



# Effective Climate Information Services for Agriculture in ASEAN

An ASEAN-CRN Knowledge Exchange Event to Increase Climate Resilience in ASEAN

21-23 MARCH 2017 | CEBU CITY, PHILIPPINES

## BACKGROUND

The ASEAN Climate Resilience Network (ASEAN-CRN) Knowledge Exchange Event on Effective Use of Climate Information Services (CIS) for Agriculture in ASEAN was conducted on 21–23 March 2017 in Lapu-Lapu City, Cebu, Philippines. The event brought together ASEAN Ministries of Agriculture, Ministries of Environment, National Meteorological and Hydrological Institutes (NMH) of ASEAN Member States (AMS), development partners, academe and civil society organizations involved in the generation and provision of CIS in the agriculture sector. Participants shared their experiences on the provision of CIS in their respective countries and generate actionable learnings and ideas for regional collaboration. The event was organized by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, through the Forestry and Climate Change (FOR-CC) project of the ASEAN-German Programme on Response to Climate Change (GAP-CC), with support from the Food and Agriculture Office (FAO) of the United Nations, and the United Nations Development Programme (UNDP) under the Integrating Agriculture into NAPs Programme. The Climate Change, Agriculture and Food Security (CCAFS) Programme of the CGIAR also provided technical assistance.

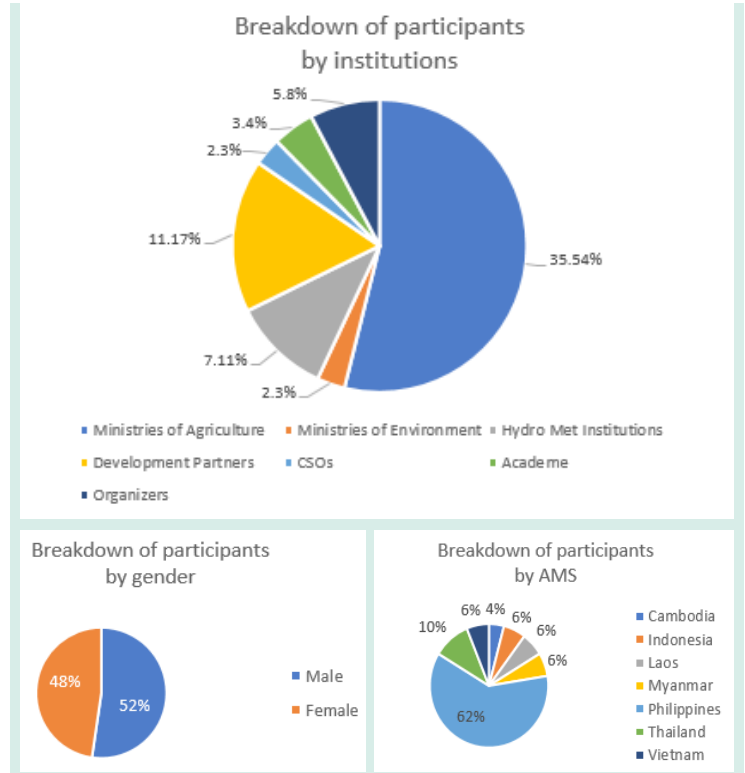
## KEY RESULTS

### Sharing of experiences on the provision of CIS for agriculture amongst AMS

In dynamic marketplace sessions, existing programmes and experiences on CIS in ASEAN Member states have been shared and discussed. The sessions focused on three key topics: CIS for agricultural productivity, CIS for market access and financial inclusion, and CIS for risk management and gender inclusion. Each market place was complemented by presentations from technical experts and partners from the region.

#### ■ CIS for agricultural productivity

Several programs and activities on CIS among ASEAN countries are already in place to maximize the agriculture sector's productivity. In Thailand, CIS is used to make water management in the country more climate-resilient, benefiting at least 900 villages which receive extension and advisory support. Indonesia makes use of Climate Field Schools to train extension workers and farmers on interpreting weather and seasonal forecasts as well on appropriate agricultural practices to maximize their yield accordingly. The Climate Field School program at the same time encourages communities to contribute weather and climate data from their localities in an effort to improve the availability of climate data and the quality of weather and climate forecasts respectively. In Laos, a climate-informed cropping calendar is produced to guide farmers on when to plant, and how to deal with diseases or climate uncertainties during the cropping cycle. Laos also has its' own climate farmer field schools applying an approach similar to Indonesia. Vietnam, finally, has developed a climate-informed information and communication technology (ICT)-based agro-advisory service for major food crops. The service allows farmers and extension workers to access field-specific information on recommended farming practices as well as on nutrient management to increase farm yields.



