. The more remote the location, the mean basal area is higher.

Forest accessibility also affects the trees' mean carbon sequestration potential (carbon sink function). More than 137% difference in carbon removal was computed between those in remote location compared to those near the road.

The forest located in a remote area was also found to have more endemic and widely distributed species that are good carbon sequesters.

Mr. Tabukovu put forth the following recommendations:

- Native landowners should be educated on the importance of their natural contribution to climate change as well as in mitigating its effects, especially floods.
- Training institutions like the Fiji National University (FNU) could/should undertake climate change-related research especially at the community level.

The speaker raised the urgent need for more climate change researches (especially at the community level) to be conducted in Fiji. He asked the audience for help and possible future collaboration.

Flooding Vulnerability of the Towns of Mabitac and Santa Maria, Laguna, Philippines

Romeo Pati, PhD
Associate Professor, University of Rizal System, Philippines

Dr. Pati's study determined the flooding vulnerability of two selected towns in the province of Laguna, Philippines using a combination of approaches and research techniques necessary to achieve a comprehensive analysis of climate change-related vulnerability.

The flood modeling predicted the flood depths in seven out of 10 communities and delineated the inundated villages *(barangays)* both in Sta. Maria and Mabitac, Laguna, Philippines.

The social vulnerability analysis showed that all of the flood-prone *barangays* in Mabitac have weak possibilities of recovery. Several *barangays* in Santa Maria are likewise socially very vulnerable to flooding.

Among the recommendations of the study include: 1) the need to develop a comprehensive social services program that cater to the health, job, and educational needs of the residents of the two towns; 2) creation and implementation of environmental programs (e.g., restoration of the original state of the watershed) that will reduce impacts of flooding; and, 3) strengthening the flood warning system and emergency response already established by the local authorities.

Q: (to Dr. Rijal) Some of the coping strategies you mentioned appear to be a way of life of the communities already. Are there any coping strategies that are specifically in response to climate change?

A: Migration is one of the coping strategies — and although it is indeed the people's way of life, it can be considered as one of the best practices (for coping with climate change).

Q: (to Dr. Pati) Please clarify about comparing between actual depth of floods and the simulated data. How can people measure them when there is flooding… it is quite dangerous.

A: We asked the residents to describe the height of floods in particular locations **after** the flooding event and we physically measured these with a measuring tape.

Q: (to Ms. de Guzman) You mentioned about the relationship between *chl a* and number of sardines in spatial and temporal analysis. Have you encountered any studies that looked into the case of aquarium species to support such observation?

A: Yes, we can expect the same relationship to occur. Based on the framework of the study, plankton abundance is related to the abundance of planktivores or fishes that feed on them. I am not sure though if that aspect of fishery production is part of this project. But we can take cues from this project in relating *chl a* abundance to climate-related drivers…

Q: (to Mr. Tabukovu) Your presentiton is very apt because you are looking at carbon sequestration potential of different forest types. Have you looked into the various leakage and permanence factors which are critical when applying for carbon credits?

A: We looked into the procedures and equations, but we haven't gone yet into the detailed aspects of carbon trading. But perhaps in the future we will work in those areas.

Q: (to Dr. Pati) Did you use combined social research designs in your study. Have you looked into the adaptive capacity of these communities?

A: That was not part of the study. But we have observed during the field work that households have been implementing adaptation measures, such as building two-story houses in the flood-prone areas.

Parallel Session 1C

Projected Impact of Downscaled Climate Scenarios on Rice Production in Two Selected Provinces in the Philippines

Linda M. Peñalba, PhD
Professor, University of the Philippines Los Baños
(presented by Mr. Francis John F. Faderogao)

The study used the following tools for the utilization of climate data to agriculture and food production in the provinces of Tarlac and Pangasinan, Philippines: Downscaling of Global Climate Models (GCMs) using SDSM (Statistical Downscale Modeling) and Dynamical Downscaling using Providing Regional Climate for Impact Studies or PRECIS (downscaling was deemed necessary to be able to use global climate data for local settings); and Crop Simulation Modeling using Decision Support System for Agrotechnology Transfer (DSSAT). Different scenarios were projected for IR64 in three riceland ecozones: upland rainfed, lowland rainfed, and lowland irrigated.

SDSM and PRECIS are comparable in projecting increases in mean temperature for both provinces. More pronounced rainfall is expected during wet season and drier dry season is expected for Tarlac. An increase in the amount of rainfall is more likely to occur throughout the year in Pangasinan.

The combined effects of increases in temperature and rainfall on rice production vary depending on the time period, location, eco-zone, cropping season, and planting schedule. Rainfed upland during wet season proved to be the most vulnerable to climate change, disrupting the cropping calendar. Because of this, there is greater loss in rice production in this ecozone.

Crop simulation modeling showed that rice productivity is expected to reduce due to climate change.

The research team recommend adjustment of cropping calendar, crop rotation and diversification, construction of small farm reservoirs, zero tillage for more effective water infiltration, and prevention of soil erosion (especially for upland rainfed conditions). In addition, the study also recommended the use of drought-resistant or submergence-tolerant varieties as appropriate.

The researcher also pushed for farmers' education to improve acceptability of alternative conservation farm technologies and to help them make informed decisions on technologies they can adopt to respond to projected climatic changes.

Measuring the Impact of La Niña on Food and Nutrition Security in Timor Leste

Mr. Agustinho da Costa Ximenes
National Consultant for Food Security, Ministry of Agriculture and Fisheries, Timor Leste

The study showed the impacts of climate change, particularly the occurrence of La Niña, in the food production, and eventually, on food and nutritional security of Timor Leste.

The changes in rainfall pattern resulted to changes in the cropping calendar for maize and rice. The total area of cultivation also decreased, causing a consequent decrease in harvest/ total production. Because of this, the price increased, and people (farmers) preferred to buy their food, rather than cultivate their own crops. This is more challenging in the rural areas where more people depend on farming for their livelihood.

The decrease in harvest has an impact on food security, which is one of the three major determinants of nutritional security, especially of children, in the country. The decreased food availability contributed to the growing malnutrition of children (34% of children under 5 are underweight and 15% are wasted).

In the cultural context, Timor Leste people think that "they have not eaten" if they did not eat rice. They do not really consider maize to be a full meal, although this is what they eat in the absence of rice.

One coping strategy of households is the reduction of food consumption per day. The government has also responded by importing rice to cover the deficit in food production.

Climate Change Implications to Food Security and Livelihood of Small Farmers in Lao PDR

Outhai Soukkhy, PhD
Deputy Director, Northern Agriculture and Forestry College, Lao PDR

The study introduced the same downscaling methodology as the in the first presentation in this parallel session from the Philippines. Two provinces were also selected in Lao PDR for this study, Luang Prabang and Savannakhet.

Flood and drought brought about grave economic damages to selected villages in the study sites.

- In August 2012, typhoon Hay Pui brought the most devastating flood that has ever occurred in Luang Prabang. Paddy fields were destroyed – resulting in serious economic damages since the province relies mainly on upland rice.
- Savannakhet is prone to both flood, affecting 45% of the paddy field areas, and drought. In August 2008, it experienced the worst flood in the history of Laos. A prolonged drought period from July-September 2011 caused the upland rice areas to dry up. An increase in insect pests, particularly grubs, also destroyed the rice crop.

Modeling results suggested that rainfed uplands suffer the most, with 71% decline in rice productivity due to climate-induced events. This is quite similar to the findings of the study conducted in the Philippines.

The study noted the absence of an early warning system as one weakness and recommended that such a system be established in the two provinces. Other recommendations include adjustment of cropping calendar to mitigate water stress effects; improved climate forecasting; information and education campaign about climate change and climate change adaptation; increased awareness among households and capacity building for local governments; introduction of drought- and submergence-tolerant varieties of rice; and use of traditional varieties as a farming strategy to cope with adverse environment and agronomic stresses.

Comment: (to Mr. Faderogao) A different variety should have been used for the upland environment. IR64 is more suitable for irrigated lowlands; upland conditions will have (negative) effects on this rice variety.

A: We used the "standard" variety IR64 which is the most widely used in crop simulations in the Philippines. The absence of genetic coefficients for other varieties (such data are needed as input in the simulation) was a limitation in the study.

Q: How robust are the methods you used if we change the rice variety in the simulation?

A: There is a need to calibrate the variety's genetic coefficient against its response to the climatic variables and compare it with the experimental data. (As previously mentioned) we are limited by the lack of data on the genetic coefficients of other varieties.

Q: Will your model work just as well in other locations or countries?

A: (Dr. Peñalba) It should, because we also used the same model in Lao PDR for downscaling climate scenarios. We can use the model as long as we have the data we need on all the variables we use, although modeling for varieties with unknown genetic coefficients is a constant limitation.

Comment/Q: There is a need to qualify the results of getting the biggest declines in yield in rainfed upland conditions – that using IR64 is likely a contibutory factor. To what factors can you attribute the differences in the simulated rice yields between Tarlac (decrease) and Pangasinan (increase)?

A: The two provinces vary in their soil profiles and differ in their climate variabilities; the farmers also follow different management practices.

Comment/Q: (to Mr. Ximenes) The land in Timor Leste is not very good for rice and corn. It is better suited for perennial crops, e.g., you have excellent records for coffee production. So why not concentrate on growing coffee and simply import your rice?

A: Our government policy is to achieve self sufficiency in rice, so even if we have problems with rice production, we are still trying. We also have a problem with coffee because of La Niña. We have a new policy to diversify our food consumption. There should really be a cultural change in the people of Timor Leste; they should also consider eating other staple foods, such as maize and root crops, and not rice only.

Parallel Sessions 2
CLIMATE CHANGE ADAPTATION and AGRICULTURE

Parallel Session 2A

Livelihood Capacity and Adaptive Strategies to Climate Change of Rice-based Farming Households in the Mekong Delta, Vietnam

Le Cahn Dung, PhD
Department Head, Can Tho University, Vietnam

The Mekong Delta, where the study was conducted, contributes more than half of Vietnam's total rice production. It plays a key role in ensuring the country's food security and rice export industry. The study sought to identify the various factors that affect farmers' capacity to adapt to climate change and to identify households' needs for adaptive livelihood strategies. Key findings of the study include the following:

- Farmers encounter a combination of climatic and non-climatic extremes. Climate-related events are heavy rains/flooding and droughts; non-climatic events are salinity, strongly influenced by soil types and land use, and insect/pests and diseases.
- Farmers in general have low response to hazards and use coping rather than adaptation measures. They devote more attention to rice pests and on-farm water management.
- Downstream areas are more vulnerable to hazards due to a combination of biophysical and livelihood constraints; most affected are saline and acidic agroecological zones where farmers also have lower household incomes, along with those in alluvial zones.

Dr. Dung recommended the adoption of integrated solutions to adapt to changes, considering labor availability, organization and input services, and output markets. The following measures should be considered with priority given to the saline and acidic zones:

- Adopting integrated solutions to adapt to changes. Consider output market, labor availability, organization and input services, and labor- intensive technology such as three rice croppings/ year.
- Development of new technology, which should encourage better participation of women, needs to be complemented by favorable micro-credit programs with in-kind loan for poor farmers; livelihood capacity building; and enabling institutions.
- Intensified land use through farm enterprise diversification and improved resource use to improve rice-based farming systems.
- Structural investments and more rational land use planning by the government to mitigate climatic extremes.

Dr. Dung noted the high percentage of TV and (mobile) phone ownership in the Mekong Delta area. These media can be optimized for information dissemination or extension (improved rice varieties, etc.) and for accessing weather information.

Community-based Climate Change Adaptation in Contiguous Agricultural Ecosystems: Experiences from the Cordillera Region in the Philippines

Roberto Sandoval, Jr., PhD
Climate Change and Food Security Specialist, FAO Manila

The project was implemented in two provinces of the Cordilleras, Philippines. Benguet is a representative site for vegetable-based agriculture. Problems include forest land conversion to vegetable terraces, soil nutrient depletion, vulnerability to landslides, and crop failure due to more extreme temperatures. Ifugao, which is site of the famous Banawe rice terraces, is representative of rice-based farming systems. The province experiences irregular rainfall, longer dry spells, intense typhoons, and the land is also vulnerable to landslides.

The study sought to improve climate change adaptation (CCA) mechanisms of local farming communities. Documentation, evaluation, and promotion of good practices were carried out through participatory action research (PAR). Some of the good practice options recommended for replication include:

- Benguet: integrating lemon in vegetable farms for slope protection, soil fertility improvement, water impoundment for irrigation, and planting garlic as fallow crop after rice
- Ifugao: early transplanting of *Tinawon* rice, planting of coffee, rambutan, and pomelo for forest enrichment and slope protection, homestead gardening

Some **key lessons** learned from the project are: 1) Farmers must be at the center of CCA; 2) PAR is an effective process for initiating local adaptation processes; 3) clearly defined criteria are needed for selecting pilot sites, farmer cooperators, and CCA good practices to maintain climate change focus[4]; 4) local working groups and technical validation meetings are essential in facilitating CCA processes and building key partnerships; 5) sensitization of local government executives is needed to create an enabling environment for CCA implementation; 6) participatory vulnerability assessments are key for targeted adaptation and community mobilization; 7) participatory monitoring and evaluation system is essential for learning and determining climate change impacts beyond economic effects; 8) existing policies and development instruments (e.g., CLUPs and DRRM plans) can serve as entry points for institutionalizing CCA.

Successful Local Food Production Project in Solomon Islands: Blueprint for the Pacific Island Countries and Territories

Ravindra Joshi, PhD
Consultant, Ministry of Primary Industries (Agriculture), Fiji Islands

This model for local food production was developed in Kwai Island in East Malaita province, Solomon Islands. It aimed to help address food and nutritional insecurity for a small island where people generally subsist on seafoods. The sandy soil is generally unfavorable for growing crops. Fruits and vegetables are costly because they are brought in from the mainland.

[4] Criteria: increase climate resilience, socio-economic efficiency, positive environmental impact, sustainability, social and cultural acceptability, potential for upscaling, immediately responds to urgent needs, promotes participation of and equal access by men and women

The local community identified organic farming project as a means to be able grow their own healthy vegetables and fruits. The ideas were developed without money from outside, but with full community participation and cost-sharing that would transform the whole Kwai Island from scarcity to sustainability ("S to S"). The project promoted the concept of sustainable land management through the use of compost and turning sandy, less fertile soil into a healthy, productive soil. Aside from the obvious nutritional and economic benefits, the project also provided practical education on waste segregation and proper disposal of non-biodegradable materials.

Ensuring food and nutritional security in small islands is particularly challenging

From the results of the project, the Solomon Island Government approved for implementation a policy on organic agriculture system and established a national task force on organic farming extension, research, and training. The model is now being promoted to communities across the Solomon Islands and in nearby Pacific countries as a means to address food and nutritional insecurity.

Mitigating the Negative Impact of Climate Changes on Field Crop Production

Medhat Mekhail Tawfik, PhD
Professor of Agronomy, National Research Centre, Egypt

To put his presentation in context, Dr. Tawfik named some of the main problems related to crop production such as water scarcity, soil salinity, and soil degradation. These are partly caused by rise in temperature, climatic extremes, changes in precipitation patterns, sea level rise, which are manifestations of climate change. He cited how a 3.5°C temperature rise would affect the productivity of some field crops in Egypt: 11% decrease in rice, 18% in wheat, 24.5% in sugar cane, and 28% in soybean. He further stated that such effects would be more serious in developing countries due to their general lack of resources, current state of vulnerabilities, poorer access to technologies, and political conflicts.

We have so much water yet we do not have enough of it for our use

Dr. Tawfik then expounded on the wide range of measures that could be undertaken to address the negative impacts of climate change on agriculture. These can be roughly grouped into what he termed as the "triple win concept" of adaptation, mitigation, and resilience.

Mitigation measures are meant to reduce greenhouse gas (GHG) emissions and enhance carbon sinks; adaptation increases the ability to adjust to existing (adverse) conditions; while resilience measures increase ability to cope with climate shocks and to function as close to "normal" as before.

Other practices include: sound pest and disease control; sustainable water use and management technologies (e.g., water harvesting, drip/subsurface irrigation); better crop residue management; growing of stress-tolerant biofuel crops (e.g., Jathropa, halophytes) that have multiple uses including bioremediation of salt-affected soils; and many others.

Trap cropping makes use of plants to protect other crops from pests

To conclude his presentation, Dr. Tawfik made several recommendations: 1) activating policies aimed at adaptation to climate change to mitigate the negative impact and increase resilience in field crop production; 2) breeding new varieties of crops adapted to heat, salinity, and drought; resistant to pests and diseases; with short growing season to reduce their water requirements; 3) expansion of organic agriculture in place of mineral or fossil fuel-based systems; 4) active participation in climate change-related international agreements and programs, and increased interest in climate change research; 5) training farmers on environment-friendly farming system management; 6) adopting sustainable land and water management practices; and 7) sustainable use of marginal soils for planting non-traditional crops that can tolerate droughts and salinity, have economic value (forage, fodder, fibres, fuel) and special uses, e.g., carbon sequestration, soil bioremediation.

Q: (to Dr. Sandoval) What were the major challenges that you had to overcome in order to arrive at such smooth partnerships and achieve such very good project results?

A: Due to the differences in cultures and priorities of the stakeholders, it was not easy at the start. Trainings and workshops were important venues for interaction. It was also difficult to sway farmers to change their generations-old practices. Through the local working groups, we held extensive discussions with them. We documented their local practices for "marrying" with recommendations from the experts and packaging these into good practice options to increase resilience to climate change shocks. Counterparting also gave all the involved parties a sense of ownership for the project.

Q: (to Dr. Joshi) You mentioned that in your project in Kwai Island, no external support was given to the people. Did they really spend for the seeds, cuttings, and other inputs? How did you convince them?

A: From the very first day, we made it clear to them that we were only going to give our time and that they would have to put up everything that will be required in the project. It was difficult in the beginning and we had very poor participation. Eventually when they saw results, they were willing to spend even for their fares to come to the capital for meetings.

Q: (to Dr. Joshi) Did you treat separately the issues of food security, poverty, and social justice? And who is the Filipino agriculturist who helped you implement the project?

A: The Filipino is Mr. Manuel Alagan; he used to be with IRRI. He is now a senior engineer with the Ministry of Agriculture in the Fiji Islands doing work on saltwater intrusion. Regarding the food security issue, we are concerned more with nutritional security, looking at the diversity of foods that people can consume. I am sorry but I am not in a position to elaborate on poverty and social justice issues.

Q: (to Dr. Joshi) How do you feel about the transformation of Kwai Island from a simply sandy to a more productive landscape?

A: I was very impressed because people have given so many testaments even to the office of the prime minister. It is possible to accomplish things if you keep them simple, and you are determined; and it is possible to get donor support if you do things first by yourself.

Parallel Session 2B

Low Delta Cropping and Micro- Irrigation Techniques as Adaptation Measures of Climate Change in Northern Balochistan, Pakistan

Faiz Mohammad Kakar, PhD
Member, Board of Directors, Center for Research and Development, Pakistan

Pakistan is mostly an arid zone country. A case study was done to look at the effects of climate change with Balochistan as the study site (44% of its land lies in arid zone). Extreme poverty prevails in the area where the people are largely dependent on underground water for domestic use and irrigation. Water table depletion is the biggest problem due to drought as an effect of climate change.

Effective and efficient water use is non-negotiable in arid zones

The research aimed to study the effects of high delta cropping of apples and apricots and low delta cropping of grapes with flood irrigation systems; investigate alternatives to both systems (in terms of water use); highlight the results of the study as climate change adaptive measures; and to sensitize policy makers about adaptation to climate change.

