

# Climate change adaptation in agricultural investment in East Asia and the Pacific

Issues and options



FAO INVESTMENT CENTRE

WORKSHOP HIGHLIGHTS





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Summary report of an Expert Group Meeting  
jointly organized by the World Bank and the  
Food and Agriculture Organization of the United Nations (FAO)  
Rome, 16-17 May 2011



**THE WORLD BANK**



**Food and Agriculture Organization  
of the United Nations**

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## EXECUTIVE SUMMARY

In East Asia and the Pacific, climate change brings an additional threat to existing development challenges for agriculture. This threat is exacerbated by the vulnerability associated with characteristics common to the bulk of the region including scarce land and water resources, exposure to climate variability associated with ENSO (El Niño Southern Oscillation), and frequent extreme weather/climate events – such as typhoons, floods, and drought.

Climate change could seriously hinder the region's efforts to address food security, poverty eradication, sustainable development and progress in achieving the Millennium Development Goals (MDGs). Against this background, FAO's Investment Centre Division in collaboration with FAO's Natural Resources Department and the World Bank Sustainable Development Department - East Asia and the Pacific jointly organized an Expert Group Meeting on Climate Change and Adaptation in Agriculture in the East Asia and Pacific region held 15–16 May 2011 in Rome. The meeting focused on issues relevant to investment operations in the region and brought together a range of FAO experts from almost all technical departments of FAO as well as World Bank managers and professional staff from agriculture, natural resource management, water, and environment sectors. The meeting aimed to: (i) reach a better understanding of the issues and options at the frontier of agricultural adaptation to climate change; (ii) identify the impacts and adaptation strategies and practices; and (iii) explore ways to mainstream climate change in development programs. Six sessions were organized over two days, including: 1. Introduction and keynote addresses; 2. Climate change impacts in agriculture: What should we expect?; 3. Adaptation to climate change in agriculture; 4. Adaptation and water; 5. Mainstreaming adaptation to climate change; and 6. Panel discussion on next steps in meeting the challenge. All presentations are available on the Investment Centre's website under "Investment Centre and Climate Change".

The workshop helped to strengthen ties between the World Bank and FAO divisions in strategic programmes and projects in East Asia and the Pacific and established the foundation for a planned follow-up meeting targeting a broader audience, likely to include interested government representatives, which will be held in early 2012 within the East Asia and the Pacific region.



## Section 1

# Introduction – Background and Purpose of the Meeting

Asia and the Pacific are home to the largest concentration of the world's undernourished and poor people. More than 60 percent of the economically active population and their dependents in the region – 2.2 billion people – rely on the agricultural sector for their livelihood. Faced with increased competition for natural resources and accelerated degradation of the environment and ecosystems – in a context where the population in the region is expected to grow by another 1.5 billion people by 2050 – food security and sustainable agricultural development are and will continue to be major concerns.

Climate change brings an additional threat to these existing development challenges for agriculture in the region. This threat is exacerbated by the acute vulnerability associated with the region's common characteristics including scarce land and water resources, exposure to climate variability associated with ENSO (El Niño Southern Oscillation), and frequent extreme weather/climate events – such as typhoons, floods, and drought.

Climate change could seriously hinder the region's efforts to address food security, poverty eradication, sustainable development and progress in achieving the Millennium Development Goals (MDGs).

To reduce the impacts of climate change and to enhance food security, adaptation measures are urgently required to increase the overall flexibility of the agricultural systems against climate shocks and changing market demands. Possible adaptation solutions include: (i) modification of farming practices; (ii) diversification and development of new and more climate-induced stress resistant crop varieties; (iii) improved soil conservation and water resources management; (iv) supplementary and improved irrigation systems; (v) development of monitoring and

early warning systems; (vi) better use of risk transfer mechanisms; and (vii) an enabling policy environment.

Availability and access to adaptation funds are critical to mainstreaming climate change adaptation into development programmes. Some adaptation measures can be directly adopted by farmers at a relatively low cost, provided that there are supporting institutions and services (extension services, seed systems etc.), other measures such as irrigation and road infrastructure, research and development and establishment of early warning and insurance systems will require increased public investment. Therefore, responses are needed at different levels. Farmers need information and access to technology, financing, and risk mitigation/transfer (e.g. insurance) tools. Spontaneous adaptation requires higher level support however, which means cross-sectoral planning and other supportive policies play a key role at the national level.

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A synthesis of the key issues raised in the meeting as well as the conclusions of the discussions is presented below. The synthesis does not include the details of the project related case studies presented<sup>1</sup>. These can be consulted on the website mentioned above.

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<sup>1</sup> Inserting the case studies would have required a lengthy introduction to the country context. This would have jeopardized the flow of the 'technical' arguments. We therefore offered the authors of the case studies the option to present them in 'boxes' which were then added to the summary, but separated from the narrative text (see boxes Indonesia, China and the Mekong Delta in the following text).



## Section 2

# Climate Change Impacts on Agriculture: What Should We Expect?

### The Impacts of Climate Change on Agriculture: A Review of the State of Knowledge

Today there is a wide recognition that climate change affects all dimensions of food security and increases vulnerability to food insecurity. Most of the relevant studies on climate change impacts on agriculture have so far been limited to food production and availability on a global scale, mainly in the areas of major cereal crop production. Apart from the several global scale prediction models available today, it is imperative to identify adaptation strategies for different scenarios and various micro-environments in order to effectively take immediate adaptation actions at local levels. In particular, small-scale subsistence producers located at lower latitudes are projected to be the most susceptible to the negative effects of climate change as the production potential is expected to shift from lower to higher latitudes. While some higher latitude areas are expected to benefit from climate change, at a global level the associated increase in temperatures may result in a more negative impact. There is also the pressing question of how to apply long-term global predictions to assess short-term impacts at the local level, a question highly relevant to agricultural practitioners.

Knowledge gaps exist in the following areas:

- (i) responses of minor cereal crops (such as millet) and non-cereal crops (such as roots and tubers) to the combined effects of carbon dioxide increase (CO<sub>2</sub> fertilization), changes in temperature and precipitation patterns;
- (ii) changes in extreme weather events and implications for crops and agriculture;
- (iii) accounting for many types of weather uncertainties, (iv) understanding of impacts ecosystems, on plant pests and diseases, on livestock, particularly in relation to animal diseases and disease vectors; (v) understanding climate change impacts on fisheries; and (vi)

translating impact information for the benefit of small-holders. In Asia, climate change impacts on rice are the most studied while studies on other cereal and non-cereal crops lag behind. Finally, the major source of information on climate change and its impacts on agriculture can be found in the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) released in 2007<sup>2</sup>.

Finally, while some degree of uncertainty in assessing climate change impact is inevitable this should not prohibit policy makers and agricultural investment officers from taking immediate action for adaptation planning. Instead, they are advised to take “robust” and “no-regret” adaptation strategies. Coordination is necessary between institutions and communities in conducting impact assessments including selection of appropriate spatial as well as temporal scales, prioritization of agricultural investments and selection of appropriate methodology and models for adaptation activities accompanied by a good understanding of related assumptions and uncertainties.