#### ■ CIS for market access and financial inclusion

The Philippines have been using ICT coupled with extension activities – such as Farmer Field Schools and Climate Smart Farmer Business Schools – as decision support tools to promote CIS for agriculture trading and marketing, where farmers are taught how to produce and package fresh farm products acceptable to the market and safe for consumption. Another of the many tools provided is the FilFARM which links sellers and buyers of agricultural produce online although, currently, it is only operating in few localities. Another channel used for disseminating information on climate smart agriculture is through radio broadcasts among rural communities in the Philippines. In this programme, experts from the Department of Agriculture are interviewed and invited to share agriculture and climate change-related topics (e.g. crop varieties, techno-demo farms) to listeners who are mostly farmers. Listeners are encouraged to elicit feedback and ask questions which are then addressed by the experts while on-air. However, agriculture is a secondary issue in their broadcasts and the challenge is to engage people in the radio campaigns and become “climate smart broadcasters”. Finally, Philippines presented the use of CIS for agricultural insurance. The climate and weather information used to reduce losses of insured farmers and thereby of the insurance providers are taken from the hydro-met institutions; climate and insurance-related information is translated into advisories and disseminated through radio, SMS, emails and farm visits. These allow the farmers to know when best to plant their crops and harvest their produce, to avoid losses for example from natural hazards like typhoons. Indonesia has a similar system in place although not yet linked to insurance. Farmers are provided advisories on



the optimal planting dates as well as varieties to use through the Integrated Cropping Calendar, which provides advisories accessible through a variety of channels. CCTV monitoring allows the Ministry of Agriculture in Indonesia to access on-time information about the conditions of rice fields in demonstration plots in a number of provinces across the country.

#### ■ CIS for risk management and gender inclusion

Using climate-informed decision support tools can ensure risk reduction in the agriculture sector. Various CIS tools and technologies are already being utilized to predict and monitor extreme weather events which can have devastating effects on farms in AMS. In Cambodia, through the “Rural Irrigation and Agriculture Productivity Improvement Project”, farmers are provided with relevant information to prepare for expected climate hazards like droughts or floods. In a similar manner, the Philippines and Myanmar meteorological institutes regularly provide customized advisories and bulletins on the weather and climate as well as recommended agronomic practices. The information is updated periodically to ensure that it is relevant to farmers in their specific localities. Both countries conduct annual or bi-annual climate fora where CIS providers and end-users come together to discuss how CIS provision and delivery can be further enhanced and promoted. In terms of gender inclusion, a project implemented in Cambodia, Laos and Vietnam titled “Agro-climate Information Services (ACIS) for Women and Ethnic Minority farmers in South-East Asia” helps local communities to generate actionable agro-climate information and reduce weather-related crop failures. Both men and women are consulted in the development of advisories to ensure that these will be understood by all community members. This is complemented by trainings and other activities on gender awareness. Some interesting findings from the project show that developing the advisories in women-only-groups made women more confident in going out and sharing the information afterwards, both to women and men.

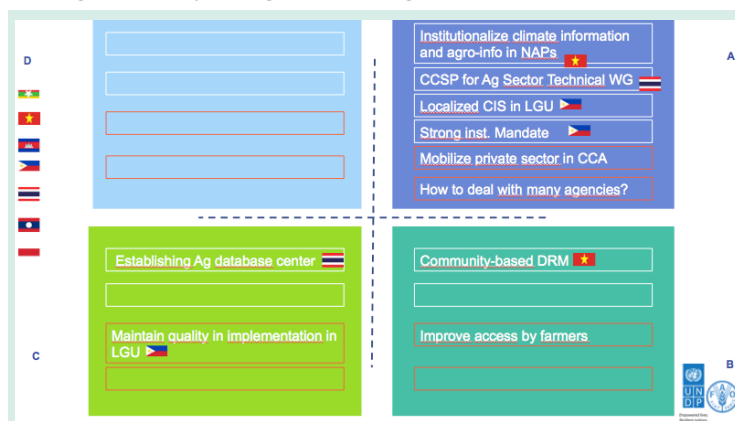
All of the programs and activities on CIS currently ongoing in AMS are provided to beneficiaries free of charge since they are mostly implemented in partnership with the Ministries of Agriculture and the Hydrological and Meteorological Institutes (main source of data) on the national level,. Direct provision of services is mostly done through extension workers (sometimes from civil service organizations and NGOs) working with farmers and other end-users on the ground. These programs show initial successes but challenges still remain such as: difficulty to provide actionable information, challenging institutional arrangements, advisories are often not crop -specific and difficult to use, lack of capacities of the stakeholders, often scarce data for good quality CIS products, good pilots but challenging to scale up, communication formats that are not always appropriate, and need for multiple channels in its delivery. However, there are also opportunities for better provision of CIS in agriculture, such as up-to-date ICT solutions and the potential investment from the private sector or crowd sourcing.