Findings showed that the energy resource required is 15 hp **minimum** for pumping out underground water at 400 ft; while 15 hp **maximum** is needed for depths of 200 ft. Other findings include:

- low delta cropping is the only option to be adapted as measure to address climate change in the area
- High efficiency irrigation systems (HEISs) are the most suitable techniques for conserving water and increasing productivity
- subsidy on electricity for tube wells is a key factor for land degradation and increasing poverty
- flood irrigation practices are main causes of water depletion, eventually creating poverty in the area

Dr. Kakar recommended the following measures: 1) promotion of low delta cropping (growing grapes with high market value because it is more cost-effective), especially by the government's extension department; 2) develop policy for discontinuing the subsidy on electricity for pumping of irrigation water and banning (through legislation) of flood irrigation practices; 3) immediate development of a huge HEIS project in the region as an alternative to flood irrigation system; material and technical support to farmers willing to shift to HEIS; 4) large scale adoption of rainwater harvesting technologies by the public sector; and 5) intensive mass awareness campaign to educate local farmers about climate change and adaptation.

Q: Is there any impact of climate change on pathology of the grape, apple, and apricot species in your region?

A: The bulk of diseases occur in apples which are introduced; they are not native to our region. The heavy use of pesticides raises issues on ecological impacts.

Q: What are your criteria for choosing grapes, apples, and apricots? Did you consider the farmers' choices because these also matter? Also, you only had one species for the low delta … would it not have been better if there were two or three species for comparison (with high delta cropping)?

A: We are considering other crops such as almonds, pomegrenates, and many others. But it is not easy to convince farmers to change their practices. The criterion for selection was that it (fruit) should be a high value crop. Among them, grapes command the best price.

Q: Is the integration of forestry crops possible?

A: The area is dry and annual rainfall is 200-250 mm, so it is difficult to make farmers shift to forestry or agroforestry systems.

Adaptive Capacity and Adaptation to Climate Change and Variability of Farming Households of Dumangas, Iloilo, Philippines

Gay D. Defiesta, PhD
Assistant Professor, University of the Philippines Visayas

Farming households in developing countries are most vulnerable to effects of climate change and variability because of their climate/weather-sensitive livelihood and lack of resources to adopt adaptation measures. Impacts can still be disproportionate across households (HHs) due to differences in their adaptive capacity. This study was conducted in the coastal town of Dumangas, Iloilo, Philippines. It aimed to determine the levels of adaptive capacity of farming HHs to climate change; identify the factors that cause the differences in adaptive capacity; and find out whether adaptive capacity translates to adaptation.

Data were analysed using Adaptive Capacity Index, a multi-criteria decision making tool composed of five indicators: human resources, physical resources, financial resources, access to information, and livelihood diversity. Adaptive capacity was classified into low, moderate, and high. Results showed that majority (62%) of the farming HHs employed some adaptation measures.

- Differences in adaptive capacity were mainly caused by large disparities in information access, physical and financial resources. Based on expert judgment, these were the most important indicators.
- Most farmers adapt to climate change despite levels of adaptive capacity; however, higher adaptive capacity translates to more adaptive strategies.
- The percentage of farmers that adapted to climate change increased with level of adaptive capacity.

Dr. Defiesta recommended the need to increase the adaptive capacity of households to enable them to employ more adaptation measures through the following: 1) conducting educational campaign and training on climate change and farming adaptation techniques; 2) making accessible to all farmers the climate and weather information generated by the local agromet station; 3) making credit more accessible to small farmers through small-denominated loans and encouraging them to avail of existing government subsidies (for seed and fertilisers); and 4) developing/encouraging effective crop insurance for small farmers.

The author also recommended the conduct of further studies on the uses, methods, and validity of adaptive capacity indices at the household level.

Q: Who identified the indicators and sub-indicators ?

A: The indicators were based on the sustainable livelihoods framework. As the study was at the HH level, it followed closely the study of Eakin et. al. used in Mexico; however, crop insurance was excluded in this study because it is not yet practiced in the area.

Q: Was geographic information system (GIS) mapping used in the study to visually represent the indicators?

A: Other factors were looked into, like vulnerability assessment, adaptive capacity, willingness to pay for adaptation, and factors affecting adaptation. But GIS mapping was not done; that would be a good extension of this study. GIS mapping would make it easier to locate which households are vulnerable and what are their adaptive capacities.

Q: What is climate field school (CFS)?

A: This is a four-month intensive training mainly focused on enabling farmers to use climate data to help them better plan and manage their farms. It is a field school because the classroom sessions are complemented by actual field observations by the farmers.[5]

A Shift in the Mycotoxin Profile in Costa Rica under Climate Change: A Case on Mycotoxigenic *Fusarium proliferatum* in Rice *(Oryza sativa)*

Adriana Murillo-Williams, PhD
Professor, University of Costa Rica

Costa Rica (pop. 4.5 million) has an area of 51,100 km^2 of which 35% is dedicated to agriculture. The main crops are rice and beans. Average rice consumption is 54 kg/person per year, and 60% of rice demand is covered by local production. Climate change current trends in Latin America show a temperature increase of 1°C and declining precipitation in Central America. Extreme events are also experienced. Future trends show the possibility of 1°C-4°C or 2°C-6°C temperature increases, which can contribute to significant decrease of rice yields by 2020. This has implications on domestic rice supply and consumption.

Extreme events may precipitate increased moisture that promotes fungal growth. Climate (temperature and moisture) is the most important factor involved in mycotoxin contamination. Mycotoxins are compounds produced by fungi that are harmful to humans and animals, e.g., aflatoxins, ochratoxins, DON, and fumonisins which are carcinogenic and toxic to animals. *Fusarium proliferatum,* identified in rice in 2011, presents issues regarding pathogenicity and potential for fumonisin production.

Latin America also experiences El Niño which increases *Fusarium* in wheat in Brazil and Argentina; occurrence of El Niño also leads to increased incidence of fungal diseases in maize, potato and beans in Peru.

[5] Dumangas is the first municipality in the Philippines and second in Asia to adopt the CFS program. The program was first launched in Indramayu, West Java, Indonesia. (*SEARCA Agriculture and Development Notes,* Vol 2 No. 2)

The role of irrigation in terms of mycotoxin and pathogenecity was studied. There were no differences in the two types of irrigation in disease incidence; inoculated plants showed a 20% reduction in emergence under both irrigation types; and emergence slowed down under flooded conditions.

Issues raised were: capacity for adaptation (lack of plant breeding in Costa Rica) which will affect rice production; need for varieties resistant to the pathogen; better adaptation to flooding and high temperatures; and alternatives for crop rotation.

Q: Is there any possibility of exploring collaboration with your neighbouring countries, e.g., Nicaragua and Guatemala to address the issue regarding the lack of plant breeding?

A: People from these countries raised the same issue. There are many biotechnologists in Latin America but they are not involved in the work of conventional plant breeders. There is definitely a possibility for collaboration; the big issue is organizing people and coordinating all these efforts.

Q: Have you encountered other mycotoxins in rice in Costa Rica such as *Aspergilla* ?

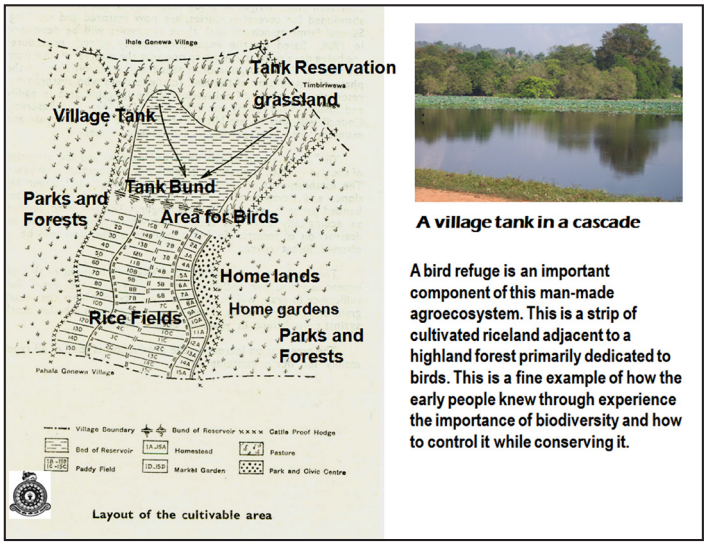
A: We do have those, but the focus of our research is on *fumonisins.* From the 2010 samples for two growing seasons, *Fusarium* was the most common fungus we found in rice.

Comment: In the Philippines, *Aspergelli* is the most predominant in rice.

Sustainable Ancient Water Management and Resilience to Climate Change in Sri Lanka

Ranjana U.K. Piyadasa, PhD
Senior Lecturer, University of Colombo, Sri Lanka

Sri Lanka has developed an ancient world hydraulic (water) civilization which is made of a network of thousands of manmade ancient lakes and ponds, known locally as 'tanks'. Used in the dry zone of Sri Lanka for rice farming in ancient times, the system is still being used at present. A 'cascade' is a connected series of tanks organized within a micro- or meso-catchment of the dry zone landscape which is used to store, convey, and utilize water from a passing stream. This hydraulic system developed to its zenith during the first millennium. It started to decline around the 12th century for reasons yet to be fully understood.



The study on the cascade system was conducted in the upper catchment of the Malwath Oya River Basin; the system used to consist of 14 tanks, now reduced to only eight. It aimed to identify current water availability for irrigation and agricultural sustainability and to re-establish and rehabilitate the tank system in the dry zone of Sri Lanka. The study concluded that the water, agricultural, ecological, and social management systems along with the cultural and spiritual norms that governed the tank cascade system has helped the rural communities to adapt to the impacts of climate change.

The author outlined several areas for possible improvement:

- General recognition of the cascade concept in rural development planning. Planners need to develop management structures not only covering individual villages but a whole system of villages within a cascade system (just as the engineers have to deal with the whole cascade system rather than individual tanks).
- Re-adjustment of land use and land tenure to suit current socio-economic realities without destroying the cascade bases.
- Preservation of the ecological system that sustained the cascade technology for many generations.

Q: Are the ancient tanks still existing?

A: Yes, the cascade system is still functioning in Sri Lanka. New irrigation systems are also being established.

Q: How do you prioritize the sharing of water?

A: The community decides on this. If the water in the tanks is not enough, they first calculate the need for rice.[6]

Q: Can the water tanks be used for raising fish culture?

A: It has been pilot tested.[7]

Q: You characterized the cascade system as a water conservation system. It is quite common in arid zones; it is also common in Pakistan. Are you planning to modify it because in Pakistan, we have done some modifications?

A: We are not hoping to change the old irrigation system. Actually in some cases, the number of tanks in a cascade system has been reduced from the original 15 to only six to eight tanks. We are trying to rehabilitate the neglected and damaged tanks and re-establish the old system.

[6] Note that the system was primarily designed for rice farming in the arid zones.

[7] However, Dr. Piyadasa also mentioned in his slides the health issues related to drinking water and eating fish from tanks contaminated by agro-chemicals, e.g., Cadmium.

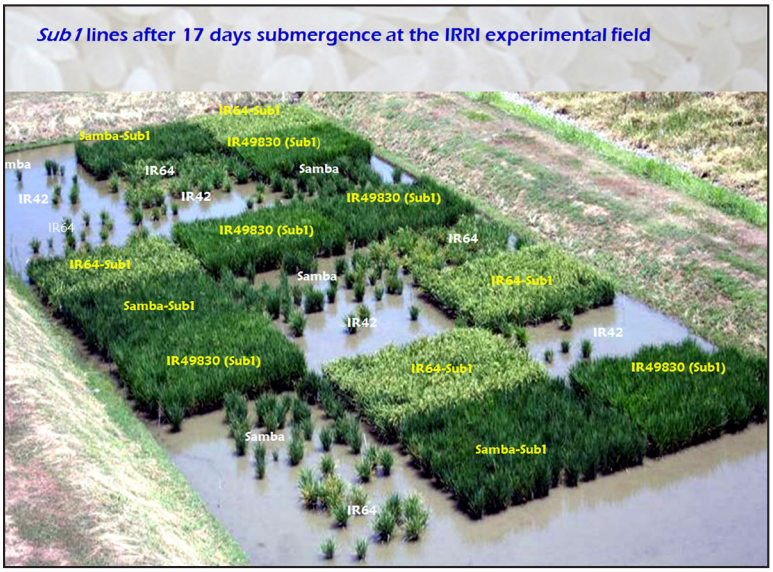
Parallel Session 2C

Increasing Rice Productivity in Rainfed Lowland Areas Vulnerable to Climate Change in Southeast Asia

Romeo V. Labios, PhD
Agronomist, University of the Philippines Los Baños

The paper presented by Dr. Labios characterized flooding as a climate change-related hazard confronting flood-prone areas and described some research interventions to respond to this phenomenon. More importantly, it illustrated that in spite of flashfloods or submergence and long-term inundation in rice-producing areas in Southeast Asia, rice productivity can be sustained and even improved with science, including properly, intelligently and participatorily identifying and selecting appropriate varieties of rice.

Dr. Labios underscored the need for collaboration among various stakeholders in the area of rice production, which include national governments, farmers and local officials, scientists and science-based organizations, as well as government agencies and non-government organizations. His presentation highlighted the following points:



- Flash floods leading to inundation (submergence) of up to two weeks can result in severe yield losses in rice.
- An adaptation strategy for such inundation is seed management for better survival against submergence during vegetative stage through the introduction of Sub1 gene. The Sub1 gene was introduced to six popular varieties or "mega varieties" (IR64, Swarna, Sambha-Mahsuri, BR11, TDK, and CR1009); these were distributed and adopted in Southeast Asia.
- Participatory varietal selection (PVS) followed by preference analysis and sensory evaluation were conducted with the help of on-farm researcher and farmers. PVS allowed farmers to choose a variety similar to or better than their best local varieties but with tolerance to flooding.
- Multi-sectoral cooperation and support can lead to commercialization and national support for Sub1 varieties. This can result to as much as 1-3.5 t/ha of yield advantage (over conventional varieties) in flood-prone areas.
- Current efforts: breeding for tolerance to salinity and stagnant or long term partial flooding
- Future plans: determine proper management options for the new varieties; packaging and disseminating them

Q: I have read many times that if we can convert Liguasan Marsh into rice fields, it would be good for the farmers and our country. With your technology, what is the prospect of converting Liguasan Marsh[8] to a rice-growing area?

A: Suitability depends on the type (depth) of flooding and quality of floodwater. We already did some trials there but Liguasan is not suitable for Sub1 varieties because the marsh is deep and the water is usually murky.

Q: What is the ecological implication of converting marshlands into rice-growing areas?

A. Sub1 varieties are not intended for converting marshland to rice production areas.

Comment: (from the moderator Prof. Mendoza) We just need to clarify that Dr. Labios' presentation was not about ecosystem conversion but rather is about crop adaptation to certain unfavourable conditions.

Q: What is the role/possible participation of indigenous people in the research?

A: The Sub1 gene can be introduced into indigenous varieties just like in the popular or 'modern' varieties. In general, PVS (involving farmers in breeding work) can help ensure better adoption of specific varieties.

Response of Agro-Pastoral Indigenous Communities to the Cascading Effects of Climate Change-Studies from Sikkim, Eastern Himalayas, India

Mr. Tenzing J. Ingty
PhD Student, Ashoka Trust for Research in Ecology and Environment, India

Mr. Ingty presented evidences of impacts of climate change in the state of Sikkim in Northeast India, which is a biodiversity hotspot. His paper documented the adaptive strategies of the local people in the area both at the individual and institutional scales.

Potatoes can now be planted in higher elevations due to warmer weather.

Among the significant impacts of climate change in pastoral communities that the study noted are: heavy rainfall (but shorter duration), less snow, and the drying up of water resources and traditional grazing areas. Others are overall warming (higher temperatures), and presence of more mosquitoes. Other impacts observed are the change in the habitat range of flowering plants, and the feasibility of planting potatoes in higher altitudes where this crop did not thrive before, which the locals consider as positive.

[8] Liguasan Marsh is a 288,000-hectare vast complex of river channels, small freshwater lakes and ponds, extensive marshes, and arable land subject to seasonal flooding. One of the main threats to this ecosystem is the conversion of parts of the marsh to rice paddies (www.birdlife.org/datazone/sitefactsheet.php?id=9802). It should be noted that marshlands serve special ecological and other functions and these should be considered before any conversion for other purposes is undertaken.

Mr. Ingty emphasized the importance of looking at the responses and strategies of local people in the discourse on and in addressing climate change impacts, including the role of social systems and arrangements in preventing serious negative impacts. His presentation further highlighted that:

- Climate change is very evident in the Himalayas with 1.5°C increase in temperature and 163 mm increase in precipitation, although there is a lack of local scientific study covering climate change. In contrast, there is richness in traditional ecological knowledge (TEK) based on experiences, perceptions, and coping strategies of indigenous communities.
- Two indigenous communities, namely the transhumance[9] Lachenpas and the nomadic Yak herder communities (or Dokpas), migrate with changes in the season. These groups do this because of deep understanding of the environment and TEK.
- Adaptation strategies of these communities include the traditional practice of the Dzumsa as an organization system that serves as management and decision making tool, where the Dzumsa plays a vital role of regulating resource use in a way that prohibits overuse and provides social, economic, and environmental security to the people.

Mr. Ingty **recommended** that indigenous people can and should be given the opportunity to participate in regional and global discourse on and strategies to address climate change by contributing local perceptions, adaptation responses, and solutions. The integration of TEK and modern science makes for a more holistic approach.

Q: You showed us some physiological and biological changes in the crops. Did you observe any movement among the people as a measure to adapt to these changes?

A: As they are a migratory community, they migrate with the seasons. But there is no clear trend in season change. Sometimes winter comes earlier, sometimes at a later time. Consequently, the herder groups' nomadic practices still adapt to the changes in season.

Q: What are the issues brought about by changes in society and environment?

A: The communities are dynamic and continue to adapt to changes in society and environment, or to climate change. It is wrong to think that they are closed to outside ideas. These people move around so they are also influenced by ideas and practices from the communities they come in contact with. For now, it is quite difficult to attribute this to climate change, or to influences from the outside.

Q: How do the indigenous peoples (IPs) perceive the changes in their environment?

A: They may have a different concept of what is happening (climate change). For them, they also see some positive changes going on like their being able to plant crops in areas where they could not grow them before. However, they also observe negative changes like the presence of mosquitoes as well as the degradation of grazing areas.

[9] Transfer of livestock from one grazing ground to another, as from lowlands to highlands, with the changing of seasons (www.thefreedictionary.com/transhumance).

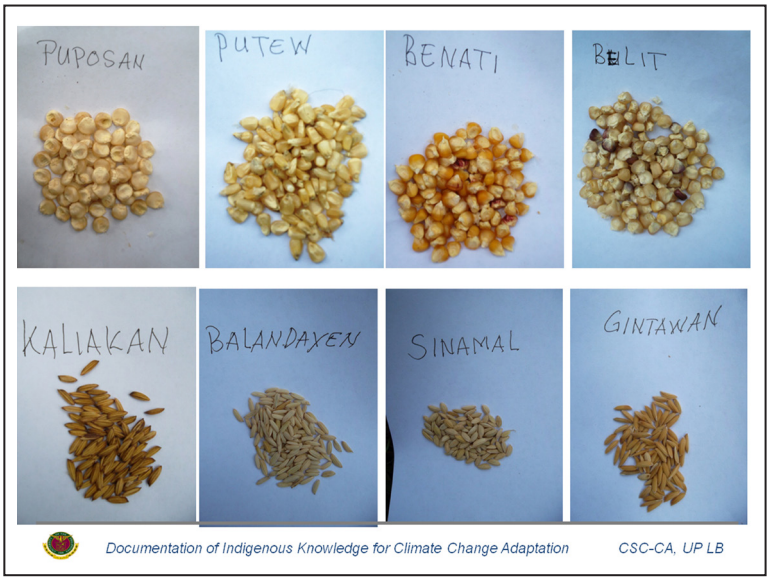
Documenting and Promoting Indigenous Agricultural Knowledge and Climate Change Adaptation in Selected Areas in the Philippines: Toward Enhancing Community- Level Food Security

Lucille Elna P. De Guzman, PhD
University Researcher, University of the Philippines Los Baños

Dr. de Guzman underscored the importance of documenting, analysing and communicating knowledge of indigenous peoples (IPs) for climate change adaptation. With insights from their study conducted in northern, central and southern Philippines, she mentioned a wide range of adaptation strategies being adopted by the sample IP communities – ranging from cropping and livestock rearing systems to post-harvest practices. Important to note is the implication that through these indigenous practices, local people have been able to sustain food production in spite of variability of climatic conditions.