### Systems at Risk: Climate Change and Water for Agriculture

Climate change will affect all the elements of the hydrological cycle, causing increased variability of precipitation, sea level rise and increased extreme weather events (such as droughts, cyclones and floods) and thereby influence water availability for both rained and irrigated agriculture. Some changes are already happening, including temperature increase, sea level rise, and concentration of precipitation in a few wet days and extension of droughts. These changes require an immediate set of responses. Some important geographical “hotspots” and

<sup>2</sup> The forthcoming Fifth Assessment Report (AR5) of the IPCC is expected to include Chapter 7 on Food Production Systems and Food Security.

agricultural production systems are particularly at risk from climate change. These include deltaic systems, surface irrigation systems receiving water from glaciers and snowmelt, semi-arid cropping systems relying on groundwater and paddy rice system in the humid tropics. Climate change adds significant additional stress to systems that are already under pressure from population growth, urbanization, labor migration and water and land scarcity.

Policymakers and agricultural investment planners are advised to: (i) make investment plans by developing and applying scenarios to test resilience of different investment options; (ii) perform resilience audits of existing water infrastructure and re-engineer them if necessary; (iii) adopt adaptive management approaches that recognize and adjust to uncertainty; strengthen monitoring, knowledge and capacity building at all levels; and (iv) build more flexibility in design and operation of water infrastructure.



## Section 3

# Adaptation to Climate Change in Agriculture

Following the previous section which reviewed the current state of knowledge on climate change and its impacts on the sustainability of food production systems, the following section provides a summary of technical expertise and empirical lessons shared in the areas of terrestrial food production systems, mainly crop and livestock production. Financial approaches to climate change derived risk management were also introduced.

### Adaptation to Climate Change in Agriculture: A Review of Options

Faced with the potential negative impacts of climate change, agricultural planners are compelled to develop more resource efficient and more resilient food systems. Being more resource efficient means producing more with fewer resource inputs, while more resilient food systems withstand the expected increase in climate variability and uncertainty, as well as slow onset changes such as increase of median temperature, modification of rainfall patterns, sea level rise and salinization, and modification in irrigation possibilities. Essential here is also to take account of various time scales.

In addition to more efficient and resilient agro-ecosystems, institutional efficiency and resilience are needed at all levels including farms, market, storage facilities and infrastructure development. Policies and institutional capacities should be designed to manage risks and to strengthen plant and animal genetic resource management, research and development, landscape approaches and extension services to build human capital. In order to effectively cope with the slow onset of major climatic changes, it is necessary to take a systematic approach encompassing economic, social and nutritional aspects. To realize such measures above, there is a need for a clear definition and measurement methodology of resource efficiency. Cases on degraded livestock systems in Qinghai, China, and northward shift in the apple cultivation in South Korea, and

salinization risks for Pulaka (a tuber close to taro) a staple crop in Tuvalu were presented.

### Genetic Resources Development for Adaptation in Agriculture

Maintenance of biodiversity and crop genetic improvement can aid in increasing the efficiency and resilience of agriculture. Climate change specific breeding challenges involve building resistance to drought, heat and biotic stresses, and include also location-specific challenges. In order to build resilient genetic resources for food security, maintenance of crop genetic biodiversity is essential. Five major sets of actions were presented: (i) the creation of a permanent source of funds to support genebanks for long-term ex situ conservation of germplasm; (ii) collection, evaluation and incorporation of crop wild relatives in breeding programs to expand the available genepool; (iii) improved information management and effective dissemination; (iv) ratification and implementation of the International Treaty for Plant Genetic Resources for Food and Agriculture (PGRFA); and (v) diversification at all three levels of genetics, species and landscape. While these measures require national and international levels of support, they should not overlook the importance of existing seed systems, including private and informal sectors such as on-farm in situ conservation. Presented examples include the Svalbard Global Seed Vault and Chinese Crop Germplasm Resources Information System (CCRIS).

### Climate Change Implications for Pest Management and Food Safety

Increasing volumes and diversity in international trade of plants, plant products, animals, animal products, and the increasing volume of human travelers and traffic will accelerate the movement of plant pests and increase risks to established production systems. The example of the spread of coconut beetle following the development of highway route 9 in Savannakhet province of the Lao People's Democratic Republic was presented.

Climate change will not only accelerate such movements but will also change transport modalities and routes as more energy efficient vehicles become available. Changing routes imply a change in relative risks of invasive plant pests. Better and more transparent information among and within countries is a necessary part of the international frameworks such as the International Plant Protection Convention (IPPC), Asia and Pacific Plant Protection Commission (APPPC), the World Organization of Animal Health (OIE: from the previous name Office International des Épizooties), Agreement on the Application of Sanitary and Phytosanitary Measures (SPS agreements) of the World Trade Organization (WTO), and the International Treaty for Plant Genetic Resources for Food and Agriculture (PGRFA).

It was noted that while effects associated with a changing climate may change pest dynamics, these do not always imply increased risk. As was demonstrated in a study of climate change impacts on insect pests of rice and fruits in Japan, the number of insect pests would increase with higher temperatures but for a majority of cases the natural enemies had a faster, even more dramatic increase in numbers. These results have implications for other sub-tropical to temperate zones, such as China, to the extent that intensified production systems will be more dependent on the use of biological controls in the future.

### Conservation Agriculture for Climate Change Adaptation in East Asia and the Pacific

Conservation agriculture<sup>3</sup> (CA) was presented as a sustainable agricultural practice in the face of climate change. It is the core strategy of one of the strategic objectives of FAO: Sustainable Crop Production Intensification (SCPI).

Conservation agriculture is a widely applicable and scale neutral climate change adaptation and mitigation option, characterized by: (i) minimum mechanical soil disturbances ('no-till'

and 'never-till'); (ii) permanent organic soil cover and (iii) diversification of crop species grown in sequences and/or associations.

Many of the concepts of conservation agriculture have been traditionally used by farmers as coping mechanisms for climate fluctuations but more recently their use has declined due to conversion to farming systems that prioritize short-term economic gains. In addition to the comparable or better long-term productivity, conservation agriculture also offers financial advantages to farmers including less machinery cost, fuel savings, labor savings, input savings, less drudgery, stable yields, more resilience to disaster risks and extreme weather events, better water efficiency and offset from carbon sequestration. Benefits of conservation agriculture are increasingly widely recognized today and conversion to conservation agriculture is on the rise. Areas under conservation agriculture now amount to 117 million hectares, which accounts for eight percent of the existing farmland worldwide. Examples from China (PRC) and DPR Korea were presented.

For agricultural practitioners, challenges lie in the initial investment associated with CA especially in capacity building in knowledge and equipment such as no-till seeding machines. Other factors that contribute to the slow uptake of conservation agriculture include lack of cultural acceptance, knowledge gaps, adverse policies and opposed lobby interests. Supportive policies and incentive mechanisms would accelerate adoption of conservation agriculture. If successful, agriculture can be part of the solutions for climate change adaptations rather than the problem. More information on conservation agriculture can be found on <http://www.fao.org/ag/ca>.

### Adaptation and Mitigation in Agriculture: Synergies and Trade-offs

Different sustainable land management (SLM) practices play an important role in increasing crop productivity in developing countries. It has become evident that the technology options that are most promising in enhancing food security at smallholder level are also effective in increasing system resilience in dry areas and mitigating climate change in humid areas. However, adoption of SLM practices has been

<sup>3</sup> FAO definition: "Conservation Agriculture (CA) maintains a permanent or semi-permanent organic soil cover. This can be a growing crop or a dead mulch. Its function is to protect the soil physically from sun, rain and wind and to feed soil biota. The soil micro-organisms and soil fauna take over the tillage function and soil nutrient balancing. Mechanical tillage disturbs this process. Therefore, zero or minimum tillage and direct seeding are important elements of CA. A varied crop rotation is also important to avoid disease and pest problems."

very slow particularly in food insecure and vulnerable regions of Southeast Asia because of lack of tenure security and property rights, limited access to information and high up-front financing costs. The discussion highlighted that climate financing could be used to overcome cost barriers to SLM adoption and to leverage additional investments in agriculture from public and private sector.