It is important to note that in order for CIS to truly benefit the farmers (end-users), more than the provision climate and weather information is needed. Climate information that is integrated with context specific agronomic and risk management advise, needs to be generated, translated into localized terminologies, communicated and disseminated, and applied by farmers in their usual farming activities. To achieve this, there is a need to: build capacity to communicate, understand and act on information among farmers, end-users, and other intermediaries; build capacity at the national meteorological services to provide information tailored to the need of agricultural decision makers; find the right balance between meeting context-specific farmer/user needs and services that can be provided in cost-effective manner on a large scale; and, strengthen institutional arrangements to sustain the development and provision of services.



### Institutional arrangements for enhanced CIS for agriculture

To ensure that CIS can be scaled-up and applied widely along all stages in agricultural value chains, they need to be mainstreamed in the institutional and political frameworks of AMS. The National Adaptation Plan (NAP) process is a means to identify strategies to adapt to the impacts of climate change and can provide a framework for the planning and provision of CIS in agriculture. Representatives from the Philippines, Thailand and Vietnam shared their experiences on the institutional arrangements for CIS and how CIS are promoted in the NAP process. The table summarizes where the best practices (white boxes) and areas of learnings (red boxes) between countries could be for CIS and NAP with regard to the four elements of the NAP, as outlined by the UNFCCC Least Developed Countries Expert Group (LEG): A) Laying the ground, B) Preparatory Elements, C) Implementation strategies, D) Reporting, monitoring and review.



Thailand highlighted the fact that climate information is available in many agencies but is scattered and should be streamlined. Another key challenge is to relay this information to farmers. To address this, in the agriculture sector, they have developed a CC Strategic Plan for Agriculture Sector Technical Working Group and an agricultural Database Center. The Philippines presented a good example of CIS provision at local level. The fact that very few local government units have their own local climate change action plans and that in order to maintain implementation standards across LGUs, capacity of all actors will need to be improved during scaling-up, remains a challenge. More resources are required and agencies should converge to provide the resiliency package to communities. For Vietnam, it is also crucial to transform and deliver climate information and agro-climate information from central level to locality. Mobilizing the private sector in climate change adaptation and agro-climate information services is of particular importance. Some of the entry points for better integration of CIS into NAPs are: institutionalize climate information and agro-climate information in NAPs, set up good system for CIS and community based disaster risk management.

The take away messages were that:

- National adaptation planning is an important priority for ASEAN member states
- CIS is a core application at all stages of agricultural value chains and planning processes
- A number of challenges remain to the scale-up of CIS
- NAP provides a framework for national adaptation planning and for the planning and provision of CIS

### Ways Forward for Enhanced Regional Collaboration on CIS

The technical sessions served as inputs for a series of interactive groupworks to develop actionable country plans for improving the generation and provision of CIS for agriculture in ASEAN. Based on the sharing of their plans for action on the national level, participants discussed bilateral and regional collaboration activities to support each other in promoting the uptake and use of CIS, in line with opportunities to access climate finance, as well as with existing initiatives and programs implemented by development partners. The succeeding tables show the summary of the group works sessions.

## ■ Challenges and solutions for CIS in ASEAN agriculture value chains

In an interactive group work session, moderated by technical experts from development partners, participants were divided into expert groups on the three main steps in the creation of CIS for agriculture as well as on providing the necessary enabling framework for the promotion of CIS. Each expert group was made up of representatives from different AMS. They shared the challenges in the provision of CIS in their

respective countries and discussed potential solutions for overcoming those challenges.

The results of the group work reveal that technical, institutional as well as behavioral reasons challenge the different steps of providing effective CIS in agriculture. The ability to efficiently communicate actionable information that is relevant to

and understood by end users is critical to ensure that CIS contribute to increasing farmers' resilience to climate change. Overcoming those challenges requires more coordination and cooperation across different institutions, exploring new technologies as well as raising the awareness and building the technical capacities of those involved in providing and using CIS.