- The indigenous farming practices of the *Bagobos* and the *Manobos* in Davao, the *Suludnons* and *Atis* in Iloilo, and *Ivatans* in Batanes were documented using non-structured interviews of key informants, focus group discussions, and actual observation of the area and its people.

- Observations include unpredictable onset of rainfall, increase/decrease in rain intensity, and increase in temperature. However, indigenous agricultural practices on cropping systems and livestock rearing enabled the indigenous people to sustain food production even with climate variability in the past.



Using traditional crop varieties is a key adaptation strategy

- Long-term adaptation strategies include high level of crop and livestock diversity; use of locally available resources and low dependency on external inputs; longer fallow periods; and use of traditional varieties and indigenous storage practices. Other practices include organic farming, indigenous crop protection, adjustment of working hours, free-range animals, wild food, indigenous food preservation, rituals and belief in spirits, and *bayanihan* or mutual helping.

- Traditional risk warning system such as bird sounds *(Manobos);* design based on the elements *(Ivatans);* multiple cropping (Atis of Iloilo and others)

- Indigenous knowledge (IK) plays an important role in attaining food security amidst climate change impacts in the Philippines.

Comment: There is an indigenous rice planting technique in Batanes where the farmers plant beans with the rice.[10] The bean will be the first to be harvested. This will increase the production of rice; it doubles if they get some rain. But the farmers also get money from the beans which is an ingredient in making *hopia*[11].

Q: What are the issues brought about by changes in society and environment?

A: There are positive changes brought by external factors (not necessarily climate change) such as NGOs coming in and introducing alternative livelihood options like exploring markets for local handicrafts made from materials people gather from the forest. However, the *Bagobos* have a negative experience when they abandoned their ancestral land because of too much pressure from a certain religious group. When they returned after a few years, a banana plantation was already put up in their land and they have to work there as hired laborers to augment their livelihood.

Q: Are there biophysical/physiological bases of their belief in risk warning sign?

A: Such validation is part of the research project, like looking into the scientific basis of their perceptions, beliefs and practices. But it has not been covered yet.

Comment: (Mr. Ingty) There is a bird in India that signals seasonal changes in the Himalayas.

[10] The bean which is a legume fixes nitrogen from the atmosphere and benefits the rice.

[11] Hopia is a popular Filipino bean-filled pastry originally introduced by early Chinese settlers; it is traditionally made of flaky puff pastry and filled with a paste of mung beans (http://www.henlin.com/hopia).

Parallel Sessions 3

INSTITUTIONAL and ECONOMIC ASPECTS of CLIMATE CHANGE IMPACTS and ADAPTATION

Parallel Session 3A

Building Climate Resilient Communities through Community-based Adaptation Planning and Action: Some Empirical Evidences from Nepal

Dharam Raj Uprety, PhD
Forestry and Climate Change Manager, Multi Stakeholder Forestry Program, Nepal

This study is based on the review of over 500 community adaptation plans (CAPs) as part of the Livelihood and Forestry Programme or LFP (2009-2011). CAPs are plans prepared by local communities to minimize their risk and vulnerability resulting from climate change. The author also used results from a study by the Multi Stakeholders Forestry Programme (MSFP) on local adaptation practices in three ecological zones of Nepal.

- Dr. Uprety opened by contextualizing the policy landscape for climate resilient communities in Nepal. The National Climate Change Policy was formulated in 2010, along with the National Adaptation Plan for Action (NAPA). The national framework for local APA (LAPA) was ready in 2011. The community members formulated their own CAPAs.

- The CAPAs gave highest priority (37%) to climate education. Other priorities included use of bio-energy for fuel/cooking (17%), water security (15%), flood control (14%), and food security (12%). Sub-activities were also specified under each of these components.

- There is a wide variety of local adaptation practices recorded. Among them are rainwater harvesting; planting grasses and NFTSs in slopes to control erosion; community forestry; and watershed management. To expand safety nets, some communities established community seed banks, agri-cooperatives, and introduced crop and livestock insurance.

However, several challenges exist. Policy making at the higher levels have weak links to community adaptation planning such that sustainability of implementation is under question. And although there is a felt need at the local level to cope with or adapt to the impacts of climate change, measures are not yet mainstreamed in development efforts. Moreover, most of the adaptation measures being implemented are introduced from outside, except for a few examples of self-initiated practices based on local knowledge.

Attitudes towards Flooding Risks in Vietnam: Implications for Insurance

Pham Khanh Nam, PhD
Deputy Dean, University of Economics, Vietnam

Farmers in Vietnam are not willing to buy insurance despite heavy government subsidies. Index-based micro-insurance can provide safeguards against external shocks such as crop failure, especially to small farmers. The process is not bureaucratic and the payouts are quick. Having eliminated the possible reasons, such as lack of information on insurance availability, financial literacy issues, and liquidity constraints, from the equation, the insurance uptake was still observed to be very low.

Dr. Nam presented the results of a study that sought to understand Vietnamese farmers' attitudes toward risk and uncertainty, and within the specific context of flooding in the Mekong River Delta. Economic experiments were employed along with interviews with 207 farmers in An Phu district in An Giang province. Certainty equivalents (CEs) were used to measure attitudes towards risks and uncertainties. CE is the fixed amount of money that makes a subject indifferent between betting and obtaining the sure amount.

The results pointed to several possible explanations why a farmer is unwilling to buy insurance, as follows:

- The farmer estimates the probability of flooding correctly, but behaves in a risk- seeking way (does not buy insurance).
- He acts in a risk-neutral or risk-averse way, but underestimates the probability of the adverse event.
- Both underestimation and risk seeking

The information above can be helpful in developing communication and sales strategies for risk management instruments. Such strategies have potential applications in weather-indexed insurance, investments in agriculture, or simply as an adaptation strategy to impacts of climate change.

Strengthening Capability of State Universities on Vulnerability Assessment to Enhance their Role in Climate Change Adaptation for Agriculture

Amparo M.Wagan, PhD
University Extension Specialist, University of the Philippines Los Baños

State universities and colleges (SUCs) play a number of important roles in climate change adaptation in agriculture. Dr. Wagan discussed a project on enhancing the capability of selected SUCs in the use of Vulnerability and Adaptive Capacity Assessment for Different Agroecosystems (VAST-Agro), a tool developed specifically for agriculture.

At least two representatives from six SUCs were trained on using VAST-Agro in different production areas in the Philippines, which included vegetables and strawberries in Benguet; mangoes in Pangasinan and Iloilo; bananas in Mindoro, Bukidnon, and Iloilo; and coconut-based productions systems in Quezon.

The process involved the local people in data collection. The field exercises captured in detail the community's own experience on specific climate stresses and their effects on the different crop production systems. It also revealed local knowledge, practices, techniques, and information on the community's socioeconomic capability to cope with climate-related stress.

- VAST-Agro provided an opportunity to identify site- and crop-specific adaptation measures for different climate-related hazards.
- VAST-Agro also provided a detailed vulnerability index that can be used as a guide for local planners in prioritizing areas for intervention.

In addition to the outputs from the VAST-Agro training-cum-implementation, the participants identified several post-training activities. Participants from Mindoro wanted to pursue research on Fusarium wilt in banana; those from Benguet were going to conduct vulnerability assessment using VAST-Agro as part of their involvement in formulating their regional Agri-Resiliency Road Map for 2013-2016. Some of the participants also planned to write papers from the experience for publication or presentation in conferences.

Climate Change and Food Security: Challenges, Success and Opportunities in Bangladesh

Mohammad Alamgir, PhD
Senior Scientific Officer, Ministry of Water Resources, Bangladesh

Bangladesh, with a population of 160 million, is a riverine country with 310 rivers. Two-thirds of the country is located just above sea level and in the estuary of three large rivers – the Brahmaputra, Ganges, and Meghna (MGB). Originating from India are 54 transboundary rivers and from Myanmar, another three. Dr. Alamgir provided additional facts and figures to illustrate the magnitude of the challenges that the country is confronted with:

- Every three to five years, a severe cyclone visits the country, flooding up to two-thirds of the country on the average and causing severe damage to infrastructure, housing, agriculture (crops and livestock), livelihoods, including losses to property and lives.
- Storm surges along the coastlines sometimes exceed 10 meters, causing saltwater intrusion into aquifers and untold additional damage to low-lying coastal areas.
- An average of 10,000 ha of land is lost annually due to riverbank erosion, which results in heavy sedimentation in downstream areas that include farmlands and water channels.

Heavy siltation clogs up river channels and kills aquatic life

- Seasonal droughts occasionally hit the northwest region, causing up to 40% water shortfalls. Over-extraction of groundwater (GW) for irrigation causes GW depletion and deterioration. Unregulated water withdrawal by its neighbour (India) worsens the situation.

The country has nevertheless achieved a lot by way of ensuring environmental and food security. Among the notable and more recent policy and regulatory initiatives include the Bangladesh Climate Change Strategy and Action Plan (BCCSAP); the National Adaptation Plan of Action (2005); Climate Change Trust Act (2010); 15th Constitution Amendment (2011); and the Bangladesh Water Act, (2012, draft).

Specifically for the agricultural sector, the government is promoting the adoption of appropriate farm technologies and enhancing the skills and capabilities of farmers for them to realise their potential yields and reduce their post-harvest losses, e.g., growing of crops suitable for various agro-ecosystems; adoption of varieties that are tolerant to climate-related stresses; and use of elevated garden beds to prevent waterlogging of crops.

For Bangladesh, the water sector is clearly the most vulnerable to impacts of climate change. In this regard, the country can count successes in adaptation as reflected in its shift from flood control to a flood management approach. The government has likewise taken similar adaptation measures in the related areas of storm surge/cyclones/sea level rise (SLR) management, drought management, water supply and sanitation, and urban drainage.

There are as many opportunities as there are challenges that need to be addressed. However, the government is acutely aware that its water issues are primarily regional and these require the cooperation of the GBM countries. Issues for consideration include 1) flood management; 2) transboundary water sharing and dry season flow management (with India and Myanmar); 3) hydropower development; 4) sediment management to improve (river) navigation and water connectivity; 5) water quality management; and 7) climate change mitigation and adaptation on the Himalayan Range. The key role of the international community on the sharing of appropriate technologies, strategies, and approaches and financial assistance was also underscored.

Q: (Dr. Kakar to Dr. Uprety) You mentioned rising temperature of .06°C - what is the source of your figure? Also, are there no other factors outside of climate change, such as vested interests in the community, that brought about forest fires in your country?

A: The figure on annual rise in temperature at .06°C comes from our Ministry of Environment. You are right, not all the events related to forest fires are effects of climate change. Illegal activities do happen, but to a large extent the fires are triggered during times of drought and in spite of the establishment of numerous fire lines maintained by forest user groups.

Q: (Dr. Bui Dung The to Dr. Pham Khanh Nam) You showed a usual gap between subjective (perceived) and objective (what really happened) probabilities of flood depth. How do you relate these outcomes to the reliability or accuracy of other valuation studies using contingent valuation method (CVM) and choice modeling to get the benefits of some flood prevention methods? CVM and choice modeling also depend on people's subjective assessment. What would be the implication of this on the analysis and interpretation of findings?

A: You raised an important issue in research methodology regarding the valuation of the environment and natural resources for rural services. Our current methodology on CVM and choice modeling is grounded on neoclassical economics, which assumes that people are rational and have perfect understanding of the world. Therefore, theory would assume no gap between subjective and objective probabilities of flood occurrence. You pointed out a key issue on reliability and accuracy of CVM and choice modeling. That is why behavioural economics wants to develop models that would bridge the gap between what people perceive and reality. Thus, there is still a lot of room for us to address this gap.

Q: (Dr. Zafaralla to Dr. Alamgir) You recommended a shift from 'solo' approach to community approach in solving problems caused by climate change. Please cite an example where the community approach proved more successful than the individual approach. Also, what is it about the culture in Bangladesh that makes the community approach more appropriate?

A: Community-based adaptation to and mitigation of climate change has been successful in Bangladesh, for instance, in coastal ecosystems management and reforestation programs involving the community. They have benefited the communities, such as in the use of forest products for livelihood. The community approach is more aligned to the traditional culture of Bangladesh where more people are involved in and benefit from the intervention, unlike the 'individual' approach that the government tends to apply.

Q: (Dr. Wulfmeyer to all presenters) A fundamental way to adapt to climate change tomorrow is by adapting to climate variability today. What are your countries doing to develop weather forecast systems to prepare for droughts, for instance; and to disseminate the information from these systems?

A: (Dr. Alamgir) We have developed a forecasting system that has a transponder, with broad analysis methods that involves schools in far-flung areas; and dissemination mechanisms for local areas. We have an environmental monitoring information network that uses various color-coded flags to connote different levels of hazards to warn and advise the community on flood levels to expect. We also have assessment methods for drought that forecasts drought levels for the next two to three years. This is transmitted to relevant agencies, nongovernmental organizations, and other stakeholders so that they may make necessary preparation for the impending drought.

Q: (Dr. Carter) I noticed in the project in Nepal that people affected are educated on climate change. Do the people affected in the field, i.e., farmers and fishers, have an idea on what is causing climate change? Do they attribute it to nature or industrial pollution and other similar factors? What ideas do you have on educating people on the causes and effects of climate change?

A: (Uprety) Let me answer your question by explaining the experience in my country. Communities in rural areas are now working to address the impacts of climate change. Large tracts of potentially productive lands would have become wastelands if the communities are not undertaking adaptation measures today. Since 2008, as an outcome of global policy dialogues, people have taken note of changes in climate, such as rains that did not come, or came two months earlier or later. Government and nongovernment interventions started at the local level, informing people about climate change and how they may cope with it. The communities were then trained and started making adaptation plans, such as conservation of river banks, contour farming, and the like. So now, there are measures being undertaken, e.g., raising of embankments for flood control. Also, all government interventions from policy to initiatives on the ground have integrated climate-proofing. We can only surmise that this involvement of people in implementing adaptations to climate change indicates their appreciation of its implications.

Parallel Session 3B

Household Economic Losses: A Case Study of Thailand's 2011 Flood

Orapan Nabangchang Srisawalak, PhD
Senior Economist, Economy and Environment Program for Southeast Asia

The paper examined the nature of the economic losses of households (HHs) during Thailand's 2011 flood, considered to be the worst to hit the country in the last 70 years. The study also looked at the extent to which the availability of information (i.e., via smart phones, internet, and mass media) had any effect on actions people took to prevent or reduce their losses.

Interviews were conducted with 589 HHs (middle and low income) in the worst hit neighbourhoods of Bangkok (Don Muang) and the adjacent provinces of Nonthaburi (Bang Bua Thong) and Pathum Thani (Klong Luang). The study explored actions people took before the flood, direct and indirect costs incurred during the flood, and expenses they expected to incur after the flood receded. Major findings are as follows:

- HHs with higher expenditures, more valuable houses, and more cars incurred significantly more losses because they had more assets at risk.
- Even after controlling for socioeconomic factors, differences in neighbourhood effects were statistically significant. For instance, household losses in both middle and low income neighbourhoods in Bang Bua Thong (higher depth + faster speed in water level rise) were higher than in Klong Luang (lower depth + slower water level rise).
- District-level flood warnings were not significant in any of the *ex post* loss model specifications that controlled for neighbourhood effects.

Evacuating household appliances and pets during the 2011 Bangkok flood

- Internet use: Heavy internet use is associated with reduced losses even in areas with deep floodwaters and received little warning; many of the heavy internet users were in B.B.Thong.

Dr. Srisawalak noted that World Bank estimated the total losses and damages at USD47 billion for the three sites. Findings of this study were about 180% to 310% higher than the WB estimates due to inclusion of other expenditures such as preventative action costs, other specific expenses incurred during and after the flood, flood-related health care costs, and HH contributions to the community.

Results of this research will be extremely useful for a number of purposes:

- The estimates offer insights for policymakers as they work to reduce economic losses from future floods. The results also bring into sharper focus important policy questions, e.g., on structural or nonstructural flood control strategies.
- There is not much evidence to prove that improved warnings would have helped many HHs reduce their losses, as many people were still caught off guard by the severity of the flood.
- The findings also point to the need of a good disaster communication strategy. For instance, information coming from the different sources were often conflicting, and therefore confusing to the public. Information about practical matters, e.g., on electricity, hygiene, and safety, were lacking, while some did not have much practical value, such as emphasis on volume rather than depth of water.
- The findings can also provide beneficial insights for future flood insurance schemes.

Q: What did your government do with regard to the rise in prices during the floods?

A: During that time, there were a lot of relief operations by the government, NGOs, and even the media. Some of them focused on the provision of "survival bags" containing noodles, water, rice, and canned fish. There was no government intervention to control prices.

Q: There are a lot of issues regarding developments in and around Bangkok; one of them is water retention due to the development of low lying areas. Have there been studies on environmental costs of the Bangkok floods and how to rehabilitate the affected areas?

A: After the flood there was a lot of talk about our natural resources, how we should be protecting the watershed and the forests in the northern region of Thailand so that we could avoid the occurrence of floods. Otherwise, most of them are in terms of economic losses in the agricultural sector especially in rice-growing areas in the central plains. There was also talk about plans to designate flood zones, where cost-benefit analyses (CBAs) of establishing these zones were largely used.

Additional comments:

- People incurred expenses to prevent or mitigate effects of the flood; in some cases, the amounts were even higher than the actual cost of damage. This puts into question whether the preventive measures were worth it.
- Respondents were geo-tracked/referenced for a planned follow-up study.

Understanding the Capacity of Policy Makers to Access and Use Climate Change Research Outputs for National Development: The Case of Zimbabwe

Mr. Ignatius Gutsa
Lecturer, University of Zimbabwe

Mr. Gutsa presented the results of his study that sought to examine the capacity of policy makers to access and use climate change research as inputs to policy making. According to him, although Zimbabwe is a signatory to the 1992 UN Framework Convention on Climate Change (UNFCCC), it has yet to have a national climate change policy. Zimbabwe only has a collection of legislative and programmatic responses as part of existing development policies, strategies, and action plans.

The research used a mix of quantitative and qualitative approaches which included a review of relevant documents, interviews, and focus group discussions. A diagnostic test was administered to evaluate the understanding of climate change science of parliamentary researchers and librarians, staff of the National Council for Science and Technology. The research was conducted in four out of the 10 provinces of the country.

- Only eight Hansards (official verbatim report of parliamentary proceedings) had evidence of debate on climate change issues in the life of the Parliament of Zimbabwe.
- Capacity to access research evidence is exemplified by computer literacy, access to computers, and reliable internet access. Several limitations constrained the respondents' access to the internet: lack of access to ICTs, spotty internet connection, power failures, and expensive broadband internet access.
- There is a general lack of appreciation among policymakers on relevant sources of information on the net, e.g., 74% were not aware of websites with good quality information on research/science topics. Internet use is often confined to checking emails and chatting on social networks.
- Only a fifth of the policy makers (21%) agreed that they need to use research evidence in their work; while 5% each of both parliamentary librarians and parliamentary researchers strongly agreed that they have access to research evidence required for their job.
- About half of the policy makers strongly agreed with the view that most research can be trusted; 37% were neutral about the issue; while the rest (16%) strongly agreed that most research cannot be trusted.

Unique to Zimbabwe is the establishment of a Junior Parliament in 1991 which aims to groom future leaders and enable youth participation on critical issues. This body, however, has not taken up climate change issues in its deliberations.

The National Climate Change Policy (NCCP) formulation process, which is led by the University of Zimbabwe's Institute of Environmental Studies, had just begun in May 2012. The NCCP is one among many aimed at addressing climate change and provide strategy for adaptation and mitigation programmes.

Q: What did you mean with "policy makers make policies from uninformed perspectives"? Why do you think that happened and what solutions can you give for that?