### **Moving from Impacts to Action: Actionable Climate Knowledge for Risk Management and Adaptation Planning in East Asia and the Pacific**

As reviewed in the previous sections, impacts of both rapid and slow onset changes in climate are increasing in East Asia and the Pacific. In order to effectively manage risks it is essential to consolidate and institutionalize climate information services on different time and spatial scales, which at present do not meet the needs of various end users of information. East Asia and the Pacific is home to diverse climatic conditions with a wide range of temperature and precipitation variability, and the region's farming systems encompass lowland rice, upland intensive mixed cultivation, pastoral systems in arid deserts, and artisanal fishing on coasts and small islands. In addition to the agro-climatic heterogeneity of the region, uncertainty in projections of climate change and its broader spatial resolution present a challenge to design locally relevant adaptation strategies in agriculture.

For better climate risk management, it is crucial to strengthen climate monitoring infrastructure and databases as well as to ensure capacity building at various levels. Existing climate information products, however, provide a good entry point but need to be strengthened by promoting development of customized and locally relevant impact forecasts and management options. Analyses of past climate trends and the utilization of current weather and climate forecast information constitute an ideal entry point to reduce the climate risks and enhance adaptive capacities. The predictability of the El Niño Southern Oscillation (ENSO) phenomenon and its relevance to East Asia and the Pacific region also provides an opportunity to reduce risks. It would be feasible to establish an effective climate information flow system from

information providers to users within the existing institutional systems in East Asia and the Pacific region. Pilot studies in the northern mountainous regions of Vietnam and the Bicol region of the Philippines showed significant benefits of using weather and climate forecast information for risk and opportunity management in agriculture.

### **Framework for Risk Management: Risk Layering and Index-Based Risk Transfer**

Risk management is a key climate change adaptation strategy. Management of agricultural risks associated with negative impacts of climate change to date has typically been piecemeal and uncoordinated with no clear demarcation of institutional roles and responsibilities. The risk layering concept provides a more coherent approach to risk management, provides a framework for designing interventions and assigning appropriate responsibilities to producers, private sector and the state. The risk layering approach divides risks into the following three layers with corresponding management levels: (i) low intensity, high frequency risks that are best retained and reduced at the local levels such as producers and local governments; (ii) risks associated with higher intensity, low frequency events that can be transferred to the insurance and reinsurance markets; and (iii) rare, catastrophic events that will inevitably require central government and/or international donors' intervention. In order to effectively institute a risk layering approach as mentioned above, three policy recommendations were suggested: (i) developing a policy framework to shift incentives and responsibility for risk management to agricultural practitioners and/or local authorities; (ii) ensuring the commercial insurance sector remains voluntary and administered by a viable institutional structure; and (iii) a disaster risk management strategy is required to increase responsiveness and transparency of catastrophic responses. An example was presented from the World Bank project on Sustainable Livelihoods Program and Index-Based Livestock Insurance Project implemented in Mongolia.

Risk transfer instruments such as index-based insurance mechanisms are useful climate change adaptation strategies to guard agricultural practitioners against potential financial losses due to extreme weather events such as flooding, droughts and tropical storms. An index-based

insurance scheme (and related parametric derivatives) is based on losses derived from an index customized to reflect the clients' risk. Any financial compensation is based on an index rather than a possible consequence of weather such as crop failure. To build a tailor-made risk index that reflects different risk profiles in a given location, satellite and remote sensing information and weather monitoring systems is necessary. Such monitoring systems are, however, not advanced enough in developing countries to provide timely and reliable data. Regulatory gaps also need to be addressed to allow more penetration of financing mechanisms in developing countries. Examples were introduced from: the Pacific Catastrophe Risk Assessment and Financing Initiative, a joint initiative by the World Bank, Asian Development Bank and Applied Geosciences and Technology Division of Secretariat of the Pacific Community (SOPAC), Caribbean Catastrophe Pool, a parametric insurance facility for 16 member countries and the world's first multi-country risk pool and ENSO Index Insurance in Peru.

### Climate Change Adaptation in the East Asia Pacific Fisheries and Aquaculture Sector

The fisheries and aquaculture sector is of particular importance to food security, livelihoods and trade in the East Asia and Pacific region. It is expected that climate change in the region will manifest itself in form of sea level rises, water temperature changes, acidification, and changes in intensity of cyclones among other things. This is likely to have a direct impact on fisheries and aquaculture through increased risk at sea, damage to infrastructure and communities along rivers and coasts, and through changes in species production cycles and ecosystem functioning (such as shifts in tuna distributions and impacts of acidification on coastal reef fisheries and bivalve systems).

Effects on society at large would include increased adaptation and mitigation costs faced by the government, issues relating to the distribution of water to the food production sectors, and effects on trade and markets.

However, there is potential within the fisheries and aquaculture sector to not only reduce internal vulnerability to climate change, but also to play a role in global mitigation efforts. Collaboration between FAO's Fisheries and Aquaculture Department and the World Bank would be possible within both sets of activities and several potential areas of collaboration have been identified, including: (i) Identifying vulnerable systems and improving adaptability to climate change in aquaculture and fisheries-dependent communities (e.g. downscaling,

NAPA implementation, CBA), (ii) Integrating climate change adaptation and disaster risk reduction planning to increase resilience in fishing and aquaculture communities, (iii) Implementing EAF/EAA as a means of climate proofing the fish production sector (e.g. integrated systems, natural barriers and defences), (iv) Coordinating and collaborating (e.g. PaCFA, COP17, joint project development, information sharing), (v) Understanding the emissions and promoting mitigation from fisheries and aquaculture (e.g. win-win solutions, shifting to less energy intensive systems), (vi) Linking oceanographic information to vulnerability indicators and vulnerable systems identification, and (vii) Monitoring climate change in fisheries and aquaculture using GIS and remote sensing.



## Section 4 Adaptation and Water

### Prospects for adaptation: Building flexibility in irrigation systems

Southeast Asia has some of the most intensively developed river basins in the world, but deltas and coastal plains are under pressure. Across the region agriculture alone is responsible for withdrawals of 775km<sup>3</sup>/year (South Asia=820: Global=2,675). Land and water scarcity is forcing intensification and water productivity will have to increase dramatically just to keep up with demand.

Unfortunately, there is little opportunity for expansion and the high opportunity cost of rehabilitation and re-engineering of existing schemes will need much smarter management of operations and existing technical environmental and financial risk – even before climate change uncertainties are factored in. Who should and can take that risk – producers or operators? Or will it simply translate into more sovereign debt?

The institutional environment and arrangements for irrigation may also be uncertain and attempts at unbundling irrigation management through Irrigation Management Transfer (IMT) and Participatory Irrigation Management (PIM) have had a patchy record. This should not deter further attempts at reform since there is clear evidence of how vibrant the commercial and informal private sector has been in the region. Irrespective of anticipated climate change impacts, irrigation institutions will be shaped by a set of internal and external ‘shocks’ – not least of which is the rate of rural-urban transition. But within this trajectory the sub-sector will have certain degrees of freedom and these need to be tested for their overall resilience to the anticipated impacts of climate change. Flexibility will be found within schemes, across basins and at macro-economic level with respect to the demand for agricultural production. This analysis needs to be taken as a whole in order to identify and structure targets for investment that maintain productivity levels and offer accepted degrees of climate resilience.