| Expert groups   | Challenges  | Proposed solutions  |
|---|---|---|
| Weather and climate information providers<br>– observers, modelers, forecasters | <ol style="list-style-type: none"> <li>1. Provision of localized information</li> <li>2. Uneven and sparse weather stations</li> <li>3. Effective and efficient communication channels to the end user</li> <li>4. Knowledge gap on climate monitoring and prediction in NMHS; lack of utilization of satellite and remote sensing data technology</li> </ol>   | <ol style="list-style-type: none"> <li>1. GIS map, crop zoning, agricultural map, improve local accuracy of forecasts</li> <li>2. Explore new technology; strengthen collaboration among institutes</li> <li>3. Calibration and validations techniques; propose new technologies</li> <li>4. Continuous capacity building for NMHS: satellite and remote sensing; agro-met courses in universities (BSc and MSc); short courses/trainings for staff on agro-met</li> </ol>  |
| Processors of CIS for agriculture   | <ol style="list-style-type: none"> <li>1. Connectability and data access</li> <li>2. Production of usable information on: yield, pest, disease; drought and flood; climate projection</li> <li>3. Agriculture sector and staff capacity</li> <li>4. Farmer capacity</li> </ol>  | <ol style="list-style-type: none"> <li>1. Alternative communication channels, offline access</li> <li>2. Agricultural research; knowledge, tool exchange; merged gridded data to fill gaps; real-time monitoring</li> <li>3. Training programs; partnership, exchange between agriculture and NMH</li> <li>4. Country-specific; use existing agricultural extension and media; farmer to farmer learning</li> </ol>   |
| Disseminators, intermediaries and end users of CIS                              | <ol style="list-style-type: none"> <li>1. Data quality</li> <li>2. Actionable data</li> <li>3. Attitude/behavior</li> <li>4. Cooperation, local delivery structure</li> <li>5. Availability</li> <li>6. Delivery</li> </ol>   | <ol style="list-style-type: none"> <li>1. Improve accuracy of data/information used (weather forecasts and advisories) and interpretation; combine different data sources to fill gap</li> <li>2. Provide crop- and site-specific information for farmers; combine different parameters/data for each risk type in one place; capacity to process information (automation)</li> <li>3. Farmers needed to be open-minded and trusting (to technologies); increase farmers' literacy and knowledge through awareness raising and capacity building activities (e.g. learning/self-help groups, trainings)</li> <li>4. Increase collaboration between the ministries of agriculture and related ministries/departments, local government units (LGUs), other stakeholders</li> <li>5. Long-term, easy/open-access, in particular, historical data; complex validation for climate-informed advisories/timeline; available tools to work data-poor environment (short-term)</li> <li>6. Scale-up farmer field schools; use of various delivery channels; strengthen use of and access to internet; translate technical/scientific terms to local dialect; well-experienced/knowledgeable extensionists</li> </ol>   |
| Policy makers – enablers, promoters   | <ol style="list-style-type: none"> <li>1. Budget: allocation for CIS for agriculture (project-based)</li> <li>2. Institutions <ul style="list-style-type: none"> <li>- Integration/synergies among line ministries; linking all existing database</li> <li>- Lack of coordination/ feedback loops between ministries CIS providers and ministries CIS users</li> <li>- Problematic bureaucratic structure</li> </ul> </li> <li>3. Regulations/Policies <ul style="list-style-type: none"> <li>- Mobilize private sector in climate change adaptation and agro-CIS</li> <li>- Lack of regulations (drafting laws on climate change); research on vulnerabilities, impacts, adaptation</li> </ul> </li> <li>4. Systems &amp; Infrastructure <ul style="list-style-type: none"> <li>- Data harmonization</li> <li>- Knowledge management for community</li> <li>- Developing local community response/feedback systems approach</li> </ul> </li> <li>5. Capacity: of national met agency to respond to information service requests</li> </ol> | <ol style="list-style-type: none"> <li>1. Institutional <ul style="list-style-type: none"> <li>- National multi-stakeholder committee on CIS</li> <li>- Institutional allocation of generation and delivery of CIS among agencies, within national agencies</li> <li>- Nationalized / aligned delivery system</li> <li>- Regional and national expert institutions to provide/use CIS advisories</li> <li>- NMHS to set up extension support to LGUs' CIS initiatives</li> <li>- Inter-ministerial Task Force on climate change for CIS</li> <li>- Convergence of initiatives on climate change among rural development agencies</li> </ul> </li> <li>2. Individual <ul style="list-style-type: none"> <li>- Programs to inculcate/promote use and importance of CIS in daily life</li> <li>- Provide scholarships for individuals to build capacity</li> <li>- Personnel to have competence on CIS</li> </ul> </li> <li>3. Enabling environment <ul style="list-style-type: none"> <li>- Government to pay attention to climate change</li> <li>- Effective leadership for CIS in local organizations</li> <li>- Investment platforms on CIS</li> <li>- Mainstreaming of CIS in national plans</li> <li>- Harmonization of local plans with national plans on climate change (bottom-up planning)</li> <li>- Policy requiring private business sector to use and generate CIS to make business operations climate-smart</li> </ul> </li> </ol> |

■ **National Action Plans to improve CIS for Agriculture in AMS**

Based on the exchange amongst experts about the challenges and solutions within the different steps of providing CIS, delegates came together in country groups to discuss necessary steps forward in their home country to improve the effective provision of CIS for agriculture. Each country group created a National Action Plan including proposed activities to improve CIS, the resources needed to do so, as well as potential partners to access those resources and implement the proposed activities.