A: I simply meant that policy makers do not make use of research evidence in making policies. For instance, limited access to the internet consequently constrains their access to information. There is need to build capacity to access and use scientific evidence in developing policy instruments.

Institutionalizing Rural Communication Services (RCS) for Climate Change Adaptation and Food Security: The Bangladesh Experience

Cleofe S. Torres, PhD and Ma. Stella C. Tirol
Professor and Associate Professor of Development Communication, University of the Philippines Los Baños

Dr. Torres and Ms. Tirol described an action research project that aims to establish Rural Communication Services (RCS) within Bangladesh's Ministry of Agriculture (MoA) through its Agriculture Information Services (AIS). AIS partners in this effort with the Department of Agricultural Extension or DAE, which primarily provides advice, education, and training on agricultural information, knowledge, and technologies to farmers.

RCS is designed to provide demand-driven, participatory, and ICT-supported communication services to meet the knowledge and information needs of the country's rural population. It was deemed most appropriate to lodge RCS within AIS for a number of reasons: 1) AIS is a mass media-based delivery system for agricultural information; 2) It is a powerful media house with state of the art media equipment, facilities and staff complement; 3) It is the government agency tasked to provide communication services for agricultural development.

Dr. Torres stated how increased climate variability negatively impacts on agriculture, which affects the livelihood of farmers. She added that the design of strategic communication is important to share information and knowledge on climate change, thereby increasing people's resilience to its impacts – thus, the need to institute RCS in the agricultural sector. Community rural radio (CRR) was identified as one of the primary media used for delivering such communication services.

The abstractness of RCS to some agencies remains a challenge. Advocacy with high-ranking government officials is needed to recruit champions for its cause and gain policy support to sustain its efforts. Being a new entity, no funding has been allocated to this initiative in the current budget.

By filling a special niche, an enabling environment is working to RCS's favor, which is considered a priority program of the DoA. For instance, a policy which aims for a "digital Bangladesh" states that "…by 2021, every Bangladeshi would be able to access, utilize, and share information and knowledge easily and efficiently." National Agricultural Extension has also been mandated to provide "an efficient, demand-led, integrated, coordinated extension support to farming communities." A directive was issued requiring all development projects to have a communication component, and that all these projects in the meantime contribute part of their funds to the RCS.

Q: Has there been any impact evaluation on the RCS in agriculture?

A: No impact study has been done yet as we are still establishing the unit that should be managing the RCS program, although in some sites that unit already exists through the community radio stations. Initial gains include the development of 30 modules into simplified radio programs for use in the farmer field schools (pilot CRR project which has already started) on the improved management of saline tolerant rice varieties.

Q: What kinds of climate information are available at the RCS and are these information connected to the Bureau of Meteorology?

A: Meteorological data is included in the national RCS but equipment are not that highly specialized. The project director is linked to a big project on livelihood adaptation to climate change under the UNDP, which is the source of climate data. However, frequency of data feed is not that frequent. Data is also not localized, but UNDP is trying to close that gap through its support in the agriculture (livelihood) sector.

Agriculture, Climate Change, Germplasm and Seeds, and Intellectual Property Rights

Krishna Ravi Srinivas, PhD
Associate Fellow, Research and Information System for Developing Countries, India

Crop biodiversity is a key factor in climate change adaptation, and developing new crop varieties that can withstand climate-induced stresses should be one of the key responses to climate change in the agricultural sector, according to Dr. Srinivas. The development and use of such varieties, he stressed, should be looked both as a mitigation and adaptation measure.

A plant breeder needs to have access to many varieties as source of germplasm. Patent issues, however, have made breeding work quite complicated. Many individuals, groups, and companies already hold exclusive rights to particular germplasms or procedures needed to develop new varieties with the desired characteristics, e.g., tolerance to drought, flooding, or saline conditions. The CGIAR group holds a very extensive genetic collection for a range of crops. These can be made available to other research institutes under some conditions.

Several treaties, conventions, and agreements govern germplasm licensing/patenting and access issues. However, only member (signatory) countries are bound by these rules. Their application is also not uniform across countries.

Patents restrict access to key technologies and materials, considering that a patent is good for 20 years. No one can use the patented item or technology unless permission to do so is granted or royalties are paid.

Critical questions for a plant breeder include the following: Who has rights to particular germplasms or technologies? How can one have access to these? At what cost? Will there be an anti-commons on account of fragmented rights, and will intellectual property rights (IPRs) aggravate this situation?

Although patents may/can be a constraint to developing new products or technologies, they are not necessarily dead ends. However, one needs to be familiar with the complex world of IPR to negotiate one's way around to find possible options or solutions. Dr. Srinivas cited the example of Golden Rice (GR), known to many as Vitamin A rice. The boxed article below illustrates what he describes as the complex reality of patents and IPR; and the attendant issues and challenges surrounding IP rights, restrictions, and safeguards. The example of GR exemplifies the intricate process of coming up with a new crop variety, and how researchers and institutions can work together for the common good.

Golden rice (GR) is a rice variety genetically modified to contain beta-carotene, a source of Vitamin A. Developed to combat Vitamin A deficiency (VAD) that can cause blindness, GR is considered part of the solution to VAD, especially in Asia where rice is the main staple food. In the 1990s, conventional breeding efforts started in IRRI to increase iron and zinc in rice. Creating rice with beta-carotene content, on the other hand, is only possible with biotechnology techniques, being undertaken in Europe around that same time. The Rockefeller Foundation (RF) funded the initial GR research by Potrykus, a Swiss breeder who collaborated with a German scientist to introduce daffodil genes into rice – a process that was duly patented. The science was complex and at that time cutting edge.

Apart from the daffodil gene-in-rice technology, several enabling technologies were also needed so that GR could be further developed and adapted for introduction in developing countries. Potrykus partnered with Syngenta, a commercial seed company which has been working on carotenoids. Syngenta negotiated to put together a package of IPR to be donated (through IRRI) for humanitarian use, which included patents held by four other agro-chemical and seed companies. The condition for use of these patents include 1) that seeds are developed for distribution to farmers in developing countries earning less than $10,000 per year from farming and 2) that release only takes place in countries with adequate biosafety regulations. The donation of this package of IPRs for humanitarian purposes was hailed as a model for the future transfer of needed Western technologies to developing countries.

Reference: David Dawe, www.agbioforum.org/v10n3/v10n3a04-unnevehr.htm

Q: On the issue of public research institutions working together with private corporations to ensure a shared IPR, is that possible? What are your suggestions?

A: In many developing countries like those in Asia, funding has declined since the '80s. Capacity should be developed but funding has to be there; incentives have to be put in place. We should go for public-private partnership (PPP) in developing new varieties and then disseminating them. The situation varies from country to country, however. Breeding work requires a lot of money and time and no private entity will go into it unless it looks potentially profitable. Initial research/funding can be undertaken or provided by the public research institutions while subsequent development and dissemination can be done by the private sector.

Parallel Session 3C

Climate Change Impacts, Vulnerability Assessments, Economic and Policy Analysis of Adaptation Strategies in Selected Coastal Areas in Indonesia and the Philippines

Asa Jose U. Sajise, PhD
Associate Professor of Economics, University of the Philippines Los Baños

Coastal communities are doubly vulnerable from the impacts of climate change because they are sandwiched between hazards from continued deforestation and other upstream environmental problems on one hand, and sea level rise (SLR) or tidal surges on the other.

Focusing on selected coastal communities in Jakarta, Indonesia and Palawan and Batangas, Philippines, the study looked at climate change impacts specifically typhoon/flooding, coastal soil erosion/CSE, and saltwater intrusion/SI; and vulnerabilities. Understanding the risks enables a better assessment of both planned (government) and autonomous (household) adaptation strategies, including policy options to address these risks more effectively.

The study used a mix of qualitative and quantitative methods. Three main analyses were done using cost effectiveness of planned adaptation strategies, vulnerability to expected poverty (VEP), and determinants of autonomous adaptation choices.

Results of the study confirm that households (HHs) face a confluence of risks and act, adapt to, and weather them simultaneously. Thus, the researchers used joint estimates for decision to adapt or not for the three different hazards together, e.g., flooding, CSE, and SI, instead of analysing them discretely.

General comparison of adaptation approaches shows that ecosystem-based approaches (e.g., mangrove reforestation, riverbank stabilization with Vetiver grass) were found to be more cost-effective than infrastructure investments. However, this was not the case in two sites in Jakarta due to ownership/tenure issues.

“Soft” strategies such as information, education, and communication (IEC) efforts, typhoon early warning, and evacuation were likewise found to be cost-effective.

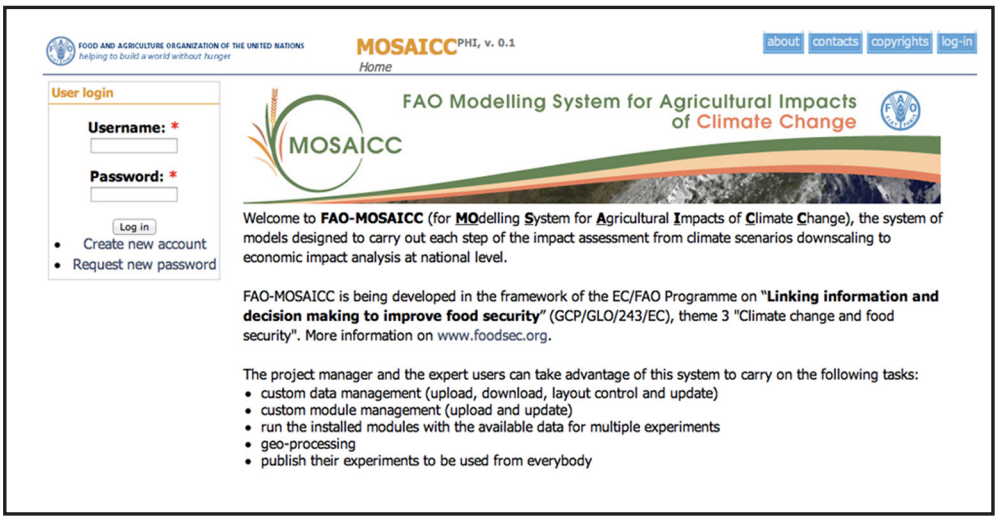
Several other insights were gained from the study: 1) HHs rationally react to the degree of threats from hazards. 2) The nature of the hazard matters and is somehow related to a gender dimension in adaptation. For instance, HHs with more male members are able to adapt better to recurrent hazards such as flooding that requires heavy physical labor in sandbagging. On the other hand, homes with more female members adapt better to the permanent hazard of saltwater intrusion, which requires looking for new sources of drinking water. 3) Government projects or planned interventions such as large-scale mangrove reforestation, building of protective barriers, and relief operations may obviate the need for autonomous adaptation strategies.

Addressing Linkages between Climate Change and Food Security through Top-Down and Bottom-Up Impact Assessments, Food Insecurity Vulnerability Analysis, Community-Based Adaptation, and Improved Socio-Institutional Mechanisms: FAO's AMICAF Framework

Eulito U. Bautista, PhD
Project Manager, Food and Agriculture Organization of the United Nations, Manila

Analysis and Mapping of Impacts Under Climate Change for Adaptation and Food Security (AMICAF) is a comprehensive framework by the Food and Agriculture Organization (FAO) of the United Nations that aims to address climate change impacts and adaptation planning targeted at improving the food security of vulnerable household (HH) groups. The AMICAF framework has four steps: 1) climate change impacts assessment; 2) food insecurity vulnerability analysis at the HH level; 3) assessing livelihood adaptation to climate change; and 4) institutional analysis and awareness-raising.

Step 1, assessment of impacts of climate change in agriculture, primarily uses Modeling System for Agricultural Impacts of Climate Change (MOSAICC), which was customized for the Philippines. This web-based system is hosted by the Philippines Department of Agriculture-Information Technology Center for Agriculture and Fisheries (DA-ITCAF). MOSAICC has four components outlined below, and uses several tools/models. Each of the components is done in partnership with different institutions.



MOSAICC v.0.1 customized for the Philippines

- CLIMATE facilitates the preparation of downscaled climate data, adapting a model developed by the University of Cantabria in Spain.
- HYDROLOGY estimates water resources under future climate conditions using STREAM, a precipitation run-off model, to simulate the discharge rate in large catchment areas.
- CROPS simulates crop yields under future climate change and technological progress scenarios with WABAL, a crop-specific water balance model.
- ECONOMY makes use of a Provincial Agricultural Market (PAM) Model to evaluate the economic impacts of future crop yields and water resources projections.

Step 2, food insecurity vulnerability analysis, develops an analytical econometrics model with the best available national HH datasets. The choice of models heavily depends on data availability. This step characterizes vulnerability and identifies variables associated with highest vulnerability levels. Step 2 builds upon past work on analysis and mapping of food insecurity by incorporating climate change-related factors.

Step 3 examines livelihood adaptation to climate change at the community level, making use of information from Steps 1 and 2. Good practice options or GPOs (from people's local practices and research findings) are identified, validated, and field tested in the local context to come up with a modified set of adaptation options. GPOs for drought, flooding, and saltwater intrusion are being field tested in selected sites in Camarines Sur and Surigao del Norte in Luzon and Mindanao, Philippines, respectively.

Step 4, Institutional analysis and awareness-raising, is being implemented with the National Economic Development Authority (NEDA) and in discussions with the Philippine Commission on Climate Change (PCCC). Activities undertaken under this step include conduct of institutional analysis; knowledge management, communication and capacity development, holding interactive fora; formulating institutional mechanisms and producing guidance materials; and policy analysis.

Existing policies are analysed to asses if these are appropriate for and supportive of (i.e., provide an enabling environment) addressing climate change impacts. Outputs from the steps outlined above are then integrated into a set of guidelines for implementation and adaptation in other countries.

Linking Climate Change, Rice Yield and Migration: The Philippine Experience

Flordeliza H. Bordey, PhD
Senior Science Research Specialist, Philippine Rice Research Institute

This study explored how rice productivity as affected by climate change induces international and cross-regional migration in the Philippines. Data mainly came from secondary sources: international migration (National Statistics Office); domestic migration (2000 Census of Population); rice data (Bureau of Agricultural Statistics); and weather (the Philippine weather station PAGASA). Fixed effects-two-stage least squares estimation was used, with migration as the dependent variable, yield and income as explanatory variables, and weather as the instrumental variable.

This study highlights that migration is one of the adaptation mechanisms particularly among Filipinos. However, differential access to household resources could have a bearing on the differences on international migration, thereby suggesting likely variations in opting to migrate as an adaptation mechanism.

More women workers migrate as unskilled workers (e.g., domestic helpers). These women are more likely to migrate because the opportunity cost for them is lower – many of them being unemployed or doing unpaid work at home.

Review of weather data shows that nights have become warmer and days wetter in the last 15 years with the following effects:

- A 1^0C rise in ave min temp during the dry season decreases ave yield by 64 kg/ha.
- A 1% increase in share of wet days diminishes ave yield by 36 kg/ha and ave gross revenue by PhP 356/ha.

- A PhP 1,000 decline in ave gross revenue increases number of overseas Filipino workers (OFWs) by 0.93 person per 1,000 population.
- A 1 MT decline in ave yield induces migration of 7.09 female OFWs per 1,000 population. The effect on male migration is not significant.

The actual increase in minimum temperature and share of wet days in the last 15 years led to declines in yield by **195 kg/ha** or an aggregate **742,000 MT or PhP 5.14 B in lost revenues.** This has resulted in about **99,000-102,000 OFWs** migrating, of which 57% are women.

The above findings led Dr. Bordey's research team to make the following conclusions: 1) The impact of climate change - via reduction in rice productivity - on migration is real and already happening. 2) With climate change effects expected to be more severe until the end of the 21st century, we expect overseas migration to intensify.

Dr. Bordey recommended that policies on migration should consider these trends in coming up with social programs to counteract negative social effects of migration; and to provide safety nets for poor households (e.g., diversification of income sources) who are unable to migrate as a strategy for adaptation.

Adaptation Behavior to Sea Level Rise at the Vietnamese Mekong Delta: Should a Sea Dike be Built?

Vo Thanh Danh, PhD
School Dean, Can Tho University, Vietnam

Located along the Vietnamese Mekong Delta (VMD), more than 90% of the agricultural land in the province of Tra Vinh is at risk from sea level rise (SLR) as a result of climate change. This study assessed the viability of constructing a concrete sea dike to protect this coastal area. Using a risk-based cost-benefit analysis (CBA), options were compared among five structural designs that can withstand a very strong typhoon that occurs every 20 years (option 1); every 50 years (options 2 and 3); and every 100 years (options 4 and 5).

Estimated costs include those that will be incurred for the construction, maintenance, and upgrading or heightening of the dikes (for options 3 and 5). Benefits factored in the equation were avoided or reduced losses from storms, floods, and saltwater intrusion (specifically impacts on rice production and aquaculture). To overcome the risk and uncertainty in estimating the impacts of storms, floods, and salinity, a simulation analysis was used.

The CBA results showed that main losses came from the agricultural sector. Large scale dikes are more cost-effective, although preferred is the initial construction of the smaller scale dike system(s), to be subsequently heightened at some future stage.

Dr. Danh concluded that: 1) a risk-CBA framework is a good choice for assessing the viability of constructing a concrete dike system in the VMD; 2) dike construction in the area is a viable option among adaptation alternatives to SLR caused by climate change; and 3) the existing national sea dike upgrading program should be revised, considering results of this study. He further recommended that other factors such as reducing loss to lives and property, wetland protection, and benefits of mangrove forests in protecting the dike, among others, should also be considered.

Comment: (Dr. Creencia) For the past 35 years, I found out that our crop yields are increasing because of calamities due to climate change. Reports being submitted by the municipalities show very high yields of rice, and some of them do not even grow rice. So there is a big correlation between increase in yield and occurrence of calamities!

A: (Dr. Bordey) Sir, when yields increase with increased incidence of calamities, that is called spurious correlation. We were careful in laying down the theoretical framework on how change in climate would affect rice yields, e.g., more rainy days and more warmer nights would cause spikelet sterility, flower abortion, etc., translating to reduced yields, and consequently lower incomes.

Comment: Now, for Dr. Vo Thanh Danh, cement dikes get covered with soil when there is erosion. But if you use vetiver grass properly, when covered with mud, they grow back up. And there will be continuous regrowth and building up of natural dikes!

A: The situation in the Mekong Delta is quite unique, different from Central Vietnam because we have mangrove forests outside the sea dikes to protect the dikes.

Q: (to Dr. Bordey) Since we are using national data on yields, we usually have problems with validity. If we want to apply your methods to different rice-growing areas in the country belonging to different climatic zones, are we going to get similar results?

A: Let me just clarify that we used regional data on yields and incomes as well as migration patterns. We can lower the unit of analysis, e.g., municipality or *barangay* (village). While yield and income data may be available for these levels, migration data are not - which is a limitation. If the needed data is available, then we could use similar patterns of analysis.

Q: (to Dr. Bordey) What specific model did your use? We have problems with using crop models and socio-economics in relation to climate change. About migration, aside from rice yields, there are a lot of other factors involved which might be interesting to explain.

A: We used an econometric model. We used data on weather averaged for five years to explain rice yield and its effects on migration, both of which were also averaged for five years. Regarding the other factors, the fixed effects model that we used looks at the region-specific effects. The regional fixed effects capture and account for the other (unobserved) factors that are happening in that region but not included in the model.

Q: (to Dr. Vo Thanh Danh) Your title asks the question, "Should we build a sea dike?" and your conclusion is, "Yes, we should." Could you explain that? Also, your rate of investment is very high but your discount rate is a very low 3%.

A: Yes, we should build a sea dike, and a large one is better than a small one. As to the discount rate, we can use 2-3% or 5%; in Vietnam, 3% is okay. We used sensitivity analysis. We increased the rate from 3% to 6%.

Comment: (Dr. Labios addressing all participants) IRRI and the Philippines Department of Agriculture-PhilRice has a national program on stress-tolerant rice which started in 2009. If you have plans for testing these drought- and submergence-tolerant lines, it would be useful if we could plan together because we already have a network of researchers doing work all over the country. We might be working in the same areas and it would be good if we could coordinate our efforts.