### Irrigation system modernization: Applying FAO MASSCOTE approach

Large-scale irrigation systems are underperforming with low agricultural and water productivities and poor water delivery to farmers. Investments are needed to bring about improvements in the functioning of these irrigation systems. Irrigation modernization is necessary with or without climate change, and is a continual process. The key to irrigation modernization is Service Oriented Management (‘the right service at the right cost to users’).

The Mapping System & Services for Canal Operation Techniques (MASSCOTE) is a stepwise methodology to evaluate irrigation system performance and to develop modernization plans for large-scale irrigation systems. It is based on FAO experiences on modernization of canal operation (in Asia and elsewhere). The MASSCOTE has been used for developing modernization plans as part of investment projects and programmes (China, India, Kyrgyzstan, Morocco, Pakistan, and Sri Lanka) and for capacity development (Central Asia, East Asia, South Asia, Near East and North Africa). It has also served as a research tool for MSc students.

Irrigation modernization programmes and projects should be characterized by smart investments that take due note of the future needs of water users. The management, operation and maintenance of large-scale irrigation systems are complex tasks that demand skilled professionals. Hence, ensuring success in irrigation modernization projects ultimately comes down to investments in capacity development.

### Prioritizing water management investment at basin level

Promoting the basin level as the unit for Integrated Water Resources Management (IWRM) has been an important trend in the region and is seen as necessary for water

**Water Sector Responses to Climate Change in Indonesia**

Indonesia – a country of a ‘thousand islands’ - faces enormous challenges from climate change, which range from increasingly frequent floods, inundation, sea water intrusion to seasonal drought, and smallholders and the poor are likely to be the most affected. Such climate risks create threats to the livelihoods of tens of millions of people, to critical infrastructure and socio-economic services, and to water and food security, and need to be mitigated and adapted to without delay.

A detailed long-term strategy for climate change adaptation in the water resources and irrigation sector for Java and other parts of the country is being developed, focusing on improving the resilience of water users. This includes: (i) capacity building for the information/ knowledge base, water resources planning and management

(establishing multi-stakeholder consultation and decision-making platforms, improving technical capacity of basin management units, master and strategic planning, water allocation systems, etc.); (ii) strengthening management institutions at national, basin and irrigation system levels through participatory approaches; (iii) modernizing the governance structure of local irrigation systems to improve system performance (sustainability) and agricultural productivity; and (iv) improving critical water infrastructure in selected basins, piloting water conservation and climate-change adaption initiatives at local and community levels.

Encouraging progress has been made in improving the capacity, decision making process and governance system for water resources and irrigation management, and local irrigation system performance as measured by increasing agricultural water

productivity in many different provinces. However, major gaps remain in institutionalizing and operationalizing integrated water resources management at the basin level, mainstreaming climate risks into planning and decision making for basin water infrastructure investments. For the irrigation sub-sector, the concept and practice of irrigation management modernization with focus on more flexible user-oriented irrigation services to meet changing needs and on fully capturing water productivity potential are yet to get footed.

There is much room for collaborations between the World Bank and agencies such as FAO in helping introduce the modernization concept, diagnosis/decision support tools such as MASCOTTE, and introducing good practices of multiple-win climate change adaption in basin water resources planning & management, and agricultural water management, building on the achievements to date

investment planning. However, adaptation strategies in agriculture commonly relate to the field or community level and are proposed for upscaling to the agro-ecosystem level; consolidating these options at the river basin level is required to assess available resources and impact on water use.

Unfortunately, there is little evidence from Southeast Asia that the focus on river basins has changed much in practice. Some of the problems with the basin level and IWRM prescriptions include: (i) a disconnect between management and investment; (ii) the need to address issues relating to both water and land use changes; (iii) the institutional and political drivers of constructed water scarcity in basins; (iv) the presence of both a formal and an informal water sector; (v) the potential tensions between national objectives and local/river basin objectives; (vi) myths and misunderstandings not dispelled

by the IWRM discourse ; and (vii) the lack of consideration for the multiple uses of agricultural water use. Generally, various proposed adaptation strategies for climate change are more or less similar to each other and climate change is used to justify second or third rate projects.

For instance, in ASEAN countries suffering from localized water stress and characterized by heavy irrigation water use, there has been a hope that demand management in the irrigation sector inspired by the urban sector and focused on improving irrigation efficiency would free up a significant quantity of water for environmental, urban and industrial uses. However, this hope is based on erroneous water accounting and it will not happen with the proposed strategies.

There are also other changes likely to have an even greater impact than climate change – such as accelerated urbanization and land use

## Mekong Delta Climate Responses

Water Resources Management in the Vietnam Mekong Delta is at a critical juncture. Since 1975, following significant development in irrigation schemes, water resources have been contributing to economic development in Vietnam. Currently, the Mekong Delta accounts for more than 50 percent of rice production and 70 percent of shrimp production in the country. Unfortunately, the Mekong Delta faces challenges related to upstream development (hydropower and irrigation), pollution of water from urbanization and increased use of agro-chemicals, and increased competition over water use (industries, domestic, aquaculture and agriculture).

Furthermore, climate change may have serious implications for the delta in the form of increased salinity intrusion and decreased availability of dry season freshwater. In order to address these climate related challenges, the Government is adopting the following principles;

- Manage the opportunities and constraints in light of

uncertainties related to upstream development, climate change impacts, poverty reduction, and hydropower development in the Mekong River Basin.

- Effectively connect global knowledge to local actions on water resources management (WRM) and agriculture production given the different needs of adaptation measures and implementation capacity of key stakeholders;
- Secure appropriate and continuous support and commitments from policy makers, development partners, and farmers on the IWRM process which requires significant time and resources for building trust and cooperation among water users/managers. This is critical for achieving sustainable development in the Mekong Delta.

In order to support the Government's initiative, the World Bank plans to support the following operations:

- A regional project comprising Vietnam, Lao PDR, Cambodia,

and the Mekong River Commission to nurture coordination among the LMB countries and support implementation of the IWRM at the regional level. This will include activities on the flood and drought risk data collection and analysis at the regional level, and support for transboundary dialogue toward the Cambodia-Vietnam Management Plan for the Mekong Delta;

- A National Project to help utilization of the water resources and strengthen the institutional capacity contributing to climate change adaptation, comprising: (a) urgent investments - for dredging secondary canals, construction of secondary and tertiary sluices, and repairing dykes; (b) support for revising water resources management planning in incorporating climate change impacts, and (c) support for water productivity, focusing on increasing water productivity at the on-farm level.

changes, population increase, etc. – that will inevitably change water use and runoff patterns and impact water quality. There is a risk that the water footprint of many frequently advocated adaptation strategies will exacerbate rather than alleviate the negative impacts of present trends and of climate change. Only a few examples exist where the cumulative impact of water-related local adaptation has been analyzed.

Case studies point to a large variation in the economic value of water by sector and by region and low economic efficiency of agricultural water use. A central and as yet unsolved policy dilemma is how to reduce rural poverty and secure a nation's food supply while at the same time improving the economic productivity of water. Other important policy issues include water use

efficiency vs. resilience and redundancy and reconciling national vs. local objectives.