The action plan of different AMS reveal that, while there are large gaps between AMS capacities, similar ideas to upgrade their CIS for agriculture exist. In the area of climate information generation for example, a common need is to expand the network of weather station as a basis to generate quality data for reliable and localized forecasts. When processing such information, advanced modeling techniques and capacity building of staff in the NMHS is an activity several AMS would like to pursue. Integrating services for farmers and mainstreaming

CIS in various communication channels and media used by the end-users is a common ambition amongst AMS to improve the delivery of CIS. For improving the enabling framework, more needs to be done in AMS to improve cooperation amongst different ministries and institutions related to CIS provision, for example by setting up respective working groups or task forces and expressing commitment in related MoUs.

|    |                     | WEATHER/CLIMATE INFORMATION GENERATION AND PROVISION   | WEATHER/CLIMATE INFORMATION PROCESSING - DEVELOP SERVICES  | WEATHER/CLIMATE INFORMATION SERVICE DELIVERY  | CIS PROMOTION/ENABLING FRAMEWORK  |
|----|---------------------|--|--|---|---|
| KH | Proposed activities | <ul style="list-style-type: none"> <li>Produce seasonal forecasts</li> <li>Build technical capacities</li> <li>Strengthen observation /weather station network</li> <li>Analysis of climate change impacts</li> </ul>  | <ul style="list-style-type: none"> <li>Agricultural information knowledge center</li> <li>Agro-met curricula</li> <li>Skills Assessment</li> </ul>   | <ul style="list-style-type: none"> <li>Climate Smart Farmer Field Schools farmer institutions</li> <li>Capacity building of extension system to deliver information to farmers</li> <li>Use of ICT in the delivery</li> </ul>                 | <ul style="list-style-type: none"> <li>Increase awareness/capacity at sub-national level</li> <li>Regulations on climate information sharing</li> <li>Higher budget allocation for NMH</li> <li>Joint MOU/declaration between ministries</li> </ul> |
|    | Resources needed    | <ul style="list-style-type: none"> <li>Modelling software</li> <li>Experts</li> <li>Financial resources</li> <li>Weather stations</li> </ul>   | <ul style="list-style-type: none"> <li>Financial resources</li> <li>Technical expertise</li> </ul>   | <ul style="list-style-type: none"> <li>Financial resources</li> <li>Local and international expertise</li> </ul>  |   |
|    | Potential partners  | <ul style="list-style-type: none"> <li>Met Department</li> <li>Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES)</li> <li>IFC: Pilot Programme for Climate Resilience (PPCR)</li> <li>United States Agency for International Development (USAID)</li> <li>United Nations Development Programme (EU-Global Climate Change Alliance)</li> <li>GIZ</li> </ul> | <ul style="list-style-type: none"> <li>CCAFS</li> <li>FAO</li> <li>International Fund for Agricultural Development (IFAD) Agricultural Services Programme for Innovation, Resilience and Extension (ASPIRE)</li> </ul>   | <ul style="list-style-type: none"> <li>Local and international NGOs</li> <li>Funding agencies</li> <li>Local authorities</li> <li>FAO</li> <li>GIZ</li> <li>Private sector (telcos)</li> </ul>  | <ul style="list-style-type: none"> <li>Local and international NGOs</li> <li>Funding agencies</li> <li>Local authorities</li> <li>FAO</li> <li>GIZ</li> <li>Private sector (telcos)</li> </ul>  |
| ID | Proposed activities | <ul style="list-style-type: none"> <li>Downscaling</li> <li>Seasonal forecast</li> <li>Cropping calendar</li> </ul>  | <ul style="list-style-type: none"> <li>Landscape and crop modelling</li> <li>Training on Pest forecasting</li> <li>Training on modelling</li> </ul>  | <ul style="list-style-type: none"> <li>MCD, android app, TV, radio, fora</li> </ul>   | <ul style="list-style-type: none"> <li>Special efforts to increase food production (rice, maize, soybean)</li> <li>Climate field schools</li> </ul>   |
|    | Resources needed    | <ul style="list-style-type: none"> <li>Historical data observation</li> <li>Spatial data observations</li> <li>Rainfall observer groups / volunteers</li> <li>Experts</li> </ul>   | <ul style="list-style-type: none"> <li>Data</li> <li>Tools</li> <li>Expertise</li> </ul>   | <ul style="list-style-type: none"> <li>Infographics</li> <li>Map and tables</li> <li>Pictures</li> </ul>  | <ul style="list-style-type: none"> <li>Extensionsists</li> <li>Pest observer</li> <li>NGOs</li> </ul>   |
|    | Potential partners  | <ul style="list-style-type: none"> <li>Universities</li> <li>BMKG (national met agency)</li> <li>International Rice Research Institute (IRRI)</li> <li>FAO</li> <li>Japan Aerospace Exploration Agency</li> <li>Japan International Cooperation Agency (JICA)</li> </ul>   | <ul style="list-style-type: none"> <li>Universities</li> <li>Indonesian Agency for Agricultural Research and Development (IAARD)</li> <li>DG of Food Crops</li> <li>Australian Centre for International Agricultural Research</li> <li>IRRI</li> <li>GIZ</li> <li>FAO</li> <li>KRDA</li> </ul> | <ul style="list-style-type: none"> <li>Ministry of Communication and Information</li> <li>IAARD</li> <li>Local governments</li> <li>Assessment Institutes for Agricultural Technology (AIAT)</li> <li>Private sector</li> <li>NGOs</li> </ul> | <ul style="list-style-type: none"> <li>Local governments (511)</li> <li>AIAT (33)</li> <li>Mass media, TV, radio</li> <li>APEC Climate Center (APCC)</li> </ul>   |