Parallel Sessions 4

SYSTEMS and TOOLS for ANALYSING CLIMATE CHANGE IMPACTS and VULNERABILITY

Parallel Session 4A

Eliciting Factors Affecting Fish Kill Events in Taal Lake through Participatory Approaches: A Tool for the Development of a Predictive Fish Kill Model

Damasa B. Magcale-Macandog, PhD
Professor of Biological Sciences, University of the Philippines Los Baños

Taal Lake is an economically important resource that provides about 40% of the fish requirements of Metro Manila, Philippines and most towns surrounding the lake (CALABARZON region). Aside from the more common tilapia *(Tilapia nilotica)* and milkfish grown in fish cages, Taal Lake is home to several endemic fish species.

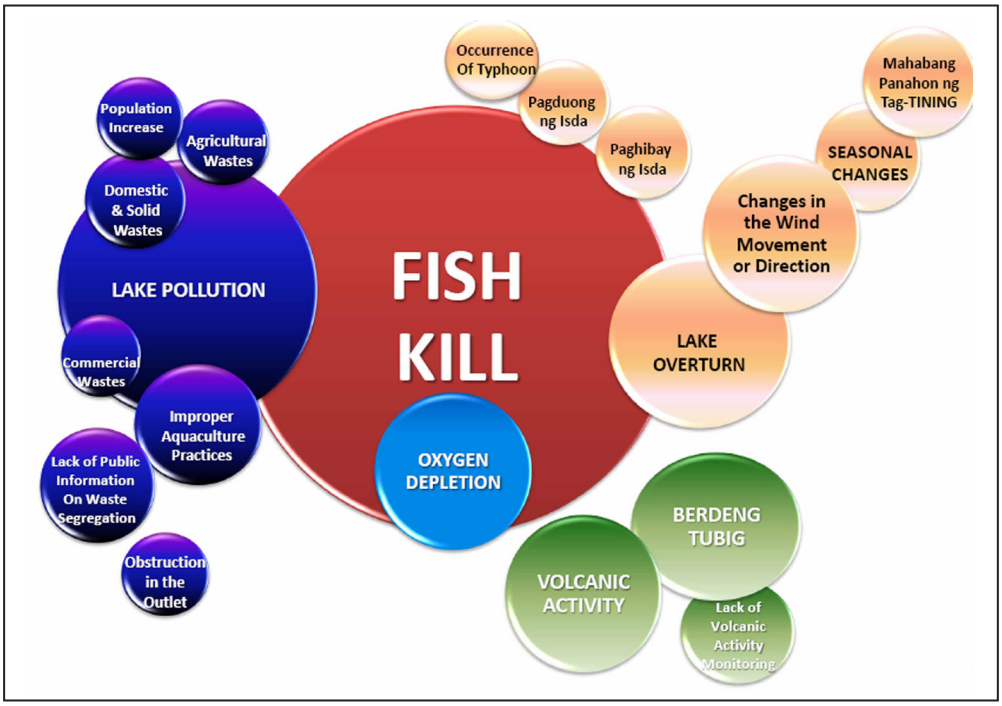
Fish kill has been observed as an annual occurrence in the lake. Occasionally, however, fish kill happens on a massive scale due to a confluence of factors. For instance, Taal Lake became a virtual graveyard of about 2,000 MT of fish in 2011 – with close to PhP 60 M worth of combined losses in four of the hardest hit towns. This prompted the Department of Science and Technology (DOST) to provide a research grant for the development of an early warning system to reduce such losses.

Dr. Macandog's team documented local ecological knowledge of fishing communities and key informants on the fish kill phenomenon using participatory rural appraisal or PRA tools, namely, community timeline, lake and land use mapping, causal and solutions mapping, plus strengths-weaknesses-opportunities-threats (SWOT) analysis. Along with other relevant information, e.g., lake water quality from the regional monitoring station of the Bureau of Fisheries and Aquatic Resources (BFAR) and weather data from the national weather station PAGASA, the research team aims to develop a predictive fish kill model as a basis for the early warning system.

Factors contributory to fish kill include both climate- and nonclimate- related factors, as follows:

- Lake pollution was identified by the community as a major cause of fish kill in the lake. Such pollution comes from improper aquaculture practices, domestic and solid waste, and agricultural and commercial waste, among others.
- Other causes that the locals enumerated include change in wind direction, greenish water, long duration of calm or stagnant-like water condition, and seasonal changes.
    - Southeasterly wind or *hanging Salatan* from April to May is characterized by very calm waters and high water temperature, which influences lake overturn and is known to have contributed to the May-June 2011 fish kill in Taal Lake.
    - Southwesterly wind or *hanging Habagat* from May to Sept brings the most unstable equatorial air (hence, the highest temperature fluctuations), causing cloudy and rainy months and typhoon events. Such weather disturbances deprive fish cages of aeration. Most of the severe fish kills occur during this period.

- Excessive nutrients in the lake, usually due to nutrient runoffs from animal waste, fertilisers, and sewage (pollution) from the land cause a dense growth of plant life, manifested as greenish water *(berdeng tubig*). The decomposing plants deplete the oxygen supply, leading to fish kills.



Causal diagram of Taal Lake fish kill

Q: How will the obtained data be used?

A: The project is still looking at the range of possible predictors for fish kill. If those factors are properly identified, they will be used as parameters of the model we are developing.

Q: How does the predictive fish kill model work?

A: The data (parameters, predictors, etc.) from different sources are integrated into a single framework that "computes" for the probability of a fish kill event so we can give an early warning as needed.

Q: What can the community do if you already have an early warning system?

A: A centralized computer system at the provincial office will be networked to the fishing communities so that people will be informed of the lake condition in real time. In case of a predicted fish kill occurrence, they could take necessary precautions to lessen their losses. For instance, they may move their fish cages to portions of the lake that will not be affected, or otherwise harvest their fish earlier than scheduled.

Additional comment: The simulations will have a seven-day leeway before the predicted fish kill event for climate-related causes. Lead time for hydrothermal events or sulfur upwelling (from the active volcano in the middle of Taal Lake) is an extremely short two hours.

A System for Monitoring the Effects of Climate on the Flux and Availability of Water Resources in the Drylands of Eastern Africa

Laban MacOpiyo, PhD
Lecturer, University of Nairobi, Kenya

Dr. MacOpiyo described how a low-cost remote sensing technology was utilised to monitor spatial and temporal patterns of change in waterholes in the pastoral regions of the Horn of Africa, which includes Ethiopia, Kenya, Somalia, and Djibouti. Here, the pastoralist population comprises about 14% of the total population in these four countries. The study sites are located in the pastoral regions of East Africa where Ethiopia and Kenya lie. They are characterized as remote, experiencing acute shortages of water and pasture for livestock, and known for conflicts and insecurity.

The research project involved the development of a simple hydrologic water balance model to estimate the daily variations in waterhole depth which can be used as the basis for climate change adaptation. The model was developed using the following:

- Advanced Space-borne Thermal Emission and Reflection Radiometer (ASTER) images to identify and locate waterholes;
- Tropical Rainfall Measuring Mission (TRMM) satellite data to extract rainfall data for watersheds in the study region;
- Global Data Assimilation System (GDAS) data to extract the climatic parameters needed to calculate reference evapotranspiration; and
- Use of android mobile phones to send vital information on waterhole depth data and for the validation of the model used.

Pastoralists need reliable information on availability of water and forage for their livestock

The model was found to be consistent with actual ground data on trends in water level and seasonal variations in the waterholes. The monitoring system is useful in the following ways:

- It serves as an early warning tool on condition of water resources in the covered areas; potential livestock migration in search of water resources; and potential livestock losses.
- It can serve as a resource management tool. It helps in planning migration based on water and pasture availability; in avoiding/reducing conflicts among groups competing for water resources; in conducting feasibility studies for new waterhole locations; and in monitoring climate impacts on water resources.
- It provides easy and free access to waterhole data through the web, http://watermon.tamu.edu/.

Prior to the existence of the current waterhole monitoring system, pastoral communities used scouts to identify areas where they could find water and forage. Even government and nongovernment agencies working in the area relied on historic knowledge and information from surveys for planning and decision making. Such methods were mostly inaccurate, time consuming, costly, and sometimes risky. Now, it is possible to get the needed information for free, irrespective of geographic location and time.

Q: The monitoring system looks impressive and extremely useful. But how do you gather "real" data without people who actually monitor the waterholes on the ground?

A: We do have people in the field - that's how we saw the simulated figures to be closely matching the data they gathered. We had to establish the system first, then eventually we would not need monitors on the ground anymore.

Q: How will users understand the data uploaded in the website?

A: The data on the waterholes were classified, simplified, and color coded into three categories based on the water levels: **green** (good): if water level >/= normal; **yellow** (watch): level < normal; **red** (alert): level << normal.

Q: How do you know/compute for the water consumption of the livestock?

A: We do not know. The model was not designed to do that task.

Q: What measures do you do when the holes dry up? How many animals have you saved with the system? What is your level of success?

A: The system provides the data needed by the communities to make informed decisions. We do not have data on animals saved. Regarding success rate, we know the system is working, but it is largely up to the users to take advantage of what it has to offer.

Q: How will the intended users know about the existence of your water monitoring system?

A: The project works closely with FAO and the National Drought Management Authority. They pass on the information to the local administrations who are in direct contact with the communities.

Economy-wide Estimates of Climate-induced Impacts on Philippine Agriculture: A Computable General Equilibrium Analysis

Arvin B. Vista, PhD
Assistant Professor of Agricultural Economics, University of the Philippines Los Baños

The author discussed the potential magnitude of impacts of climate change on Philippine agriculture and on the economy as a whole. A general equilibrium model was used as a tool for analysing climate change-induced impacts on productivity in agriculture, fisheries, and forestry sectors; industry/ manufacturing output; and productivity in the services sector.

The model was tested using five simulation scenarios: 1) production shocks for selected crops; 2) consumption shock; 3) production and consumption shocks; 4) related sector shock; and 5) combination of simulations 1, 2, and 4. Key results are as follows:

- Production shock is more likely to have a stronger impact on aggregate output than the consumption shock.
- Decline in agricultural productivity and manufacturing output explained most of the drop in real GDP & increase in general price levels, yet there is gain in employment for some key agricultural sectors, namely, sugarcane, rice and corn.
- Climate-induced impacts would mostly affect the country's export sector.
- The country would be benefiting from the substitution effects whenever there is an increase in demand or consumption of fishery products and services.
- Consumption shock would cause an increase in real GDP, employment, export, and import in the fishery sectors.

The study inferred that climate change-induced impacts would have an overall negative effect on key Philippine agricultural sectors, and thus on the overall economy. According to Dr. Vista, this would necessitate the adoption of mitigating measures by farmers and the local government units or LGUs in several areas:

- Boosting the fishery sector may lessen the impact of climate change on the Philippine economy, e.g., increasing the capacity of commercial fishing and aquaculture operators. (The Philippine fishery sector is less vulnerable to the impacts of climate change compared to other 137 economies of the world. - Allison et al., 2009)
- Adoption of organic farming practices – need for some transitional subsidies from the government to support the promotion of indigenous practices that will result in diversified farming.
- Thinking globally and buying local produce may be advantageous for the domestic economy in the short run.
- There is a need for targeted safety nets for the affected stakeholders given decline in employment and failure in food crop production.

Q: What would account for the relatively flat employment trend for the agricultural sector compared to the total employment figures?

A: The study did not really go into that… perhaps it could be due to increased mechanization or shift to corporate farming.

Comment: Some of the mitigating measures you mentioned cannot be done at the farmers' or even the LGU levels without the enabling environment. The national government may have to step in with the necessary policy interventions to make them work.

Suggestion: The author should have considered the conversion of agricultural lands to residential areas among the simulation scenarios.

Parallel Session 4B

Methodological Framework for the Decision Support System for Climate Change Adaptation in Rainfed Rice Areas

Anita A. Boling, PhD
Postdoctoral Fellow, International Rice Research Institute, Philippines

This study being conducted in the Philippines, Indonesia, and Lao PDR aims to develop a methodological framework for an integrated decision support system (DSS) for rainfed rice production. Using a variety of data from various sources, simulations were undertaken to come up with a range of options that should help farmers adapt to the impacts of climate change.

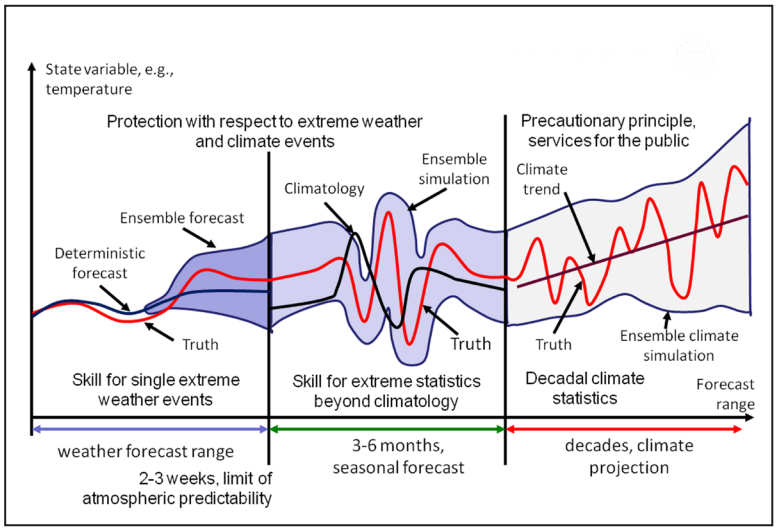
Experiments were conducted in greenhouse and field conditions to find out how different rice lines respond to varying conditions such as weather/climate (e.g., temperature, solar radiation, rainfall), water management, and fertiliser management. Farmers were also interviewed to learn about their practices vis-à-vis climate-related constraints, such as impending drought or high rainfall.

Data from the experiments, real-time and seasonal weather forecasts, including farmers' practices are analysed. Resulting information are further defined and evaluated, and fed into the model to simulate potential rice yields under varying conditions. Expected outputs of the research would be potential management interventions in the following aspects: planting date(s) for specific weather scenario forecasts; rice variety and promising lines; including options for crop establishment methods, recommended nutrient management options, irrigation management, and tillage practices.

Regional and Climate Simulations: Current Performance, Key Challenges, and the Fundamental Importance of their Coupling with End User Models

Volker Wulfmeyer, PhD
Professor, University of Hohenheim, Germany

Dr. Wulfmeyer stressed the importance of seamless prediction of weather and climate in order to protect lives and property from extreme weather events. With current available technology, he declared that we could have a decent weather forecast range of two to three weeks (the limit of atmospheric predictability) and seasonal climate forecasts to predict events of drought or high precipitation for three to six months. According to him, such seasonal scales are important for agriculture and food security. Decadal climate projections, on the other hand, are an important basis for putting in place the needed infrastructure or services for the public.



For simulations to be useful for end users and decision makers, dynamical downscaling is essential where the land use system (along with the feedback processes, orography[12] and sea-breeze effects) is resolved to 3km. With this connection, Professor Wulfmeyer explained the Coordinated Regional Downscaling Experiment (CORDEX) that can simulate regional climate scenarios and decadal projections for specific time slices. He described the Hohenheim Integrated Land System Model, a collaborative project of 12 research institutes, which is useful for determining the impact of climate change on crop yields, food quality, and food security. This consists of an atmosphere-land surface model coupled with a crop growth model and a land use decision model. He explained how a set of external factors (e.g., political, demographic, and economic conditions) drives or affects the whole system.

The earth is under a lot of pressure – from people's need for food security and health, land use, population growth, energy production and demand, socio-economic and political development, and climate change. Underscoring the need for seamless weather to seasonal forecasts so that we are prepared for extreme events, Dr. Wulfmeyer concluded, "In order to adapt to climate change tomorrow, we must learn to adapt to climate variability today."

Use of Statistical Downscaling and Process-based Crop Model in Assessing Climate Change Impact on Rice Yield

Mr. Mark Jay P. Dating
Instructor of Statistics, University of the Philippines Los Baños

Temperature, rainfall, and solar radiation are vital climatic factors that affect rice growth and development. A significant change in any of these variables would result to corresponding changes in rice yields. The study was conducted to simulate the effects of climate change on rice productivity in two sites in the Philippines: Los Baños, Laguna, and Malaybalay, Bukidnon.

Using Statistical Downscaling Model (SDSM), climate projections from General Circulation Models (GCMs) were downscaled for baseline years and the years 2020, 2050, and 2080. Downscaled weather values from SDSM were used as inputs to ORYZA2000, a process-based crop simulation model to assess potential effects of climate change and variability on rice yields in the study sites. Results of the simulations are as follows:

- There is an increasing trend in weather variability both In Los Baños and Malaybalay.
  - Results showed substantial increase in minimum temperatures in both sites, especially during the first quarter. Substantial increase in maximum temperature is observed in all months for Bukidnon.
  - Considerable increase in rainfall is shown in the two sites, especially in 2050 and 2080.
  - Substantial increases in solar radiation are also shown for both sites.
- There is an increase in rice yield in 2020 in both locations. However, the model shows that yields start to decrease in 2050.
- The month of March is relatively not favorable for dry season planting, i.e., results in lowest yields. In Bukidnon, January is most favorable for planting while in Laguna, it is February.
- September is relatively not favorable for wet season planting for both sites. On the other hand, July was shown to be favorable for planting during wet season.

By showing how the rice crop responds in terms of yield to the predicted changes in temperature, rainfall, and solar radiation across a specified timeline, the model serves as a helpful tool in determining the needed intervention, e.g., best time for planting during the wet and dry seasons.

[12] The study of the physical geography of mountains and mountain ranges (www.thefreedictionary.com/orography).

Track-Risk-Impact-Policy (TRIP) Modeling of Tropical Cyclones for the Agricultural Sector

Engr. Glenn S. Banaguas
Director for Research, De La Salle Araneta University, Philippines

For a country like the Philippines that gets visited by an average of 20 typhoons annually, Track-Risk-Impact-Policy (TRIP) modeling of tropical cyclones (TCs) is an extremely useful tool for helping people mitigate and adapt to potential damage from highly destructive cyclones.
Engr. Banaguas further explained that by studying the history of TCs and simulating how they are likely to behave in the future, we are better able to deal with them. As an example, he showed decadal TC data from 1950 to 2009 highlighting the following:

- Bicol Region holds the top spot for being at the receiving end of the most number of TCs at their most intense with a total of 156 for the past six decades. Tying for second place at 147 TCs were Cagayan Valley, Central Luzon, and CALABARZON. SOCCSKSARGEN ranks last at No. 9 with 27 TCs.
- Years 1960-1969 experienced the most number of TCs (~360); 1990-1997 with ~340; and 2000-2009 with a little over 300.
- Overall data for the six decades covered show that the greatest number of cyclones happen in August, followed by September, and then July.

Using the above figures, one can simulate the general behavior of future cyclones. Engr. Banaguas also presented a simple equation of calculating the risk from an incoming cyclone with the formula RISK= Hazard (intensity, duration, etc.) x Exposure (area, size of population) x Vulnerability. He also showed examples of more sophisticated risk modeling tools using the Monte Carlo Simulation Modeling and with geographic information systems or GIS.

Engr. Banaguas then outlined relevant policies that the Philippine government has passed, such as RA 7160 (Local Government Code); RA 9729 (Climate Change Act); and RA 10121 (Disaster Risk Reduction and Management Act). RA 7160 stipulates that local governments can allocate 5% of their revenues as disaster fund. Citing Cabusao as an example (Cabusao is a municipality of Camarines Sur in the Bicol Region; 2009 population- 19,653), he gave the following figures:

- In 2009, Cabusao had an income of Php 10,053,996.00; 5% of this is around Php 502, 699.80, allotted for disaster fund.
- Assuming that if only one cyclone hit the town and 100% of the Cabusaoeños were affected by the calamity, each resident would have a budget allocation of PhP 26/day (approximately US$0.63/day). Further, if the typhoon affected only 20% of the population, each person would be allocated PhP 128 (approximately US$3.12).