FAO is piloting a water investment framework in the EAP region. This methodology combines typologies of sectoral users (for instance, paddy production, water supply and sanitation, and aquaculture), national and river basin development objectives (both socio-economic and water-related) and short, medium and long time scales. A water accounting/auditing foundation should underpin the development of a coherent set of policy goals, bulk sectoral allocations, production and productivity targets, "water saving irrigation", risk management strategies, actions across different levels, and improved quality and effectiveness of investment.

### Adaptation to Climate Change on China's 3H Plain

China's 3H Plain is critical to the country's agricultural economy and to national food security. Yet its future productivity is in doubt partly due to water stress. Climate change is making itself felt through higher annual temperatures and reduced rainfall, which in turn has led to more frequent spring droughts. The combination of increasing industrial and domestic water demands and intensifying climate change, which will require increased water use by farmers due to greater evaporation, means that much of the region could face a serious water deficit by 2030.

In 2004, China's government responded by launching a World Bank financed project that focused on working with farmers and technical experts to implement water-saving measures across five provinces. The Ministry of Finance's State Office of Comprehensive Agricultural Development (CAD) coordinated the activities with assistance from ministries responsible for water resources, agriculture, land and forestry. The overall aims were to reverse the inefficient use of water for farming,

and to increase the financial returns to farmers.

A range of irrigation-centered engineering, agronomic and management measures were implemented across 107 counties, with the goal of improving 505,505 ha of low- and medium-yielding farmland, benefiting 1.3 million farm families. The formation of water users associations, encouraged by the government, provided forums to introduce training in new water management techniques, as well as a mechanism for improved local water management based on farmer participation. Irrigation facilities constructed as part of the project were handed over to these water users' associations so that farmers could take ownership for managing and maintaining the infrastructure.

In 2006 CAD requested, and received, a grant from the Global Environmental Facility (GEF) to incorporate adaptation activities into the ongoing project. In addition to water resources advisers, agricultural experts were sent to the area to introduce new drought- and pest-resistant wheat varieties more closely matched to expected future growing conditions. Similarly,

government-led pilot programs introducing new techniques to better manage irrigation water took hold after farmers saw the benefits for themselves in terms of reduced water waste, cost of irrigation, groundwater depletion and evaporation, and especially in terms of water productivity.

The result of the project is the improvement of more than 500,000 ha of farm land. More than 1,000 water user associations have been set up, and 209 farmers' specialized associations and 20 farmers' specialized cooperatives have been established. 256 research, experimental and demonstration activities focusing on the selection and testing of adaptation measures and advanced agriculture and water saving technologies have been implemented, and many have been adopted by farmers in the field.

Critical to the success of the project was the strong coordinating carried out by CAD, as well as the cooperation and creating of joint ownership with farmers, and partnership with leading scientific and agricultural research institutions for technical support. at the on-farm level.



## Section 5

# Mainstreaming Adaptation to Climate Change

### Towards mainstreaming climate change adaptation in agricultural policies

Climate change is expected to affect markets in a variety of ways, and particularly through: (i) adverse productivity impacts (lower yields, variable inputs), (ii) changes in cost structures and competitiveness (transport, energy) and (iii) increased resource constraints on the supply (e.g. increased water scarcity) and demand forces (changing diets, climate-certified foods, and local food). These factors have negative implications for food deficit regions, which may become even more dependent on imports and for trade in general due to increased uncertainty and variability of world prices (through sharper weather and supply shocks) and the emergence of new sources of competition with new areas entering food production as ecology shifts.

Tackling climate change is a complex process. Adaptation is multi-dimensional (ecological, socio-economic) and decisions on how to adapt need to be developed at different scales (household, market, national) and geographical levels (basins, watershed, region). Adaptation policy can also target economy-wide parameters to enhance macro-resiliency to market level shocks. A variety of macro policy instruments may be utilized including trade measures, market policy support, stockholding, land tenure and water rights reforms, among others. Adaptation requires a long term perspective and ensuring sustainability of programmes is key. In agriculture, this means that adaptation policies must ensure long run economically viable incentives to induce farmers to adopt climate-smart practices.

Adaptation policies require an integrated framework for assessing vulnerabilities and options (considering ecological, economic and social dimensions). For developing countries, climate-smart adaptation policies need to be harmonized with other national priorities including agricultural development, food security and poverty alleviation. To ensure effective adaptation policies, a greater

emphasis must be placed on institutional coordination (central/local government, public-private sectors, government-farmers organizations). This also requires building national capacity to initiate vulnerability assessments, formulate adaptation actions, implement and monitor adaptation projects.

A variety of appropriate policy instruments to enhance adaptation to climate change can be formulated depending on the local context. These include: (i) strengthening access to information on climatic statistics; (ii) re-assessing agricultural research priorities and strengthening extension; (iii) aligning prices/tax schemes to reflect full production costs (internalizing externalities (GHGs) and scarce/finite resources such as water and fossil energy); (iv) investing in and/or subsidizing climate-smart technologies, resource-conserving, or productivity enhancing agricultural practices (drip irrigation, water collection); and (v) increasing training and education coupled with strengthened capacity of local institutions to undertake autonomous adaptation activities. Above all, adaptation policies need to focus on creating a favorable enabling environment through improving institutions, economic incentives, legal frameworks, education and health.

### Mainstreaming risk management and community based adaptation

Mainstreaming adaptation to climate change into development needs to combine autonomous adaptation (spontaneous, local) and planned adaptation (government led). Both types of adaptation include Disaster Risk Reduction (DRR) practices and processes that focus on prevention and impact mitigation of extreme events and provide a suitable entry point for initiating sustainable, long term adaptation processes at local level.

Planned adaptation and DDR needs to be supported through: (i) enhanced government policies and services in the form of capacity

development; (ii) promotion of climate resilient infrastructure; (iii) enhanced research for adaptation; (iv) technology transfer and dissemination; and (v) proactive application of incentives for adaptive action as well as the use of disincentives to address unsustainable agricultural practices. Most countries already have institutional foundations for DRR to build on at all levels. But adaptation in agriculture will be done ultimately by farmers, pastoralists and fishermen, who unfortunately, these are often the very groups that are most exposed to the effects of climate variability and natural disasters. The community level provides the most suitable operational nexus for linking autonomous adaptation, planned adaptation and disaster risk reduction. With or without government policies, adaptation efforts must be carried out at the ground level.

Mainstreaming of adaptation within agriculture calls for the promotion of community-based adaptation (CBA), which should figure prominently as part of the overall national Climate Change Adaptation (CCA) strategy. Some of the options for catalyzing local adaptation actions include: (i) building on local knowledge and blending it with scientific know how; (ii) planning of interventions along the cross-sectoral livelihood perspective applied by local actors; (iii) iterative planning cycles coupled with participatory action research, including sound M&E; and (iv) documentation and systematic replication of good practices along slowly shifting agro-ecological and socioeconomic settings. The most crucial technical innovations needed for better adaptation planning include more reliable and locally accessible seasonal weather forecasting systems, translated into specific seasonal advice on crop selection and water management. Ultimately, mainstreaming of CCA requires political will and enabling policy frameworks.

### Financing options for adaptation

Currently there are many financial investment flows for climate action in developing countries. Financing for climate change mitigation through green house gas (GHG) emission reduction has accounted for the largest share of climate finance to date, encompassing not only the public sector but also private sector. Financing mechanisms for climate change adaptation also include the World Bank and Global Environment Facility (GEF).