|    |                     | WEATHER/CLIMATE INFORMATION GENERATION AND PROVISION  | WEATHER/CLIMATE INFORMATION PROCESSING - DEVELOP SERVICES   | WEATHER/CLIMATE INFORMATION SERVICE DELIVERY  | CIS PROMOTION/ENABLING FRAMEWORK   |
|----|---------------------|---|---|---|--|
| LA | Proposed activities | <ul style="list-style-type: none"> <li>Data format, validation</li> <li>Global satellite vs. local station</li> <li>User knowledge on agro-met</li> <li>National committee on CIS (key line ministries)</li> <li>Wireless automatic weather stations</li> </ul>   | <ul style="list-style-type: none"> <li>Training programs for agricultural staff (on modelling and interpreting met data skills)</li> <li>Training modules on CIS</li> <li>Hardware and software CIS tools and technology</li> </ul>                           | <ul style="list-style-type: none"> <li>Hotline service (on CIS for agriculture during rainy seasons)</li> <li>Volunteers (men/women, two from villages/communities, youth and women unions)</li> </ul>  | <ul style="list-style-type: none"> <li>Mainstreaming CIS on national implementation plans</li> <li>Building adaptive capacity of stakeholders</li> </ul>   |
|    | Resources needed    | <ul style="list-style-type: none"> <li>Global Environment Facility (GEF)</li> <li>Least Developed Countries Fund (LDCF)</li> <li>Green Climate Fund (GCF)</li> </ul>  | <ul style="list-style-type: none"> <li>Strengthen coordination between NAFRI and Dept. of Meteorology and Hydrology (DMH) in the provision of CIS in agriculture</li> </ul>   | <ul style="list-style-type: none"> <li>Mass media production improvements</li> </ul>  |  |
|    | Potential partners  | <ul style="list-style-type: none"> <li>Dong Dok</li> <li>RIMES</li> <li>International Research Institute for Climate and Society IRI</li> <li>National Agriculture and Forestry Research Institute (NAFRI)</li> <li>IRRI</li> <li>International Water Management Institute</li> <li>FAO</li> <li>UNDP</li> </ul>                            |   | <ul style="list-style-type: none"> <li>District Agriculture and Forestry Office/extension staff</li> <li>Sub-DMS in district level</li> <li>Two key persons from each community</li> </ul>  | <ul style="list-style-type: none"> <li>DMH (Min. of Environment and Natural Resources (MONRE))</li> <li>NAFRI, Dept. of Agriculture (DOA) (Min. of Agriculture and Forestry)</li> <li>Min. of Information and Communication</li> </ul>   |
| MM | Proposed activities | <ul style="list-style-type: none"> <li>Strengthen cooperation between DOA and DMH</li> <li>Establish more weather stations for national coverage</li> </ul>   | <ul style="list-style-type: none"> <li>Strengthen capacity of staff to use modernized technology</li> </ul>   | <ul style="list-style-type: none"> <li>Upgrading of mobile services</li> <li>Establish more climate farmer field schools</li> </ul>   | <ul style="list-style-type: none"> <li>Institutional cooperation mechanism</li> <li>Budget allocation</li> <li>National Climate Smart Agriculture Policy</li> </ul>  |
|    | Resources needed    | <ul style="list-style-type: none"> <li>Funding support/budget</li> <li>Experts</li> </ul>   | <ul style="list-style-type: none"> <li>Experts</li> <li>Infrastructure (software and hardware)</li> </ul>   | <ul style="list-style-type: none"> <li>Experts</li> <li>Infrastructure</li> <li>Funding support</li> </ul>  | <ul style="list-style-type: none"> <li>Contribution and interest of higher authorities</li> <li>Budget</li> </ul>  |
|    | Potential partners  | <ul style="list-style-type: none"> <li>Min. of Agriculture, Livestock and Irrigation (MOALI)</li> <li>DMH (Min. of Transport and Communication (MOTC))</li> <li>United Nations Economic and Social Commission for Asia and the Pacific</li> <li>Korea International Cooperation Agency</li> <li>GIZ</li> <li>JICA</li> <li>RIMES</li> </ul> | <ul style="list-style-type: none"> <li>MOALI</li> <li>MOTC</li> <li>GIZ</li> <li>FAO</li> <li>RIMES</li> <li>PAGASA</li> </ul>  | <ul style="list-style-type: none"> <li>MOALI</li> <li>MOTC</li> <li>KOICA</li> <li>Private sector</li> </ul>  | <ul style="list-style-type: none"> <li>MOALI</li> <li>MOTC</li> <li>Cabinet</li> <li>ASEAN-CRN</li> </ul>  |
| PH | Proposed activities | <ul style="list-style-type: none"> <li>Replication of CIS in 300 LGUs (2018)</li> <li>Development of news forecast products (e.g. S2S)</li> <li>Coverage of all LGUs within the next five years</li> </ul>  | <ul style="list-style-type: none"> <li>Training of LGUs on the localization of CIS</li> <li>Development of applications (mobile and others) on Risk Management Options for agriculture and fisheries</li> <li>Regional training on AgroMet at APCC</li> </ul> | <ul style="list-style-type: none"> <li>Forge partnership with Telcos</li> <li>Development of ICT tools and apps</li> <li>Distribution of weather boards in all villages</li> <li>Mobilize/tap all existing delivery channels</li> <li>Distribute IEC materials, climate advisories</li> </ul> | <ul style="list-style-type: none"> <li>Impact evaluation (midterm)</li> <li>PAGASA extension services to assist LGUs (PAGASA Regional Officer)</li> <li>Leverage existing potential funding sources (Peoples Survival Fund (PSF), GCF, General Appropriations Act, Disaster Risk Reduction and Management Framework)</li> <li>Capacity building (DA personnel, farmers, LGUs, etc.) on interpretation and generation of CIS</li> <li>DA reorganization to respond to climate change</li> <li>Collaboration among agencies' mechanism in data warehousing and distribution</li> </ul> |
|    | Resources needed    | <ul style="list-style-type: none"> <li>PAGASA modernization budget</li> <li>2018 500M budget for AMIA (proposal)</li> <li>Additional ESETS budget</li> </ul>  |   | <ul style="list-style-type: none"> <li>Existing resources of DA</li> <li>Private sector CSR funds</li> <li>DICT budget</li> </ul>   | <ul style="list-style-type: none"> <li>Climate services forum for agriculture</li> <li>Budget for impact evaluation</li> </ul>   |