The above example illustrates the inadequacy of the government's budget allocation for disasters. For instance, if the cyclone lasts for five days and the whole population of the town is affected, then each resident would have a measly budget of PhP 5/day (approximately US$0.12/day).

Q: (for Engr. Banaguas and Mr. Dating) Did you use statistical validation before using the models to test how accurate they are as tools for prediction?

A: (Engr. Banaguas) Yes, definitely, the models were validated.

(Mr. Dating) Yes. Especially for SDSM, the coefficient of variation and standard error of the parameters are low. When we look at the model as a whole, the r^2 is also very low.

Q: (for Dr. Boling) How could alternate wetting and drying (AWD) be considered a climate change mitigation measure?

A: The conventional practice of continuous flooding in irrigated rice production produces nitrous oxide and methane. In AWD, the rice paddies are drained during specific periods within the rice growing cycle. This water-saving technology or practice reduces methane emission (by 70%-90%) so the global warming potential is reduced.

Comment: (for Mr. Dating) You mentioned that every increase in temperature has a corresponding decrease in yield. But your model shows the decrease only by 2050.

A: The time slice covering 2050 starts with 2036, and significant decrease in yields could already be seen as early as then (2036).

Comment: (for Engr. Banguas) On 16 December 2011, advisories from PAGASA and the LGUs made no warnings of an incoming typhoon. Based also on "track", typhoons usually entered from Surigao and not from Davao in the south. Thus, we were not prepared for disaster when typhoon Sendong struck[13].

A: Sendong was an extreme case. We cannot predict exactly where TCs will enter and how many will enter. We can only try to understand the optimum value of the risks so we can be prepared.

Q: (for Engr. Banaguas) You mentioned something about MDG. Either your country is matching the target or is still far from achieving it.

A: Based on studies, occurrence of disaster is correlated with increased incidence of poverty. Moreover, poorer households are more vulnerable (to calamities). Many institutions are working together in order to meet our MDG goal of poverty reduction. We are trying to provide the right climate change adaptation schemes especially for poor families who are most vulnerable. We want to be positive. That's why we have CCA and DRR.

Q: (for Dr. Wulfmeyer) Please explain a bit more about downscaling – for example, down to 3km – and its usefulness to the agriculture sector. Can we substitute with time scale across the landscape?

A: If resolution is increased, physical inconsistencies become more apparent and we can make needed corrections. It is also important to look into limitations. In statistical downscaling, you will make some assumptions, and biases exist. So, you have to undertake verification efforts. Downscaling needs to be coupled with end-user models to be useful in food security impact studies.

Q: (for Engr. Banaguas) Please clarify other determinants of vulnerability, aside from poverty incidence.

A: Other human development indices are also used, such as health status, income, age, and education. For example, people with lower incomes are more vulnerable compared to those with higher incomes who have the means to cope better. The very young and the old people are more vulnerable compared to the middle aged who are more able-bodied.

[13] Typhoon Sendong (international name: Washi), brought heavy rains in a very short period of time in Bukidnon and nearby municipalities in Southern Philippines. Most affected by the resulting floods were the downstream areas of Cagayan de Oro City and Iligan and their environs. The highly destructive flood was due to a combination of "acts of God" and "acts of man": 1) Huge volumes of water coming from the upper portions of the watershed met with the high tide at 2 a.m. when most people were asleep – thus, the high number of casualties in the areas near and along the coast.; 2) Human activities contributed to the magnitude of the calamity, e.g., reported illegal logging and mining upstream; intensive agricultural activities that even encroached on riverbanks/ easements; and human settlements in identified geo-hazard (landslide- and flood-prone) areas.

Plenary 2

REGIONAL and SOUTH-SOUTH COLLABORATION in RESEARCH and DEVELOPMENT

Agrobiodiversity and Climate-smart Landscapes for Improved Food Security under Climate Change: A Call for Increased South-South Collaboration

Reinhold G. Muschler, PhD
Latin American Chair of Agroecology and Agrobiodiversity,
Center for Research and Higher Education on Tropical Agriculture, Costa Rica

To start his presentation, Dr. Muschler affirmed what most speakers in the conference had so far stated: that climate change is already occurring; that there is an increase in heat and water stress; that there is an increase in extreme weather/climatic events; and that details are largely fuzzy or unknown at the local level. He stressed the need for agricultural systems that can cope with uncertainty, of which diversity at all levels can play an important role.

He further noted that there is lack of diversity in modern agriculture. Only three crops, namely, maize, wheat and rice, provide 60% of the world's calories; only 30 crops provide 95% of the world's needs; and more than 75% of crop varieties have been lost in the past century.

According to Dr. Muschler, more than 12,000 plants are classified as edible. Most of these are known as neglected and under-used species (NUS). NUS, e.g., amaranth and millets, among many others, attract little attention for a host of reasons: 1) limited or no promotion, as they are often labeled as "poor man's food"; 2) restricted range and localized use; 3) characteristics and uses are poorly documented; 4) not attractive to researchers, extensionists, policy makers, donors; 5) and weak or no seed supply systems.

On the other hand, NUS are important as they are part of the cultural heritage of their places of origin. They are often adapted to agroecological niches and marginal land; can be produced with little or no external inputs; are often highly nutritious; and have medicinal and/or multiple uses.

The Center for Tropical Agricultural Research and Higher Education (CATIE) in Costa Rica has an extensive frozen and living germplasm collection of vegetable crops. Among them are over 1,500 accessions of beans, 500 tomatoes, 1,100 peppers and chillies, 1,900 squash/cucurbits; a large collection of roots and tubers; unique collections of coffee, cacao, and peach palm; plus fruit trees such as annonas and zapotes. The Center also works closely at the community level with farmers who maintain farm seed banks by planting, producing, and sharing or exchanging their seeds.

Dr. Muschler said that we have to examine the important role of NUS to diversify agricultural systems - increasing resilience to climate change impacts, and improving food and nutritional security especially if incorporated into climate-smart landscapes.

To achieve success for climate-smart landscapes, we need to use appropriate agro-ecological production techniques, supported by good policies. Climate-smart landscapes have the following elements: incorporation of trees; organic matter in the soil; presence of earthworms and beneficial microorganisms; habitat for flora, fauna, and biological allies; a connection from local, national, to regional levels (integration); and production is linked with protection.

Climate-smart landscapes retain water on the mountains, keep soil above the water, show adaptive engineering, and exhibit diversity both in the field and on the plate. On the last point, Dr. Muschler declared that excellent work in the field of agriculture is often not matched with promoting healthy dietary habits through diversity in the food we eat.

Dr. Muschler sounded a call for South-South collaboration on the identification, promotion and use of neglected, climate-resilient but highly nutritious crops and fruit trees to better adapt to and mitigate effects of climate change. He concluded by stressing that germplasm diversity holds the key to climate change adaptation.

Advancing Higher Education and Research in Climate Change and Disaster Risk Reduction Through Multilevel Collaboration

Juan M. Pulhin, PhD
College Dean and Professor, University of the Philippines Los Baños

The multidimensional and interdisciplinary nature of climate change and disaster risk reduction (DRR) requires a paradigm shift in education and research. Academic institutions can facilitate social learning and transformation though multilevel collaboration that would link science, policy, and practice. Dr. Pulhin presented the case of the Asian University Network of Environment and Disaster Management (AUEDM at www.auemd.net), a group composed of 28 universities in the region.

The evolution of the network started in the aftermath of the 2004 Indian Ocean tsunami. From 2006-2008, UNISDR supported EU project in four Asian universities: Kyoto University in Japan, University of Peradeniya in Sri Lanka, Madras University in India, and Bandung Institute of Technology in Indonesia. The AUEDM was established in 2008.

Upon selection of the partner universities, a baseline survey was conducted on the perception and interest of university students in DRR; courses were identified and prioritized. Eight training modules were developed and tested, and courses were developed based on the training modules.

Modules include: School Safety, Climate Change Adaptation, Community-based Coastal Zone Management, Community-based Information System, Participatory Urban Risk Management, Leadership Training Program for NGOs, Post Disaster Environmental Impact Assessment, and Flood Risk Management. These modules were incorporated into undergraduate or graduate courses either as core or electives in varied disciplines: applied geology, geography, oceanography, urban and country planning, environmental studies, civil engineering, climate hydrology, watershed management, social work, sociology, and anthropology.

The network has grown from the original four to the present 28 member universities in 17 Asian countries. Current activities include: developing higher education essentials for DRR; developing implementation research guidelines; bilateral/multilateral projects under AUEDM framework; student and faculty exchange; student internships; conduct of workshops and meetings; and publication of research papers, journals, and books.

Dr. Pulhin cited several challenges to AUEDM, namely, the breaking of traditional academic/discipline boundaries in collaboration; engaging the participation of members from various levels; getting commitment from higher level university officials and donor agencies; long gestation period in university curriculum development; and coordination, where the focal institution/person plays a vital function in the network.

With the broadening of the network's scope of learning in the field by working with other stakeholders like NGOs and local government, AUEDM faces even more challenges. Yet, its positive contributions and initial accomplishments may be considered as rewards in themselves.

Q: What initiatives do you undertake to sustain activities beyond current funding cycles?

A: (Dr. Pulhin) The AUEDM faces constant a struggle in this regard. Thus, it makes sure that its approach is strategic and need-driven. We work on various fronts from bilateral to multilateral engagements. We also promote interdisciplinary research. However, we have to keep within our research agenda to maintain our focus.

(Dr. Muschler) You can keep on doing your work if you have special people who can move things. Our program/projects are usually attractive to Nordic donors. It is important to attract funding although some activities can move forward without much funding.

Comment: (from Chancellor Cruz) Funds are usually not a problem in North-South collaborative projects. The situation is more challenging for South-South collaboration.

Q: (for Dr. Muschler): In Asia we have "civet coffee" which is very expensive; do you have that in Mesoamerica?

A: We don't, but we are also looking into specialization. Overproduction of some products depress their prices. We have a graduate student doing research on non-mainstream varieties.

Q: (for Dr. Pulhin) The graphs you showed on vulnerability lumped Asia as one. Are there particular countries in the region that are more vulnerable?

A: The graphs are simply summaries per region. A lot of data is available by country. It depends on the type of index being used. We have to be clear about the indicators to measure vulnerability. UNISDR bases its figures on the number of disasters, while IPCC has its own system. In one German index, the Philippines ranks No.2 in terms of vulnerability.

Q: (for Dr. Pulhin) What other universities in your network come from South Asia aside from India? Have you measured the impact or success of your efforts?

A: We have member universities from Pakistan, Nepal, and Bangladesh. Yes, we had an initial assessment in our fourth year.

Additional comment: It is important to integrate modern science and local knowledge toward more robust assessments.

Plenary 3

PANEL DISCUSSION on NETWORKING FOR R&D and CAPACITY BUILDING on CLIMATE CHANGE and FOOD and ENVIRONMENTAL SECURITY

Asia Pacific Adaptation Network (APAN)

Ms. Hiroko Kodaka
Associate Programme Manager

Ms. Kodaka introduced APAN as follows:

- It is part of UNEP's Global Climate Change Adaptation Network (GAN). It aims to facilitate institutional capacity building, knowledge management, and dissemination of best adaptation practices in the region.
- It is structured in such a way that it will cover the different parts of the Asia-Pacific region through existing organizations. Activities in the region are being managed and coordinated by the Regional Hub.
- A major activity of the network is the Annual APAN Climate Change Adaptation Forum. The third forum will be held at Incheon, South Korea on 18-20 March 2013.

Ms. Kodaka invited everyone to participate in the Forum, which will be another opportunity for knowledge sharing and networking. The theme is "Mainstreaming Adaptation into Development". She enjoined interested participants to submit their paper abstracts (http://bit.ly/adaptforum2013) on any of the following thematic focuses: adaptation strategies; critical and neglected groups; adaptation in sectors and systems; and knowledge management for adaptation.

University of the Philippines Los Baños Interdisciplinary Program on Climate Change

Dr. Maria Victoria Espaldon
UPLB Vice Chancellor for Research and Extension and IdPCC Co-Coordinator

In response to the different issues related to climate change, the IdPCC was formed to coordinate all the efforts of the university and to further develop strategies as climate change is part of UPLB's growth areas. It is a university-wide multidisciplinary program that undertakes:

- synthesis of R&D activities and research in priority areas related to climate change;
- providing assistance to different government agencies in the development of their research agenda;
- implementation of information, education, and communication (IEC) activities;
- conduct of capacity building activities for various sectors;
- project development assistance; and
- providing technical inputs to mainstream climate change and disaster risk reduction and in developing instructional materials in schools at different levels.

With its secretariat lodged with the UPLB School of Environmental Science and Management (SESAM), the program works closely with nine other colleges of the university, including the Graduate School. It also works in collaboration with relevant government agencies in conducting research across landscapes.

University of Tokyo

Dr. Seishi Ninomiya, *Professor*

The University of Tokyo is host to several networks and projects that develop and promote the use of information technology in addressing climate change. These networks include the following:

- Asian Federation of Information Technology in Agriculture (AFITA), a federation of national AG-IT societies with eight members and seven associate members. Since its creation in 1998, it has held conferences every two years;
- The Asia Pacific Advanced Network (APAN), a consortium that aims to provide high performance internet infrastructure for nonprofit activities and to bridge disciplines in the Asia-Pacific;
- GEO Group on Earth Observation System of Systems (GEOSS), which was created for the use and integration of data from different sources;
- Data Integration and Analysis System (DIAS), which aims to generate knowledge for solutions to environmental problems through an infrastructure integrating various data across fields; and
- Other networks like the Green Network of Excellence and International Network of Federations of Information Technology in Agriculture (INFITA).

Economy and Environment Program for Southeast Asia (EEPSEA)

Dr. Herminia Francisco, *Director*

EEPSEA aims to build capacities on environmental economics research and operates in Southeast Asia and China. Its activities include provision of research grants; conduct of training courses for researchers and natural resource managers, policy makers, journalists, and justices, and workshops and conferences; and publication development and dissemination.

Eighty percent (80%) of EEPSEA's budget goes to research, and 11% of research projects currently funded are climate change-related. These include several that have been presented in this conference.

EEPSEA has been working with local government units (LGUs) to communicate research findings to them directly. It works in partnership with organizations in SEA. It is also open to working with other disciplines.

Dr. Francisco explained EEPSEA's tag line "We **value** the environment" to mean two things: that the program puts a high premium on the environment; and that the program actually measures and assigns a monetary value to the environment.

ASEAN GIZ Biodiversity and Climate Change Project (BCCP)

Dr. Berthold Seibert, *Project Director*

BCCP is an initiative to enhance capacities of ASEAN countries to mitigate climate change through biodiversity conservation. It facilitates cooperation between members of ASEAN, as well as regional and international organizations, on biodiversity-related issues.

The project focuses on biodiversity and ecosystems such as the ASEAN Heritage Parks with 10 pilot projects in the region. It looks at how the initiatives work on the ground.

Together with SEARCA and the ASEAN Center for Biodiversity, GIZ is sponsoring a training course on biodiversity and economics first week of December 2012.

Comment: (Dr. Creencia) We have been treated to doom and gloom pictures on the negative effects of climate change for the past two days. My challenge to everybody is: can we pick out some favorable effects of climate change, and build from those? For example - San Carlos, Negros, Philippines received very little rainfall this year, but its sugar cane yields doubled. Temperatures in Ilocos Province were a record high, but the region produced the best garlic.

Q: (for Dr. Ninomiya) Can we access the satellite data from your different networks for free?

A: The public data can be accessed for free. I don't know how much satellite data the other networks have; some of those are freely accessed, while others are not.

Q: (Mr. Tabukovu from the Fiji Islands, addressed to all speakers). In what ways can you assist my country?

A: (Dr. Francisco) Unfortunately, Fiji is not within our area or coverage. Nevertheless, it is still possible for you to attend our training courses. If your organization can take care of your airfare as its counterpart, EEPSEA can cover your costs for participating.

(Dr. Ninomiya) Our focus is on networking and capacity building. Even if your institution is not officially a member, sending staff to attend a conference (in any area, not necessarily on climate change) already makes it part of the network. Networking is mutually rewarding as you learn from all the interaction. So please visit the websites.

(Dr. Seibert) Our mandate is to work with ASEAN member countries, but we can also work with others outside ASEAN via memoranda of understanding (MOU). We make an appeal to Southern governments to support their own staff and their own organizations to participate in events.

(Dr. Espaldon) UPLB (IdPCC) is not a funding agency, but we engage other institutions to collaborate with us in research projects. For example, we want to submit a proposal to the Asia-Pacific Network for Global Change Research (APN) which requires at least two Southern countries to partner with one Northern country. From time to time we are looking for partners facing the same challenges so we could identify a common research agenda to work on.

(Dr. Creencia) We should be proactive and creative in our search. For instance, there is a big directory of funding agencies I found in the UPLB library and it appears I am the only one using it. There are about 3,000 donors listed that give money for different types of programs working on different issues. Who has heard of the World Council of Churches? The directory indicates that it donates half a billion dollars annually for projects in Bangladesh.

Q: Is it possible for EEPSEA to work with us in Timor Leste? How can we get in touch with your institution?

A: (Dr. Francisco) The best way is for donors to support other organizations assisting Timor Leste so that we could work with them.

Do visit our website www.eepsea.net and download our materials. Please take advantage of our free materials for a start. You can also use them to familiarize yourself with the organization and its programs.

(Dr. Seibert) We have invited two participants from the government of Timor Leste in our upcoming December training-workshop on "Integrating Ecosystem Services in Development Planning". This is part of our effort to better integrate your country into regional (ASEAN) initiatives.

(Dr. Lansigan) The Asia-Pacific Network for Global Change Research (APN) is one of our sponsors for this conference. This is also an opportunity for our colleagues in the Asia-Pacific who need financial support to attend meetings, trainings, conferences, or to conduct field research. Deadline for proposal submissions is September every year; results are usually out by April of the following year.

Comment/Q: (from the moderator, Dr. Lasco) I'd like to challenge our panelists to go back to the issue of sustainability. What do you think is the secret for sustaining networks?

A: (Dr. Francisco) EEPSEA is considered as a research network. It has been in existence for 18 years. Would you consider that sustainable? Maybe. Donor-driven? We have been funded by donors since we started. One key to longevity is doing good (quality) work. There is nothing wrong with being donor-driven as long as you keep within your mandate and priorities.

(Dr. Seibert) The ASEAN Center for Biodiversity (ACB) is seven years old and as an international organization, only three, and is donor-driven throughout. In the ASEAN context, having this kind of institution is a matter of political will. Biodiversity is not easy to sell because it is generally not a priority in international cooperation. But Germany has committed to us half a billion euros per year from 2013 through our different channels in the donor community. So there are funds for this kind of work. We just need the right set-up, because without commitment from our ASEAN partner organizations, this would not have been possible.

(Dr. Espaldon) Champions are important. And there is a need for champions to mentor other champions for genetic replication (i.e., they would multiply in number). If the original champion leaves, there is succession if there is capacity building, which is also important for sustainability.

Comment/Q: (Dr. Wulfmeyer) Regarding the focus of this conference on adaptation, it seems to imply that you have given up on mitigation. Climate change is not a natural effect because we induce the change in climate. So how far are you combining mitigation efforts with adaptation?

A: (Dr. Seibert) Working on mitigation is quite easy. We all stop eating meat. We raise about 80 billion animals and they make use of about 40% of the agricultural land. Animals, especially beef cattle contribute significantly to carbon emissions, particularly methane. However, this also presents a huge potential for us. Whether this can be addressed under the agenda of food security is another question because food security has many facets, e.g., agroforestry to diversify food production systems because our way to produce meat is not diversified anymore.

Comment: (Dr. Wulfmeyer) We can also go into more renewable energies to avoid fossil fuel emissions. Then we can also reduce our need for (climate change) adaptation.