The World Bank's financing programs for climate change adaptations fall under the following five schemes: (i) Pilot Program for Climate Resilience (PPCR); (ii) Global Facility for Disaster Reduction & Recovery (GFDRR); (iii) Risk Instruments; (iv) International Development Association (IDA)/International Bank for Reconstruction and Development (IBRD); and (v) other Trust Funds.

The Global Environment Facility (GEF) managed climate change adaptation financing programs include: (i) Strategic Priority on Adaptation (SPA) Trust Fund; (ii) Adaptation Fund; (iii) Least Developed Country Fund (LDCF); and (iv) Special Climate Change Fund (SCCF). The details of each financing mechanism are available in the relevant presentations. Of special relevance is the Adaptation Fund which is the major international fund solely committed to adaptation to climate change. It was established to finance concrete adaptation projects and programmes in developing country Parties to the Kyoto Protocol that are particularly vulnerable to the adverse effects of climate change. The World Bank serves as a trustee of the Adaptation Fund that is financed from a 2 percent share of the certified emission reductions (CER) proceeds on the Clean Development Mechanism (CDM) project activities and other sources of funding.

Amid high expectations from all parties, the governance of climate change financing mechanisms has become more complicated. The demands are much larger than the resources currently available. Accordingly, strategic choices of the funds and agreements on priorities need to be made between national stakeholders and international donors.



## Section 6

# Panel Discussion: How Can We Meet the Challenges?

### Climate change adaptation in agriculture - summary of discussions

Climate change impacts represent an additional burden on top of a range of existing challenges characteristic of this region, of which the most significant are: (i) the need to produce more food with fewer natural resources, contributing to the poverty reduction agenda and (ii) maintaining environmental services. The issues to address are: (i) what is unique about climate change and (ii) what measures have already been taken.

Climate change raises some immediate concerns, particularly in the context of already observed climate variability and the frequency and patterns of natural disasters. Some of these urgent topics attract the attention of policy-makers who have started to look into longer-term issues. What is being experienced now is not simply normal weather variability but a fundamentally different type of change in the climate.

As for climate change impacts, it is important to note that impacts are not always negative. However, the higher the temperature the more negative the impacts will be. It is also likely that the impacts will be disproportionately negative for the most vulnerable and poorest areas.

In terms of information needs there was a clear recognition that what is known about climate impacts remains highly uncertain. There are models at different levels of analysis, but most are done at a global level, and are of little use for making immediate decisions at the local level. Although many of the issues have to be addressed at the global level, the solutions in terms of adaptation lie at the local level. The main question faced by farmers and agricultural practitioners is what steps can be taken based on short-term weather forecast and predictions of climatic phenomena over a few months.

Below are some important additional messages from the discussions:

- Short-term action is facilitated by building on and reinforcing adaptation capacities that already exist. A case in point is the genetic variability already conserved in gene banks that can be used and drawn on to develop a range of plant varieties with the necessary climate ready characteristics.
- It is important to highlight pragmatism and also the use of past trends in addition to the predictions, which carry a lot of uncertainty. A pragmatic approach is required in the use of the climate models and particularly in how to make use of them at the local level. 'No regrets' investments and robust decision making/planning (which can adapt to changing predictions) combined with flexibility in managing adaptation are needed. On the topic of conservation agriculture or low-tillage techniques for reducing environmental impact while improving soil and crop productivity, the important message is what incentives can be offered to farmers to encourage their adoption of such measures. All such techniques have to be viewed from the 'local level' perspective and questions of scale need to be considered.
- The discussion on pest management elicited recognition that the linkage with infrastructure development and preventive as well as adaptive measures need to be taken into account. As for livestock impacts, there are also many strong cross-cutting linkages, for instance feed quality, water management and disease control.
- Suitable responses may already exist at different levels. At the farmer level, the availability and access to information and new techniques are critical, and so are the need for risk transfer and risk management. It is recognized that spontaneous adaptation

often takes place, but it needs to be complemented by supporting policy at the national level. At the national level, there was much discussion on the cross-cutting issues and the need for coordinating policies. The importance of institutions and institutional cross-cutting collaboration will turn out to be the key challenges for climate change work to move forward. For the risk management tools already available, the question is how they can be linked to market-based solutions.

- As for the 'triple win' scenario (productivity increase for food security with climate resilience and low-carbon development in the agriculture sector), it was noted that this in fact may not be a triple win but maybe a double win and one loss, or a double loss and one win. As more technicians and policy makers engage in climate change activities, there will be opportunities for multiple wins, but much depends on institutions, policies, information, and participation of different stakeholders.

### Climate change adaptation and water - summary of discussions

In the discussion on water, it was pointed out that what is being done in terms of adaptation in agriculture is not entirely new; these are often developments that would have taken place regardless of climate change (e.g., improving the management of irrigation schemes). Again, the difference is that climate change has raised the urgency of these actions. Examples of adaptation abound and include common interventions such as soil moisture preservation, pest management and improved seed storage.

Some major considerations include:

- On the issue of strategic focus, it is not necessary to follow the UNFCCC too closely, but look at the adaptation that is taking place and see how this may be relevant to the 'moving train' in many of the countries in the region. Medium- and long-term actions may require a certain degree of innovation. But in general, one should be pragmatic and focus on the issues that are of immediate relevance, i.e. weather phenomena such as El Niño. Whatever is carried out as part of adaptation, it is essential that fact-based evidence and

measurable indicators are readily available to monitor the impact of these actions in terms of their ability to modify the climate change-associated trends.

- On the issue of modernization of irrigation, there has been a tendency over the last three to four decades to rehabilitate schemes which have been underperforming and the majority of cases were simply addressing deferred maintenance. In this context, the aforementioned MASSCOTE model is very useful and should be applied in many of the on-going irrigation projects. On the institutional side, modernization means rethinking the way a service is offered. It is worth stressing that modernization of irrigation into a resilient system demands not only efficiency but also storage redundancy as a strategic priority, because there is a danger that high efficiency invites vulnerability.
- On the issue of risk, the provision and utilization of water ultimately is a service and it has many users or uses: farmers, industries, and, of course, environmental uses. When viewed from this perspective, there are three attributes that are important: (i) on-time water availability – closely linked to properly defined rights; (ii) costs (both financial and opportunity costs); and (iii) uncertainty brought on by climate change, which calls for a rethinking of how water as a service is being offered in the context of economic scarcity including the way one plans and engages in dialogue with the region's countries and clients.
- On the issue of linking water with agriculture, certain non-structural challenges lie outside the purview of the water sector. With irrigation and water resources always attracting the lion's share of investments in agriculture, construction begins in a state of frenzy, leaving no time for 'extraneous' items. While knowledge abounds, the public sector systems are invariably ill-equipped to supply information on time. Nevertheless, there is an ideal entry point for agricultural colleagues and the tendency for irrigation and other agricultural practitioners to work in isolation must give way to increased cooperation between the specialized fields.

- Again, getting the institutions and policy environment right, is crucial. Irrigation management transfer (IMT) has been an important issue in the region throughout the past two decades. Not everything has worked as planned but the basis has been established to facilitate the modernization of the sub-sector through the users themselves. What is required now is to take a step back and analyze the past experiences: What has worked and what has not? Why are there still so many water user associations underperforming? It is necessary to analyze and revise the existing incentive systems of IMT in order to make these organizations more effective. If successful, they can play a catalytic and maybe even a leading role in the design and implementation of effective adaptation measures in the region.