| WEATHER/CLIMATE INFORMATION GENERATION AND PROVISION |                     | WEATHER/CLIMATE INFORMATION PROCESSING – DEVELOP SERVICES   | WEATHER/CLIMATE INFORMATION SERVICE DELIVERY  | CIS PROMOTION/ENABLING FRAMEWORK   |  |
|--|---------------------|---|---|--|--|
|  | Potential partners  | <ul style="list-style-type: none"> <li>PAGASA</li> <li>FAO</li> <li>LGUs</li> <li>Dept. of Agriculture (DA)</li> <li>Dept. of Energy</li> <li>Dept. of Information and Communications Technology (DICT)</li> <li>Phil. Crop Insurance Corporation</li> <li>GIZ</li> </ul>   | <ul style="list-style-type: none"> <li>PAGASA</li> <li>APEC</li> <li>LGUs</li> <li>State Colleges and Universities</li> <li>GIZ</li> <li>FAO</li> <li>RI</li> </ul>   | <ul style="list-style-type: none"> <li>DICT</li> <li>DA</li> <li>Philippine Disaster Resilience Foundation (PDRF)</li> </ul>   | <ul style="list-style-type: none"> <li>PSF, GCF, DRR, GAA</li> <li>All development partners</li> </ul>   |
| TH   | Proposed activities | <ul style="list-style-type: none"> <li>Get agro-met data from Meteorology Department</li> </ul>   | <ul style="list-style-type: none"> <li>Min. of Agriculture and Cooperatives (MOAC) to process data</li> <li>Expertise c/o Royal Irrigation Department/DOA, Department of Agricultural Extension (DOAE), HAIL</li> <li>DWR-MONRE: National Water Resource Committee</li> </ul> | <ul style="list-style-type: none"> <li>Linkages of agriculture CIS with existing CIS in the local areas</li> </ul>   |  |
|  | Resources needed    | <ul style="list-style-type: none"> <li>Agri-map</li> <li>Zoning</li> <li>Water table</li> <li>Soil data</li> <li>Rainfall</li> <li>Land use</li> <li>Crop models</li> </ul>   | <ul style="list-style-type: none"> <li>Cloud computing</li> <li>Climate modelling (crop modelling)</li> <li>Capacity development on climate information processing</li> <li>Communication using various media</li> </ul>  | <ul style="list-style-type: none"> <li>Capacity building on how to communicate climate information</li> <li>Feedback mechanism (two-way communication)</li> </ul>  | <ul style="list-style-type: none"> <li>Inclusion of CIS in National Adaptation Plans</li> </ul>  |
|  | Potential partners  | <ul style="list-style-type: none"> <li>Hydro and Agro Informatics Institute; Geo-Informatics and Space Technology Development Agency (Min. of Science and Technology)</li> <li>MONRE</li> <li>Min. of Digital Economy and Society</li> <li>MOAC</li> <li>Min. of Interior</li> <li>International organizations</li> </ul> | <ul style="list-style-type: none"> <li>NWRC</li> <li>Universities</li> <li>MOAC – insurance</li> <li>International organizations</li> </ul>   | <ul style="list-style-type: none"> <li>LGUs</li> <li>DOAE</li> <li>Min. of Interior</li> <li>TAO</li> <li>Min. of Digital Economy and Society</li> <li>Private sector</li> <li>CPD</li> <li>Kaset Tambon</li> <li>Farmers' council</li> <li>Tele-centers learning centers</li> </ul> | <ul style="list-style-type: none"> <li>Policy briefs</li> <li>Submission to Cabinet Ministers</li> <li>Inclusion in the National Economic and Social Development Plan</li> <li>MOAC/Office of Agricultural Economics</li> <li>National Economic and Social Development Board</li> <li>Budget bureau</li> <li>International organization</li> </ul> |
| VN   | Proposed activities | <ul style="list-style-type: none"> <li>Increase the quality and number of weather observation points/stations</li> <li>Create historical weather data for various purposes</li> </ul>   | <ul style="list-style-type: none"> <li>Acquire High Performance Computing (HPC) to run long term climate projection modes</li> </ul>  | <ul style="list-style-type: none"> <li>Policy to allow private sector service delivery</li> <li>Generate evidence for policy</li> </ul>  | <ul style="list-style-type: none"> <li>MOU between relevant national government institutes and multi-national agencies concerning CIS generation, delivery and dissemination</li> <li>Generate evidence for policy</li> </ul>  |
|  | Resources needed    | <ul style="list-style-type: none"> <li>Human and financial resources</li> </ul>   | <ul style="list-style-type: none"> <li>Human and financial resources</li> <li>Satellite rainfall estimation and merging (RRI, University of Reading, University of California)</li> <li>Modelers, IT experts</li> </ul>   | <ul style="list-style-type: none"> <li>Community-based adaptation experts</li> <li>Policy analysts</li> </ul>  |  |
|  | Potential partners  | <ul style="list-style-type: none"> <li>MONRE</li> <li>Min. of Agriculture and Rural Development</li> <li>GIZ</li> </ul>   | <ul style="list-style-type: none"> <li>MONRE</li> <li>UNDP</li> </ul>   | <ul style="list-style-type: none"> <li>Asian Development Bank</li> <li>World Bank</li> <li>Domestic companies</li> <li>National agriculture extension centers (MARD)</li> </ul>  | <ul style="list-style-type: none"> <li>MARD</li> <li>MONRE</li> </ul>  |