A: (Dr. Francisco) In our research program, we look at the cost and assess/recommend payment for environmental services in various sectors so that we can encourage more reforestation efforts. We encourage researchers to do economic analyses of various energy options so we can also help governments identify how they can invest on renewable options. We agreed implicitly that although this is an adaptation conference, it does not necessarily mean that we do not consider mitigation as important.

Comment/Q: (Ms. Jayme) I come from the clean energy side and it is refreshing for me to see a climate change conference giving attention to adaptation because mitigation gets so much emphasis and interventions already. Kudos! A forum dedicated to clean energy is held annually at the Asian Development Bank (ADB). Julian Cribb, who authored the book *The Coming Famine*, was in Manila recently. He concluded that we can find solutions in technologies coming down the line. He thinks, however, that the big gap is in research and development (R&D) - which is the theme here. What collective strategies do you have to increase R&D spending because it is not coming at the rate we need it? What would be your strategy to pump-prime work in this area specifically under food and environmental security?

A: (Dr. Lasco) The good news is that the Philippines is one of the countries that has increased its research spending in the last one to two years. Even globally, climate change-related research is awash with funding, unlike in the mid-1990s when we started work in the area.

(Dr. Francisco) We are a research network, and about 70-80% of our funding goes to research. But for research to be appreciated by governments, we have to work closely with them, both at the national and regional levels in order to get policy support, increased R&D budgets, and help ensure sustainability.

(Dr. Espaldon) Through the UPLB Office of the Vice Chancellor for Research and Extension, we are coordinating the university's research program – not projects- with different departments and line agencies of the government. We are in charge of packaging research proposals based on our conceptual framework. The Philippines Department of Science and Technology has set aside some funds for climate change adaptation in agriculture. The same case is true for the Bureau of Agricultural Research under the Philippines Department of Agriculture. Even the Commission on Higher Education has allocated funds for research. So really, the Philippines is increasing its R&D spending.

CLOSING PROGRAM

Knowledge Center on Climate Change Adaptation in Agriculture and Natural Resource Management in Southeast Asia

Ms. Angela Mae S. Miñas, web content administrator, introduced the participants to one of SEARCA's knowledge portals, the Knowledge Center on Climate Change Adaptation in Agriculture and Natural Resource Management in Southeast Asia (KC3). Logging onto the KC3 website itself, Ms. Miñas used the actual site to explain its main features and their functions: news, features, gallery, knowledge resources, and community page. KC3 is essentially designed as an online resource and interactive platform for policymakers, researchers, academicians and other individuals who are interested in climate change. Ms. Miñas encouraged everyone to visit the KC3 website (www.climatechange.searca.org) and make full use of what it has to offer.

Synthesis, Conclusions, and Recommendations

Dr. Ma. Victoria O Espaldon, co-chair of the UPLB Interdisciplinary Program on Climate Change (UPLB-IdPCC), started her synthesis with Dr. Dar's opening slide of "the rising perfect storm" showing the combination of global problems currently facing today's world. She followed this with Dr. Lansigan's "web" depicting that three of these have already passed the safety threshold, namely: biodiversity loss, nitrogen cycle, and climate change. These challenges urgently need to be addressed, and requires what Dr. Teng described as multisectoral, multilateral, multidisciplinary, integrated approach - thus, the rationale for this conference.

Dr. Espaldon provided a comprehensive summary for all the plenary and parallel sessions. Highlighted below were the key ideas, findings, and lessons from her summary:

- Climate change is here and now. Rise in temperature, increased climate variability, extreme weather events, etc., clearly pose grave threats to food production, the environment, including lives and property.
- A wide variety of tools are available to determine the effects of climate change. These tools range from sophisticated simulations and modeling by technical experts (e.g., GIS, SDSM, PRECIS, DSSAT, CORDEX, etc.) to highly participatory approaches involving end users in the local communities (e.g., PRA, documentation of local or indigenous knowledge and practices).
- Such tools are likewise helpful in pointing to measures needed to mitigate the risks or adapt/improve resilience to the effects or impacts of climate change. These measures need to be implemented in an integrated fashion to be effective, which include a combination of the following factors: change in people's attitudes; adoption/adaptation of new practices; physical infrastructure investments; and enacting policies to provide enabling environment and ensure sustainability of efforts.
- A rich collection of knowledge systems and technological options are available to support CCA and DRR efforts. However, there is also a need to document, validate, and package local knowledge and practices (including socio-economic and cultural aspects) for promotion and upscaling as appropriate, along with the science-based technologies.
- Due attention should be given to most vulnerable or degraded (agro) ecosystems; most vulnerable or marginalized populations groups (women, children, indigenous peoples); and even to neglected but ecologically and nutritionally important crops.

- It is important to counterpart with the local communities and engage them in participatory processes – from needs analysis, implementation, up to monitoring and evaluation. This gives local people a sense of ownership for project initiatives as well as helps ensure sustainable and long-term changes.

To sufficiently meet the huge challenges in ensuring food/nutritional security and environmental sustainability, Dr. Espaldon advanced the following additional recommendations:

- Continue strengthening collaborations in R&D, education, and community development efforts across public and private agencies – covering local, national, regional, and global scales;
- Mainstreaming science and technology including good local practices in local and national governance systems as this will help ensure sustainability; and
- Strengthening extension programs and knowledge transfer of research institutions including exchange between and among agencies working on climate change. This can be done through existing extension systems and networks; collaborative projects and activities; various fora such as trainings, workshops, and conferences; including online resources such as SEARCA's KC3.

One of the more immediate post-conference initiatives Dr. Espaldon presented is the harvesting of selected articles from among the presentations. These will be published in a special edition of two journals, one a Philippine-based and the other regional in scope. These are the *Journal of Environmental Science and Management (JESAM)* of UPLB-SESAM, and the *Asian Journal of Agriculture and Development* (AJAD) published by SEARCA. She noted that the conference is also a resource-rich pool from which to recruit reviewers or referees and editors. Dr. Espaldon stated that working together on the said issues of the two journals is also a form of collaborating and fostering stronger linkages among the participants and the institutions they represent. In closing, she reiterated appreciation to all for actively contributing and participating for the past two days.

Closing Remarks

Dr. Puja Sawhney, APAN Regional Coordinator, thanked SEARCA and UPLB for organizing and hosting the conference; the speakers, session moderators, and poster presenters; and the participants for actively taking part during the last two days. She expressed appreciation to the conference partners and donors for their support, and again to SEARCA, as the agriculture thematic node of APAN, for organizing the event and ensuring its success.

This being her first visit to SEARCA and meeting its staff, Dr. Sawhney in behalf of APAN pledged to continue to strengthen the working relationship between the two institutions. She was heartened by the many useful presentations and discussions, new ideas, opportunities, and learning gains generated by the conference. She underscored the need to put short, medium, and long term strategies in place to tackle climate change in all sectors. She then emphasized that:

- the power and use of science and technology in tackling food and environmental security needs to be recognized and further strengthened;
- available technologies need upscaling; and
- market efficiency needs to be developed, greater investments should be placed in rural infrastructure, and market barriers ought to be removed.

Dr. Sawhney considered the conference a milestone that marks current efforts in climate change, and stated that APAN will continue to work with its partners in the region, and further expand and strengthen its network. She explained that APAN's networking activities center around organizing events such as conferences focusing on knowledge sharing and capacity building, publishing its monthly newletter, and developing its website and web portals, among others.

The annual Asia-Pacific climate change adaptation forum is one of the major avenues for institutions to get together and forge partnerships for climate change-related actions. Dr. Sawhney extended her invitation to everyone to take part the third climate change adaptation forum to be held in March 2013 in Incheon, South Korea.

APAN and SEARCA are planning a series of joint events, according to Dr. Sawhney, such as a training course on climate change adaptation, a policy roundtable likely to be held in Myanmar, participating in side events in the upcoming Conference of the Parties (COP) meeting and the next Intergovernmental Panel on Climate Change (IPCC) Working Group Meeting in 2014. Lastly, Dr. Sawhney encouraged the participants to provide their feedback and suggestions to help improve the event, and again thanked everyone for their active participation.

CONFERENCE EVALUATION

Seventy-six participants responded to the ICCCIAFES evaluation forms. The conference was evaluated on a number of areas, namely, clarity and achievement of objectives, time allotment, content/topics, and administrative arrangements. Participants were asked to rate each item from 1 to 5, with 5 being the highest. Aside from being asked to elaborate on their ratings, the participants were also requested to accomplish a separate one-page feedback form for additional comments and suggestions.

Clarity of Objectives/Achievement of Objectives

Participants generally found the conference objectives to be clear (42%-59%) and very clear (37%-53%). Likewise, most of them assessed each of the objectives to be achieved (33%-49%) and fully achieved (41%-59%).

Table 1. Comparison between clarity of objectives (C) and achievement of objectives (A).

Objectives		2=Unclear		3=Not sure		4=Clear/ Achieved		5=Very clear/ Fully Achieved	
		Freq	%	Freq	%	Freq	%	Freq	%
1. Exchange state-of-the art knowledge on climate change science	**C**					39	**51.32**	37	48.68
	A			5	6.58	25	32.89	45	**59.21**
2. Gather scientific information and experience related to food and environmental security in Southeast Asia	**C**			3	3.95	45	**59.21**	28	36.84
	A	2	2.63	6	7.89	28	36.84	39	**51.32**
3. Identify location-specific knowledge and adaptation strategies that may be upscaled to other regions	**C**			7	9.21	36	**47.37**	33	43.42
	A			6	7.89	37	**48.68**	31	40.79
4. Promote partnerships and linkages for collaborative activities on climate change adaptation	**C**	1	1.32	3	3.95	32	42.11	40	**52.63**
	A	1	1.32	3	3.95	30	39.47	41	**53.95**

N.B. No respondent gave a rating of 1 (C= very unclear; A= unachieved).

Participants considered the conference as highly beneficial, relevant, and timely – that it provided a good venue for experts, academicians, and practitioners to learn and share ideas, new knowledge, and good practices on climate change impacts adaptation and mitigation. ICCCIAFES according to them likewise presented opportunities for networking, exploring linkages and collaboration with other institutions, and providing valuable information on funding opportunities and other resources.

In terms of general assessment and overall satisfaction, 66% rated the conference to be **excellent,** and about a third of them rated it as **good.** Only one participant was not satisfied and indicated that the conference needs to be improved.

Time Allotment

Figure 1 below shows that most participants felt that there was sufficient time for the duration of the conference (agree+ strongly agree = 88%). However, about a fourth of them expressed that adding another day or two would have been better. They expressed that there were a lot of interesting presentations that they were not able to attend because parallel sessions were too packed and compressed so they had to choose which ones were most beneficial to them.

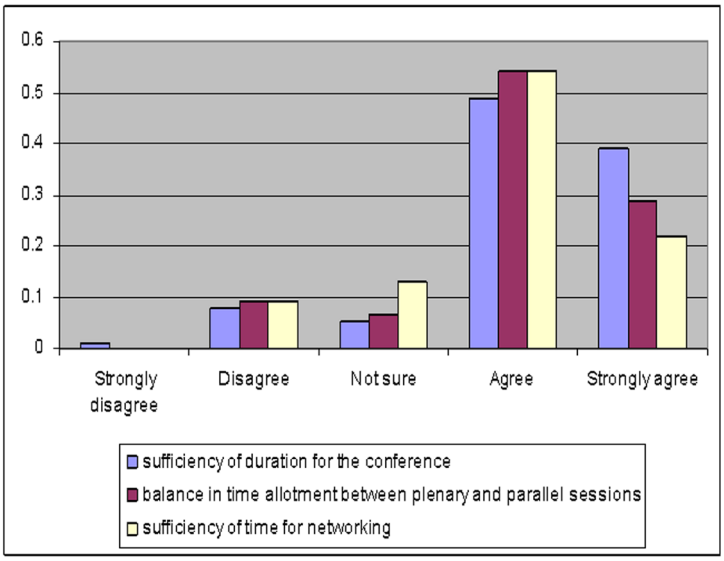


Figure 1. Assessment of the time allotment for the conference

Most of the participants (83%) agreed/strongly agreed that there was a good balance in the time allotment between the plenary and parallel sessions. However, some of them commented that time allowed for each speaker in the parallel sessions was too short. Many of the presenters were not able to keep within the time limit; some of the longer presentations had to be cut off; or otherwise the speakers had to zip through their Powerpoints. Suggestions to improve the situation included briefing the presenters beforehand so that they would be more time-conscious, and applying quality (perhaps even quantity) control on the Powerpoints before the presentation. Another was to allot more time for the individual presentations so that the papers - especially the methods used and results - could be more extensively discussed.

Furthermore, about three-fourths or 76% of the participants felt that there was enough time during the conference for networking. They valued the opportunity to meet, discuss, and share ideas and experiences with experts from various disciplines. Some of them came to fully appreciate the need to improve their connections and realise the value of collaboration across sectors, between/among institutions, and even countries or regions in order to adequately address climate change concerns. With this connection, a few of the participants particularly appreciated the inclusion of two sessions devoted to the topic – Plenary 2 (South-South Collaboration…) and Plenary 3 (Networking for R&D…).

Content/Topics

Most participants felt that the conference met their expectations (agree + strongly agree = 83%); that the areas or topics covered were adequate (88%); and assessed the conference to have provided sufficient amount of new information (91%). They also commented that the event was very informative, comprehensive, enlightening, and well-represented in terms of discipline or field and countries.

Table 2. Evaluation of conference content and topics

Item	Disagree		Not sure		Agree		Strongly agree	
	Freq	%	Freq	%	Freq	%	Freq	%
▪ The conference met my expectations.	1	1.32	1	1.32	33	43.42	38	**50.00**
▪ The conference is related to my job responsibility.			1	1.32	28	36.84	45	**59.21**
▪ The topics are relevant to the needs of my institution.			2	2.63	28	36.84	44	**57.89**
▪ The conference coverage was adequate.	3	3.95	3	3.95	41	**53.95**	26	34.21
▪ I am satisfied with the quality of conference presentations.	1	1.32	2	2.63	38	**50.00**	32	42.11
▪ The amount of new information provided is sufficient.			4	5.26	41	**53.95**	28	36.84
▪ I would recommend this conference to my colleagues.			1	1.32	28	36.84	45	**59.21**

N.B. No respondent gave a rating of 1 or strongly disagree.

Two respondents stated that the conference "exceeded" or "surpassed" their expectations. Below are samples of direct quotes from participants who expressed met expectations:

- "I am fully satisfied with what happened in the conference. I found it useful and got introduced to ideas which I have not been aware of."
- "Yes, my expectations were met to all extents because I learned lots of new information, met with new friends and presented a paper."

The conference received very good marks for **relevance.** Almost all of the participants (97%) agreed/ strongly agreed that the topics presented were related to their current jobs and relevant to the needs of their institutions (96%). Below are some of their comments:

- "Seasonal climate forecasting models for rainfed farming communities… and downscaling models would help me in my research."; "…useful discussions to improve my research work"
- "Some experiences/methods/results are applicable in my country."

- "Learnings… on climate change adaptation and mitigation practices can be replicated in our project areas…with some modifications to fit local communities."
- "Yes, a new perspective for integrating climate change (concepts) into the classroom."
- "As a plant scientist, I realised that there is a huge scope for modeling (GIS) in my work."

Many participants indicated that the topics on climate change adaptation and agriculture (Parallel Sessions 2) were the most useful, and also suggested that this area should have been given more emphasis. This could be largely due to the fact that most of the participants were connected with state/agricultural colleges or universities, and departments or ministries of agriculture in their home countries. Even those from the regional/international agencies and NGOS were mostly working with the agricultural sector.

Although topics dealing with simulation and modeling were considered useful and interesting by many participants, the same sessions were also rated to be the "least beneficial" by some others. Samples of the related comments:

- "The assumptions or projections research studies because they are not factual. They could be right or wrong depending on various factors."
- "Use of statistical downscaling and process-based crop model in assessing climate change impacts…"
- "Those presentations with simulation or statistical data."
- "…complex and very technical methodologies."

Without the proper context, it may not be easy to appreciate such models, figures, and graphs - along with the accompanying jargon - especially to the uninitiated. Some of the presenters of these topics perhaps failed to explain the utility or significance of the models they used in policy formulation and planning climate change adaptations and developing relevant interventions. In some cases, the presentations were quite long, leaving no time for the open fora so these issues could have been clarified.

Ninety-two percent (92%) expressed satisfaction with the quality of the presentations. A number of them suggested ensuring that the papers/ presentations had **practical** conclusions and applications to address the effects or impacts of climate change.

Despite the organizers' encouragement for everyone to view the exhibits during the breaks, a few participants felt that the posters were really left out. "Out of sight, out of mind" – even with the space limitations, it would have been better if the poster exhibits were put up along the corridors on the same floor as the SEARCA DL Umali Auditorium where most of the sessions were held.

Lastly, an overwhelming 97% of the participants felt that this conference is worth recommending to their colleagues. Some of them suggested for the conference to be "continued" – either to have it organized as a regular event, conducted in other countries, or otherwise design a scaled down version for country-level implementation.

Several participants also stressed the importance of research results to be translated not only into practice, but to form part of the basis for policy making.

Administrative Arrangements

Overall, the participants gave very high ratings for both the organization, logistics, and administrative arrangements of the event and with the performance of the conference secretariat. No participant rated the conference very poor or poor on these criteria. They found the conference to be very well-managed and highly organized in all aspects. See Figure 2 below.

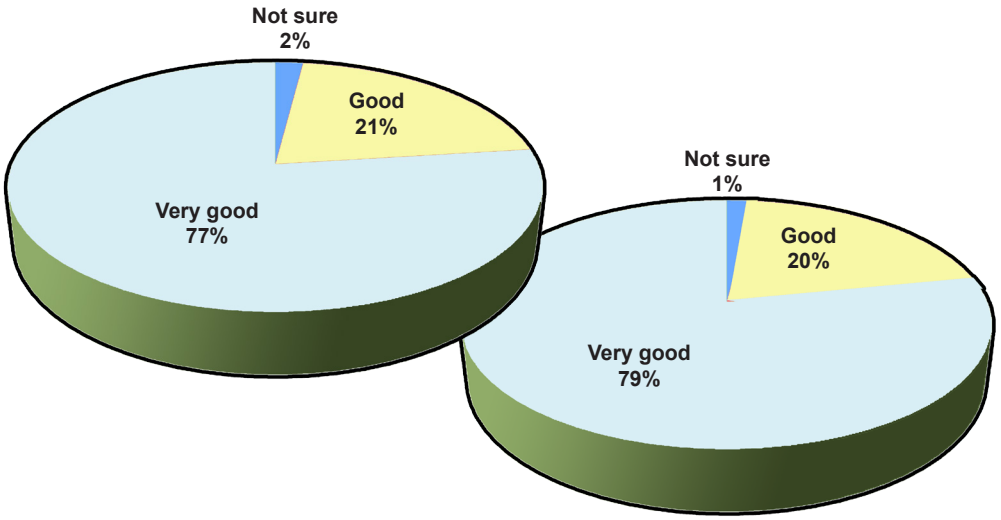


Figure 2. Rating for the overall administrative arrangements of the conference (left); and for the performance of the conference secretariat (right); (N=76).

Although few in number, most of the logistical issues were food-related, as reflected in the following comments and suggestions: "...Be considerate of food restrictions."; "Give healthy options for vegetarians (e.g., purely vegetarian diet in the menu, not vegetables that are just side dishes), and for non-pork or non-beef eaters."; "Provide local fruits and **natural** fruit juices without (added) sugar."

Comments were largely positive and laudatory: excellent organization and arrangements; well planned, well organized (especially in coordinating a large number of international travellers); extremely well managed, well structured, and well facilitated/conducted; excellent time management; excellent program (including cultural activities); smooth flow of proceedings; enjoyable. Some participants also appreciated the organizers' taking care of even the smallest details and their flexibility in accommodating last-minute requests.

