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Office of Environment, Energy and Climate Change
BRIEFER

Decision Support Tools for Climate Resilient Agriculture in the Bicol Region

Vulnerability to Climate Risks

The Bicol Region, located in the southeastern part of Luzon, Philippines, is vulnerable to climate-related hazards such as typhoons, floods, and dry spells. Such vulnerability translates to large agricultural losses affecting the economic livelihoods Bicol's population, 39% of whom work in the agriculture and fisheries sectors.[1] Losses arise from direct damages to crops and irrigation facilities and reduced water availability for farmers. For instance, from 2007-2011, Bicol sustained PhP 5.36 billion (US $122 million) worth of damage in rice farming due to typhoons, floods, and droughts.[2]

Flooded rice paddies in Nabua, Camarines Sur after a typhoon

The predicted occurrence of El Niño in 2014 is expected to result in reduced rainfall and drought conditions, further stressing the region. With long-term climate change impacts posing uncertainty in the region's agriculture sector, there is a need for 'agro-climate tools' to improve local capacities to anticipate and respond to climate risks to support Bicol's long-term food security.[3]

The Bicol Agri-Water Project

The Bicol Agri-Water Project (BAWP), a USAID grant implemented by the University of the Philippines Los Banos Foundation, Inc. (UPLBFI), in partnership with the International Research Institute for Climate and Society (IRI) at Columbia University in US, the Department of Agriculture Regional Field Office 5 (DA RFO5), and the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) is working to develop, test, and apply agro-climate tools to support decisions for managing climate risks at the farm level and for managing water resources at the watershed level. Adopting a user-driven approach, BAWP is customizing state-of-the-art, user-friendly decision support tools for the Bicol region, with watersheds of Buhi-Barit in Camarines Sur and Quinale A in Albay serving as pilot areas. The decision support tools include: (a) Water Evaluation and Planning

[1] CountryStat Philippines, Regional Profile: Bicol, Jun. 2014 <http://countrystat.bas.gov.ph/?cont=16&r=5>.

[2] Philippine Institute for Development Studies, "Impacts of Natural Disasters on Agriculture, Food Security, and Natural Resources and Environment in the Philippines," Discussion Paper Series No. 2012-36, Oct. 2012, Jun. 2014 <http://dirp4.pids.gov.ph/ris/dps/pidsdps1236.pdf>.

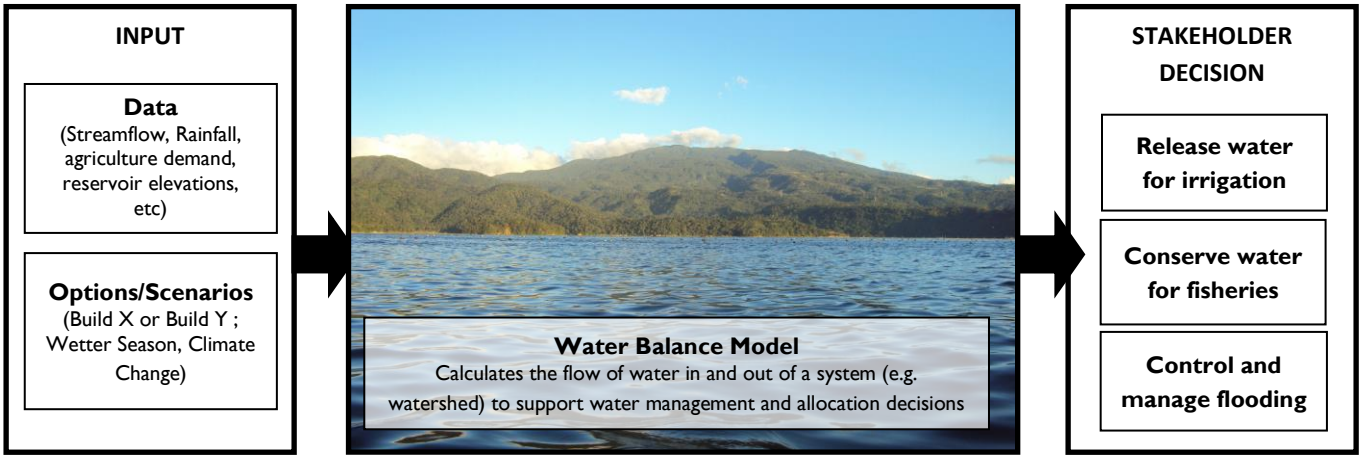
[3] Agro-Climate Tools for a New Climate-Smart Agriculture, CGIAR Program on Climate Change, Food Security, and Agriculture, 2011, Jun. 2014 <http://ccafs.cgiar.org/sites/default/files/assets/docs/iri_agro-climate_tools_brief-web.pdf>.