### **Mainstreaming Climate Change Adaptation – summary of discussions**

Policy is an indispensable tool for leveraging market mechanisms to enable farmers to incorporate better adaptation measures. The need for an open trading system will be ever more critical in the future as farmers resort to changing their cropping patterns in the face of increased vulnerability. A significant potential for adaptation actions can be found in local knowledge which is currently not capitalized on in a sufficient manner. Natural disasters rooted in increased climatic variability have occurred in the past. This offers valuable lessons on adaptation that have yet to be learned. Learning, however, will only take place when certain successful measures have been mainstreamed into policies and programmes. Exchange of experiences between nested communities as part of large networks will be key to this learning process. To enlist farmers' interest, adaptation strategies should offer something more than mere maintenance of livelihoods.

The discussions confirmed that the community level is the level best suited for operationally linking autonomous adaptation (spontaneous, local), planned adaptation (government led) and disaster risk reduction. Mainstreaming adaptation to climate change into development comprises of - and needs

to combine - both autonomous adaptation, including DRR practices and processes, and enhanced government policies and services (planned adaptation and DRR). Mainstreaming of adaptation within agriculture calls for the promotion of community-based adaptation (CBA), which should figure prominently as part of overall national CCA strategies.

### **What are some of the more concrete entry-points for adaptation in the region?**

There has been a shift in focus of global policy dialogue on climate change from the traditional sectors to forestry and more recently also to agriculture and land use. Within the forestry sector there is increased willingness to pay globally to address climate change. Focus has also changed from mitigation to adaptation, reflecting the interests of developing countries. These developments, in parallel, could be treated as a certain opportunity to mobilize resources for adaptation. Furthermore, at the national policy level there is an increasing recognition that adaptation to climate change can have an immediate impact in terms of both food security and natural disaster risk mitigation benefits. A significant challenge lies in how to translate this global and national interest into local action. Given that natural disasters are a fact of life, disaster management might well serve as the ideal 'entry point' for drawing attention to climate change adaptation needs. To empower them to make better decisions, farmers should be supplied with the best technology available along with usable information from prediction models. Offering incentives to farmers to encourage their adoption of good adaptation practices will command much more attention in the future, particularly to help them tide over the 'lag' period before they can derive the expected returns: given its minimum establishment period, the lack of incentives is possibly one reason why conservation agriculture has not spread further so far.

The success of adaptation measures at a micro level could be demonstrated through increased on-farm yields by introducing new, improved seeds. Adaptation require a tailored, country-by-country approach. In a region like Southeast Asia, one has to contend with a diverse range

of conditions and constraints, for instance comparative resource endowments such as petroleum which could be used to buy rice at times of poor harvest, and variable levels of seed diversity.

In the water sector concrete opportunities present themselves for FAO-WB cooperation. These include: (i) regular irrigation projects, which have provided many lessons to be learned for South-South cooperation (translating lessons from China to the rest of East Asia is relatively easy and offers a quick success); (ii) small basins in heavy rainfall areas, such as in Indonesia and the Philippines, lending them to interdisciplinary analysis (optimized food production with disaster management), since large cities are located on the edges of the basins; and (iii) larger deltas which have a highly complicated and dynamic environment. In order to find out how the myriad factors interconnect, be it in the Mekong delta or in the large basins in China, joint efforts between the World Bank and FAO are vital.

Future analytical work might delve into how climate change's impact on agriculture varies with geographic location and how the particular location would fare, based on its comparative advantages. A good example is rice production in the Mekong Delta in Vietnam and Cambodia. In the next couple of decades, sea water intrusion into the delta in Vietnam will likely lead to a shift away from rice production to shrimp farming and higher-value products, to Cambodia's benefit.

### Dialogue with clients on adaptation

Two important messages for the clients, especially the Ministries of Finance are: (i) it is the most vulnerable of the poor who will suffer the most from natural disasters, not least climate change, and any reduction in effort would add to their increased vulnerability; and (ii) food insecurity and unsafe food are consequences of natural disasters interacting with an already critical situation. In order to convince the clients on the adaptation measures, it is essential that planning for potential options is defined by near-term climate change impacts, not exceeding 10 years as opposed to the common practice of 20 or 40 years.

If the counterpart Ministry in the concerned country is the Ministry of Agriculture and Water, the engagement strategy could be to propose a modest amount of funding just for the purpose of testing out what could be done for adaptation through pilot studies. In this manner, clients could be prompted to reflect on the important issues and 'talk the same language'. However, any discussion of global models would be a 'nonstarter'. If the Ministry of Finance is the counterpart, it is worth making clear that nonengagement in a particular adaptation action will have certain financial consequences.

The World Bank notes an increasing interest and engagement of the Ministries of Finance in climate change since the Bali Climate Change Conference. While their initial motivation may have been rooted at the level of funding availability, discussions have often shifted toward how domestic fiscal policies, subsidies and other instruments need to be adjusted. On some occasions, studies on the cost of climate change impacts have convinced the governments of the need to take action. An equally welcome development is that almost all countries have set up institutional mechanisms, with varying degrees of effectiveness, to engage in a cross-sectoral dialogue. It should also be pointed out to countries that climate change may not only bring negative impacts but also positive: certain opportunities could arise depending on how flexible and versatile one's reaction is.

### How to promote FAO-World Bank cooperation in climate change adaptation in East Asia and the Pacific

The situation has long arisen where the sustainable development agenda has to be re-oriented to accommodate the demands of climate change. The history of collaboration between the World Bank and FAO in preparing agricultural investment projects in developing countries provides the best background for a better understanding of adaptation-related issues. The obvious question is how to mainstream some of the technical solutions developed by FAO within the scope of the World Bank's investment projects and vice versa.

Recent discussions have taken place regarding how the partnership at a project-by-project basis could be transformed to a higher, more strategic

level. There is a lot to be learned through a regular and systematic exchange of information between the two institutions of which the respective work programmes are complementary. In addition to formal workshops, informal networks on specific themes are envisaged (e.g., video conferences on a host of common themes).

In the water sector a more strategic approach to the FAO-World Bank collaboration is already on-going. Livestock, climate-smart agriculture, and disaster risk management are additional thematic areas to proceed in a similar fashion. FAO's Fisheries and Aquaculture and Natural Resources Departments could help identify the climate change impacts on fisheries and vulnerable systems based on oceanographic data and associated adaptation strategies. Given some advance notice more FAO technical experts could

be invited on specific World Bank projects. The FAO-World Bank partnership in China offers a productive example. There is a need to document the lessons that have emerged from this partnership through simple publications, in order to facilitate replications of successful partnership in other countries.

Finally, it was agreed that planning should begin in early September 2011 for the planned follow-up FAO-World Bank expert meeting on Climate Change and Adaptation in Agriculture in East Asia and the Pacific region, scheduled to take place in May 2012 in the region. This meeting will focus on presenting and discussing investment operations on climate change adaptation that are presently being planned in the region. The shareholders of these operations will be important participants in this event.