Day 1 | November 21

TIME	ACTIVITY	SPEAKERS
7:30 am	Registration SEARCA Front Lobby	
8:30	Opening Program SEARCA DL Umali Auditorium *Chair:* Dr. Maria Celeste H. Cadiz *Program Head for Knowledge Management, SEARCA*	
8:30	Messages	Dr. Gil C. Saguiguit Jr. *Director*, SEARCA Dr. Rex Victor O. Cruz *Chancellor* University of the Philippines Los Baños (UPLB) Mr. Naderev M. Saño *Commissioner,* Climate Change Commission
9:15	Keynote Speech *Food Security and Climate Change Impacts on Urban-Rural Linkages*	Dr. Paul S. Teng *Dean of Graduate Studies and Professional Learning* National Institute of Education (NIE) *Senior Fellow on Food Security* Center for Non-traditional Security Studies S. Rajaratnam School of International Studies (RSIS) Nanyang Technological University (NTU), Singapore
9:35	Conference Overview	Dr. Felino P. Lansigan *Co-chair,* UPLB Interdisciplinary Program on Climate Change (UPLB IdPCC) *Professor,* UPLB
9:50	Opening of Poster Exhibit (Drilon Hall Lobby, 3rd Floor)	Dr. Mariliza V. Ticsay *Unit Head,* Knowledge Resources, SEARCA
10:00	Group Photo	
10:15	Coffee/Tea	
10:30	PLENARY 1 - Status, Prospects, and Practices on Climate Change Adaptation in Agriculture SEARCA DL Umali Auditorium *Chair:* Dr. Felino P. Lansigan IdPCC Co-chair and Professor of Statistics, UPLB Lead Author, Intergovernmental Panel for Climate Change *Rapporteur:* Dr. Serlie B. Jamias Public Relations Director, Office of the Chancellor (OC) Associate Professor of Development Communication, UPLB	
	Climate Change Impacts and Adaptation in the Semi-Arid Tropics	Dr. William D. Dar *Director General,* International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)
	Agricultural Adaptation to Climatic Change at the Grassroots Level and Use of Advances in Science and Technology	Dr. Seishi Ninomiya *Professor* Institute for Sustainable Agro-ecosystem Services University of Tokyo, Japan
11:45	Open Forum	
12:15 pm	Lunch	

Day 1 | November 21

TIME	ACTIVITY	SPEAKERS
	Parallel Sessions 1: CLIMATE CHANGE IMPACTS AND VULNERABILITY	
1:30 pm	Session 1A (SEARCA DL Umali Auditorium) *Chair:* Dr. Agnes C. Rola, Dean and Professor, College of Public Affairs and Development (CPAf), UPLB *Co-chair:* Ms. Dulce D. Elazegui, University Researcher, UPLB CPAf *Rapporteur:* Mr. Edwin R. Abucay, Assistant Professor, College of Human Ecology (CHE), UPLB	
	Unavoidable Global Warming Commitment and Its Food Security, Impacts and Risks, Implications Focused on South East Asia	Dr. Peter Carter Climate Emergency Institute, Canada
	An Analysis of the Impacts of Climate Change on Crop Yields and Yield Variability in Ethiopia	Mr. Zerihun G. Kelbore *PhD Candidate*, University of Trento, Via Verdi, Italy
	Climate Changes in Cambodia, Philippines and Vietnam: A Vulnerability Analysis at Commune and Household Levels	Dr. Bui Dung The *Director,* Office of Science-Technology, International Cooperation and Postgraduate Education, College of Economics, Hue University, Vietnam
	*Carbon Sequestration and Climate Change Impact on the Yield of Bagras (*Eucalyptus deglupta *Blume) in Corn-based Boundary Planting Agroforestry System in Northern Mindanao, Philippines*	Mr. Richmund A. Palma *Assistant Professor* Misamis Oriental State College of Agriculture and Technology, Philippines
	Session 1B (SEARCA Drilon Hall) *Chair:* Dr. Dr. Amparo M. Wagan, University Extension Specialist, UPLB CA *Rapporteur:* Dr. Rico C. Ancog, Assistant Professor, School of Environmental Science and Management (SESAM), UPLB	
	Climate-Driven Variations in Small Pelagic Fisheries Production in Northern Zamboanga and Bohol Sea: Potential Impact, Vulnerability, and Local Adaptive Capacity	Dr. Asuncion B. De Guzman *Professor*, Mindanao State University at Naawan Philippines *Presenter:* Ms. Katrina Lynn B. de Guzman
	Food Insecurity and Climate Change in Nigeria: How Vulnerable are the Rural Farmers?	Dr. Samuel O. Awoniyi *Lecturer,* Joseph Ayo Babalola University, Nigeria
	Vulnerability and Adaptive Capacity of Pastoral Communities under Climate Change in the Hindu Kush Himalayan Region	Dr. Srijana Joshi Rijal *Consultant*, International Centre for Integrated Mountain Development (ICIMOD), Nepal
	Status of Native Forest Managed by Mataqali under Anthropogenic Pressure - A Case From Sote Village, Nukurua, Tailevu, The Fiji Islands	Mr. Maika Tabukovu *Lecturer,* Fiji National University, Fiji Islands
	Flooding Vulnerability of the Towns of Mabitac, and Santa Maria, Laguna, Philippines	Dr. Romeo Pati *Associate Professor,* University of Rizal System, Philippines
	Session 1C (Sam-Arng Srinilta Room) *Chair:* Dr. Ravindra C. Joshi, Consultant, Ministry of Primary Industries (Agriculture), Fiji Islands *Rapporteur:* Engr. Joan Pauline P. Talubo, Assistant Professor, UPLB CHE, and Ms. Ma. Rowena Beatriz Q. Inzon, MS Student, UPLB SESAM	
	Projected Impact of Downscaled Climate Scenarios on Rice Production in Two Selected Provinces in the Philippines	Dr. Linda M. Peñalba *Professor,* UPLB, Philippines *Presenter:* Mr. Francis John F. Faderogao
	Measuring the Impact of La Niña on Food and Nutrition Security in Timor Leste	Mr. Agustinho da Costa Ximenes *National Consultant for Food Security* Ministry of Agriculture and Fisheries, Timor Leste
	Climate Change Implications to Food Security and Livelihood of Small-Scale Farmers in Lao PDR`	Dr. Outhai Soukkhy *Deputy Director*, Nothern Agriculture and Forestry College, Lao PDR
3:00	Coffee/Tea	

Day 1 | November 21

TIME	ACTIVITY	SPEAKERS
	Parallel Sessions 2: CLIMATE CHANGE ADAPTATION AND AGRICULTURE	
3:30 pm	Session 2A (SEARCA DL Umali Auditorium) *Chair:* Dr. Gloria Luz M. Nelson, Professor, College of Arts and Sciences (CAS), UPLB *Co-chair:* Prof. Rosario V. Tatlonghari, Assistant Professor, College of Development Communication (CDC), UPLB *Rapporteur:* Dr. Serlie B. Jamias, Public Relations Director, UPLB OC, and Associate Professor, UPLB CDC	
	Livelihood Capacity and Adaptive Strategies to Climate Change of Rice-Based Farming Households in the Mekong Delta, Vietnam	Dr. Le Cahn Dung *Head*, Department of Social Economic and Policy Study Mekong Delta Development Research Institute Can Tho University, Vietnam
	Community-Based Climate Change Adaptation in Contiguous Agricultural Ecosystems-Experiences from the Cordillera Region in the Philippines	Dr. Roberto C. Sandoval Jr. *Climate Change and Food Security Specialist* Food and Agriculture Organization of the United Nations (FAO) Philippines
	Successful Local Food Production Project in Solomon Islands: The Blue Print for the Pacific Islands Countries and Territories	Dr. Ravindra C. Joshi *Consultant,* Ministry of Primary Industries (Agriculture) Fiji Islands
	Mitigating the Negative Impact of Climate Change on Field Crop Production	Dr. Medhat Mekhail Tawfik *Professor of Agronomy,* National Research Centre, Egypt
	Session 2B (SEARCA Drilon Hall) *Chair:* Dr. Leonardo M. Florece, Dean and Professor, UPLB SESAM *Co-chair:* Dr. Decibel F. Eslava, Associate Professor, UPLB SESAM *Rapporteur:* Prof. Ma. Theresa M. Talavera, Director and Assistant Professor, Institute of Human Nutrition and Food (IHNF), UPLB CHE	
	Low Delta Cropping and Micro Irrigation Techniques as Adaptation Measures of Climate Change in Northern Balochistan, Pakistan	Dr. Faiz Mohammad Kakar *Member, Board of Directors* Centre for Research and Development (CRD), Pakistan
	Adaptive Capacity and Adaptation to Climate Change and Variability of Farming Households of Dumangas, Iloilo, Philippines	Dr. Gay D. Defiesta *Assistant Professor* University of the Philippines Visayas (UPV), Philippines
	A Shift in the Mycotoxin Profile in Costa Rica under Climate Change – A Case Study on Mycotoxigenic Fusarium proliferatum *in Rice (*Oryza sativa*)*	Dr. Adriana Murillo-Williams *Professor*, University of Costa Rica
	Sustainable Ancient Water Management and Resilience to Climate Change in Sri Lanka	Dr. Ranjana U. K. Piyadasa *Senior Lecturer,* University of Colombo, Sri Lanka
	Session 2C (Sam-Arng Srinilta Room) *Chair:* Prof. Ma. Emilinda T. Mendoza, Assistant Professor, College of Human Ecology (CHE), UPLB *Co-chair:* Dr. Rio John T. Ducusin, Chair and Professor, Department of Veterinary Clinical Sciences, College of Veterinary Medicine (CVM) UPLB *Rapporteur:* Mr. Efraim D. Roxas, Instructor, UPLB CHE	
	Increasing Rice Productivity in Submergence-Prone Areas Vulnerable to Climate Change in South East Asia	Dr. Romeo V. Labios *University Researcher* UPLB CA, Philippines
	Response of Agro-Pastoral Indigenous Communities to the Cascading Effects of Climate Change-Studies from Sikkim, Eastern Himalayas, India	Mr. Tenzing Ingty *PhD Student,* Regional Office for the Himalayas/ Northeast India, Ashoka Trust for Research in Ecology and the Environment
	Documenting and Promoting Indigenous Agricultural Knowledge and Climate Change Adaptation in Selected Areas in the Philippines: Toward Enhancing Community-Level Food Security	Dr. Lucille Elna P. De Guzman *University Researcher* UPLB CA, Philippines
5:20	End of Day 1	
6:30	Cocktails and Dinner	

Day 2 | November 22

TIME	ACTIVITY	SPEAKERS
	Parallel Sessions 3: INSTITUTIONAL AND ECONOMIC ASPECTS OF CLIMATE CHANGE IMPACTS AND ADAPTATION	
8:30 am	Session 3A (SEARCA DL Umali Auditorium) *Chair:* Dr. Srijana Joshi Rijal, Consultant, ICIMOD *Rapporteur:* Dr. Lucille Elna P. de Guzman, University Researcher, UPLB CA	
	Building Climate Resilient Communities through Community Based Adaptation Planning and Action: Some Empirical Evidences from Nepal	Dr. Dharam Uprety *Forestry and Climate Change Manager* Multi Stakeholders Forestry Programme, Nepal
	Attitudes towards Flooding Risks in Vietnam: Implications for Insurance	Dr. Pham Khanh Nam *Senior Economist,* EEPSEA and *Deputy Dean,* Faculty of Development Economics, University of Economics, Ho Chi Minh, Vietnam
	Strengthening Capability of State Universities on Vulnerability Assessment to Enhance their Role in Climate Change Adaptation for Agriculture	Dr. Amparo M. Wagan *University Extension Specialist* UPLB, Philippines
	Climate Change and Food Security: Challenges, Success and Opportunities in Bangladesh	Mr. Mohammad Alamgir *Senior Scientific Officer (Forestry)* Ministry of Water Resources, Bangladesh
	Session 3B (SEARCA Drilon Hall) *Chair:* Dr. Corazon L. Rapera, Chair and Professor, Department of Agricultural Economics College of Economics and Management (CEM), UPLB *Co-chair:* Mr. Karamat Ali, Country Coordinator, Pakistan Waters Partnership *Rapporteur:* Prof. Mayo Grace C. Amit, Assistant Professor, UPLB CPAf	
	Household Economic Losses: A Case Study of Thailand's 2011 Flood	Dr. Orapan Nabangchang Srisawalak *Senior Economist,* EEPSEA and *Associate Professor,* Sukhothai Thammatirat Open University, Thailand
	Understanding the Capacity of Policy Makers to Access and Use Climate Change Research Outputs for National Development: The Case of Zimbabwe	Mr. Ignatius Gutsa *Lecturer,* University of Zimbabwe
	Institutionalizing Rural Communication Services for Climate Change Adaptation and Food Security: The Bangladesh Experience	Dr. Cleofe S. Torres *Professor* and Prof. Ma. Stella C. Tirol *Associate Professor* UPLB CDC, Philippines
	Agriculture, Climate Change, Germplasm and Seeds, and Intellectual Property Rights	Dr. Krishna Ravi Srinivas *Associate Fellow,* Research and Information System for Developing Countries, India
	Session 3C (Sam-Arng Srinilta Room) *Chair:* Dr. Herminia A. Francisco, Director, Economy and Environment Program for Southeast Asia (EEPSEA) *Co-chair:* Dr. Ronaldo B. Saludes, Assistant Professor, College of Engineering and Agro-industrial Technology, UPLB *Rapporteur:* Dr. Rico C. Ancog, Assistant Professor, UPLB SESAM	
	Climate Change Impacts, Vulnerability Assessments, Economic and Policy Analysis of Adaptation Strategies in Selected Coastal Areas in Indonesia and the Philippines	Dr. Asa Jose U. Sajise *Associate Professor* UPLB, Philippines
	Addressing Linkages between Climate Change and Food Security through Top-Down and Bottom-Up Impact Assessments, Food Insecurity Vulnerability Analysis, Community-Based Adaptation, and Improved Socio-Institutional Mechanisms: FAO's AMICAF Framework	Dr. Eulito U. Bautista *Project Manager,* FAO Philippines

Day 2 | November 22

TIME	ACTIVITY	SPEAKERS
8:30 am	Session 3C	
	Linking Climate Change, Rice Yield and Migration: The Philippine Experience	Dr. Flordeliza H. Bordey *Senior Science Research Specialist* Philippine Rice Research Institute
	Adaptation to Sea Level Rise in the Vietnamese Mekong River Delta: Should a Sea Dike be Built?	Dr. Vo Thanh Danh *Dean*, School of Economics and Business Administration Can Tho University, Vietnam
10:00	Coffee/Tea	
	Parallel Sessions 4: SYSTEMS AND TOOLS FOR ANALYZING CLIMATE CHANGE IMPACTS AND VULNERABILITY	
10:30	Session 4A (SEARCA DL Umali Auditorium) *Chair:* Dr. Orapan Nabangchang Srisawalak, Senior Economist, EEPSEA and Associate Professor, Sukhothai Thammatirat Open University, Thailand *Co-chair:* Dr. Bui Dung The, Director, Office of Science-Technology, International Cooperation and Postgraduate Education, College of Economics, Hue University, Vietnam *Rapporteur:* Dr. Michelle Grace V. Paraso, Associate Professor, College of Veterinary Medicine, UPLB	
	Eliciting Factors Affecting Fish Kill Events in Taal Lake through Participatory Approaches: A Tool for the Development of a Predictive Fish Kill Model	Dr. Damasa B. Magcale-Macandog *Professor* UPLB CAS, Philippines
	A System for Monitoring the Effects of Climate on the Flux and Availability of Water Resources in the Drylands of Eastern Africa	Dr. Laban MacOpiyo *Lecturer,* University of Nairobi, Kenya
	Economy-Wide Estimates of Climate-Induced Impacts on Philippine Agriculture: A Computable General Equilibrium Analysis	Dr. Arvin B. Vista *Assistant Professor* UPLB CEM, Philippines
	Session 4B (SEARCA Drilon Hall) *Chair:* Dr. Canesio D. Predo, Assistant Professor, UPLB CFNR *Co-chair:* Dr. Paul David Esker, Professor, University of Costa Rica *Rapporteur:* Prof. Devralin T. Lagos, Assistant Professor, UPLB CHE	
	Methodological Framework for the Decision Support System for Climate Change Adaptation in Rainfed Rice Areas	Dr. Anita A. Boling *Postdoctoral Fellow,* International Rice Research Institute
	Regional Climate Simulations: Current Performance, Key Challenges, and the Fundamental Importance of their Coupling with End User Models	Dr. Volker Wulfmeyer *Professor*, University of Hohenheim, Germany
	Use of Statistical Downscaling and Process-Based Crop Model in Assessing Climate Change Impact on Rice Yield	Mr. Mark Jay R. Dating *Instructor,* UPLB CAS, Philippines
	Track-Risk-Impact-Policy (TRIP) Modeling of Tropical Cyclones for the Agricultural Sector	Engr. Glenn S. Banaguas *Director for Research* De La Salle Araneta University, Philippines
12:00 pm	Lunch	
1:15 pm	PLENARY 2 - Regional and South-South Collaboration in Research and Development SEARCA DL Umali Auditorium *Chair:* Dr. Rex Victor O. Cruz Chancellor, UPLB *Rapporteur:* Dr. Michelle Grace V. Paraso Associate Professor, UPLB CVM	
	Agrobiodiversity and Climate-Smart Landscapes for Improved Food Security under Climate Change: A Call for Increased South-South Collaboration	Dr. Reinhold G. Muschler *Latin American Chair for Agroecology and Agrobiodiversity* Center for Agricultural Research and Higher Education Costa Rica

Day 2 | November 22

TIME	ACTIVITY	SPEAKERS
1:15 pm	PLENARY 2	
	Advancing Higher Education and Research in Climate Change and Disaster Risk Reduction through Multilevel Collaboration	Dr. Juan M. Pulhin *Dean and Professor* CFNR, UPLB, Philippines *Coordinating Lead Author,* Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report
2:15	Open Forum	
2:30	PLENARY 3 - Panel Discussion on Networking for R&D and Capacity Building on Climate Change and Food, Environmental Security *Chair:* Dr. Rodel D. Lasco Philippine Program Coordinator, World Agroforestry Center (ICRAF) *Rapporteur:* Ms. Darleen Gela Project Officer, ICLEI Local Governments for Sustainability - Southeast Asia	
	Asia Pacific Adaptation Network (APAN)	Ms. Hiroko Kodaka *Associate Programme Manager,* APAN
	University of the Philippines Los Baños Interdisciplinary Program on Climate Change (UPLB IdPCC)	Dr. Maria Victoria O. Espaldon *Chair,* UPLB IdPCC Vice-Chancellor for Research and Extension, UPLB
	University of Tokyo	Dr. Seishi Ninomiya *Professor* Institute for Sustainable Agro-ecosystem Services University of Tokyo
	Economy and Environment Program for Southeast Asia (EEPSEA)	Dr. Herminia A. Francisco *Director,* EEPSEA
	ASEAN GIZ Biodiversity and Climate Change Project (BCCP)	Dr. Berthold Seibert *Project Director,* ASEAN-GIZ BCCP
3:45	Coffee/Tea	
4:15	*Synthesis, Conclusions and Recommendations*	Dr. Maria Victoria O. Espaldon
4:30	Closing Program	
	Closing Remarks	Dr. Puja Sawhney *Regional Coordinator,* APAN
	Appreciation	Dr. Felino P. Lansigan Dr. Maria Celeste H. Cadiz

Name	Position	Organization	Address	Telephone	Fax	Mobile	Email
Bangladesh							
Dr. Mohammad A. Alamgir	Senior Scientific Officer (SSO)	Water Resources Planning Organization (WARPO),Ministry of Water Resources, Bangladesh	Water Resources Planning Organization, House No:103; Road No. 01, Block:F, Banani, Dhaka-1213, Bangladesh	+88 28814554	+88 29883456	+881556555684	alamgirforester @yahoo.com
Canada							
Dr. Peter D. Carter	Environmental Health Protection Policy Development	Climate Emergency Institute	4708 Captains Crescent Pender Island, BC Canada V0N 2M2	+12506293811	+12506293511		climateemergencyinstitute @gmail.com
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