■ **Regional cooperation to improve CIS for Agriculture in AMS**

In the following session, delegates shared and discussed their National Action Plans. Based on these discussions and on identifying common needs amongst AMS or existing expertise in AMS, participants proposed regional cooperation activities.

Proposals for collaboration were made between certain countries e.g. for sharing resources by organizing trainings on a same topic or for utilizing resources available in one AMS and of interest for another, as well as on the regional level, where

ASEAN could collaborate as a whole. Below table summarizes the ideas for regional collaboration that resulted from these discussions.

|   | ASEAN/Regional level | AMS OFFERING EXPERTISE ON CIS   |   |   |  |   |  |  |
|---|----------------------|---|---|---|--|---|--|--|
|   |                      | KH  | ID  | LA  | MM   | PH  | TH   | VN   |
| AMS PROPONENT OF REGIONAL COLLABORATION |                      |   | Development of seasonal cropping calendar                       |   |  |   | Agro-climate information for agricultural water management                                   |  |
|   |                      |   |   |   |  | Crop insurance  | Crop modelling (training and application)  |  |
|   |                      |   | Utilization of Android mobile applications for agricultural use |   | Capacity building activities from experts on hydro-meteorology | Trainings and capacity building activities from PAGASA  | Sharing of lessons and experiences on linking different agencies for a single command system |  |
|   |                      |   |   | Strengthening capacity of hydro-meteorology staff through trainings |  | Technical assistance from PAGASA to strengthen capacities of hydro-meteorology staff through trainings  |  | Upgrading of mobile services for agriculture use |
|   |                      | <ul style="list-style-type: none"> <li>World Meteorological Organization Regional Climate Centers (WMO-RCCs) Climate Monitoring – ENSO, IOD, monsoon, etc.</li> <li>Standardization of the language of disaster (AHA Center)</li> <li>Data warehouse with ASEAN Specialized Meteorological Center</li> <li>ASEAN Regional Risk Insurance Facility (GCF proposal)</li> </ul> |   | Crop pest forecasting   |  |   |  |  |
|   |                      | <ul style="list-style-type: none"> <li>ASEAN CIS Knowledge and Expert Advisory Hub</li> <li>Narrowing the gap between the CIS data rich and poor AMS</li> </ul>   |   | Crop pest forecasting   |  |   | Training on agro-meteorology center  |  |
|   |                      |   |   |   |  |   | Training on agro-meteorology center  |  |
|   |                      |   |   |   |  | Collaborate with PH and TH on a training program for agriculture extension workers on the provincial level to interpret CIS for agro-advisory development |  |  |