# AGENDA OF THE EXPERT MEETING

## Climate Change and Adaptation in Agriculture East Asia and the Pacific Region: Issues & Options

FAO-World Bank Expert Group Meeting  
Rome, May 16-17, 2011

### Day 1

Start	End	
-	8.30	<b>Registration – Lebanon Room- FAO</b>
9.00	9.30	<b>Welcome, Overview</b> <b>Welcome address</b> Suzanne Raswant, Chief, Latin America, the Caribbean, East Asia and the Pacific Service, Investment Centre Division, FAO <b>Overview of the workshop</b> Rabih Karaky, Sr. Economist, World Bank/Klaus Urban, Sr. Institutions Specialist, Investment Centre, FAO
9.30	10.15	<b>Session 1: Key note addresses</b> Chaired & Moderated by: Suzanne Raswant, Chief, Latin America, the Caribbean, East Asia and the Pacific Service, Investment Centre Division, FAO <b>EAP- World Bank regional perspective on climate change and sustainable development</b> Magda Lovei, Sector Manager, World Bank <b>Implications from Cancun on climate change and agriculture</b> Peter Holmgren, Director, Climate Change, Energy and Tenure Division, FAO
10.15	10.45	Discussion - Q&A, Comments
10.45	11.15	<b>Break</b>
11.15	12.00	<b>Session 2: Climate change impacts in agriculture: what should we expect?</b> Chaired & Moderated by: Suzanne Raswant, Service Chief, TCIO, FAO <b>The impacts of climate change on agriculture: a review of the state of knowledge</b> Hideki Kanamaru, Natural Resources Officer, Climate, Energy and Tenure Division, FAO <b>Systems at risk: climate change and water for agriculture</b> Jean-Marc Faurès, Sr. Water Management Officer, Land and Water Division, FAO
12.00	12.30	Discussion - Q&A, Comments
12.30	13.30	<b>Lunch Break</b>
13.30	14.15	<b>Session 3: Adaptation to climate change in agriculture</b> Chaired & Moderated by: Magda Lovei, Sector Manager, World Bank <b>Climate change adaptation in agriculture: a review of options</b> Alexandre Meybeck, Sr. Climate Change Officer, Agriculture Department, FAO <b>Genetic resources development for adaptation in agriculture</b> Luigi Guarino, Senior Science Coordinator, Global Crop Diversity Trust <b>Climate change implications for pest management and food safety</b> Peter Kenmore, Chief, Plant Protection Service, FAO
14.15	14.45	Discussion - Q&A, Comments
14.45	15.00	<b>Break</b>

<b>Start</b>	<b>End</b>	
15.00	15.45	<p><b>Session 3: Adaptation to climate change in agriculture</b>            Chaired &amp; Moderated by: Jennifer Sara, Sector Manager, World Bank</p> <p><b>Conservation agriculture for climate change adaptation in EAP</b>            Theo Friedrich, Senior Officer, Plant Production and Protection Division, FAO</p> <p><b>Adaptation and mitigation in agriculture: Synergies, tradeoffs and implications</b>            Giacomo Branca, Economist, Agricultural Development Economics Division, FAO</p> <p><b>Integrating climate resilience into agriculture and natural resources management: adaptation interventions in The Philippines and Samoa</b>            Samuel Wedderburn, Sr. Natural Resources Management Specialist, World Bank</p>
15.15	16.15	Discussion - Q&A, Comments
16.15	16.30	<b>Break</b>
16.30	17.15	<p><b>Session 3: Adaptation to climate change in agriculture</b>            Chaired &amp; Moderated by: Rabih Karaky, Senior Economist, World Bank</p> <p><b>Moving from impacts to action: Actionable climate knowledge for risk management and adaptation planning in EAP</b>            Selvaraju Ramasamy, Natural Resources Officer, Climate, Energy and Tenure Division, FAO</p> <p><b>Framework for risk in the livestock sector – Lessons from Mongolia</b>            Andrew Goodland, Sr. Agricultural Economist, World Bank</p> <p><b>Index based risk transfer and insurance mechanisms for adaptation</b>            Abed Khalil, Water Specialist, World Bank</p>
17.15	17.45	Discussion - Q&A, Comments
18.00		<b>Cocktail in Aventino Room</b>

## Day 2

<b>Start</b>	<b>End</b>	
9.00	10.00	<p><b>Session 4: Adaptation and water</b>            i. <b>Adaptation and prospects for irrigation and drainage</b>            Chaired &amp; Moderated by: Klaus Urban, Sr. Institutions Specialist, Investment Centre, FAO</p> <p><b>Prospects for adaptation: building flexibility in irrigation institutions</b>            Jacob Burke, Sr. Water Policy Officer, Land and Water Division, FAO</p> <p><b>Irrigation system modernization: Applying FAO MASSCOTE approach</b>            Robina Wahaj, Irrigation Officer, Land and Water Division, FAO</p> <p><b>Water resources and irrigation sector management in Indonesia</b>            Xiaokai Li, Sr. Water Resources Management Specialist, World Bank</p> <p><b>Innovations in integrated water resources management in China</b>            JIANG Liping, Sr. Irrigation Engineer, World Bank</p>
10.00	10.30	Discussion - Q&A, Comments
10.30	10.45	<b>Break</b>
10.45	11.30	<p><b>Session 4: Adaptation and water</b>            i. <b>Adaptation in river basins and deltas</b>            Chaired and Moderated by: Vijay Jagannathan, Sector Manager, World Bank.</p> <p><b>Prioritizing water management investment at basin level</b>            Thierry Facon/Zhijun Chen FAO, Land and Water Division, FAO</p> <p><b>Managing water resources in large river deltas: The Mekong Experience</b>            Toru Konishi , Sr. Economist, World Bank</p> <p><b>Climate Change, Water Security and Agriculture Development in the 3H region</b>            Qun Li, Sr. Operations Officer, World Bank</p>
11.30	12.00	Discussion - Q&A, Comments
12.00	13.30	<b>Lunch break / Side Event - Presentation: The Ex-Ante Appraisal Carbon-balance (EX-Act)- Presentation starts at 12:30</b>

Start	End	
13.30	14.30	<p><b>Session 5: Mainstreaming adaptation to climate change</b>            Chaired &amp; Moderated by: Ede Ijjasz-Vasquez, Sector Manager, World Bank.</p> <p><b>Towards mainstreaming climate adaptation in agricultural policies</b>            Aziz Elbehri, Sr. Economist, Market and Trades Division, FAO</p> <p><b>Mainstreaming disaster risk management and community based adaptation</b>            Stephan Baas, Natural Resources Officer, Climate Change, Energy and Tenure Division, FAO</p> <p><b>Agriculture: Enhancing Productivity, Resilience, and Sustainability in a Changing Climate- Country examples</b>            Marjory-Anne Bromhead, Advisor, World Bank</p> <p><b>Financing options for adaptation</b>            Christophe Crepin, Lead Environment Specialist, World Bank</p>
14.30	15.00	Discussion - Q&A, Comments
15.00	15.15	Lunch Break
15.15	16.45	<p><b>Session 6: Panel discussion: how can we meet the challenge? next steps</b>            Chaired &amp; Moderated by Patrick Labaste, Lead Agriculture Economist, World Bank</p> <ol style="list-style-type: none"> <li>1. Summary of Session Results</li> <li>2. Options for CC Adaptation in EA Agriculture portfolio</li> <li>3. Dialogue with the clients on CC-Adaptation</li> <li>4. How to promote FAO-WB cooperation in CC adaptation in EAP</li> </ol>
16.45	17.00	Wrap-up and closure





**Please address comments and inquires to:**

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