Model (WEAP), (b) Climate-Agriculture Model (CAM), and (c) Knowledge Sharing Portal and Maproom (KSPM). Complementing these technology-based tools is the Seasonal Climate Forecast and Extension Advisory (CLEA), an advisory bulletin that will be issued by municipal agricultural extension offices to farmers.

Water Evaluation and Planning (WEAP) Model

WEAP is a computer-based software tool that provides users with an integrated approach for water resources planning and management in a river basin. As a customized tool, WEAP-Bicol uses climate and hydrological data (e.g., rainfall amount, river water flow and irrigation needs) and calculates water supply available to users in the Quinali A and Buhi-Barit watersheds. The tool can also be applied at various scales including river basin, sub-watershed, and farm level. Once in place, WEAP-Bicol will enable decision makers such as water level managers, irrigators associations, or municipal agriculture officers to make informed decisions on how best to manage and allocate water resources especially on occasions where there are competing demands for water, ensuring that water will be available to farms in low-lying areas.

Schematic diagram of WEAP Model



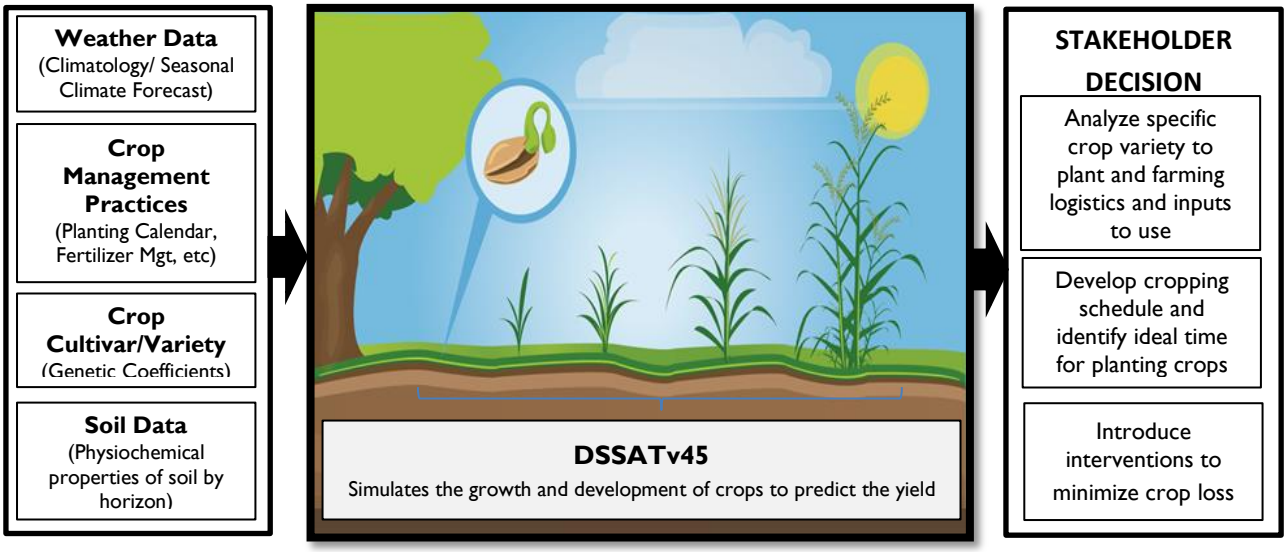
Functionally, WEAP-Bicol is linked with the CAMDT and the KSPM, acting both as a source and user of data/information from these two other decision support tools. Its interface with the CAMDT can help users, for example, understand how simulated water availability will affect crop management options. Meanwhile, climate and hydrological data from KSPM are inputs for the models that WEAP-Bicol will generate, which in turn will be made available to users through the KSPM website.

Climate-Ag Modeling Decision Tools (CAMDT)

The CAMDT is a computer desktop tool designed to guide decision-makers on adopting appropriate crop and water management practices that can improve crop yields given a climatic condition. It is a suite of tools, starting with IRI's Climate Predictability Tool (CPT) and PAGASA's seasonal climate forecasts that feed climate data to an analytical tool called, Decision Support System for Agrotechnology Transfer (DSSATv4.5) crop models, to extract risk profiles of crops, specifically rice, planted at different time windows. Decision-makers can use the risk profile to analyze the specific variety to plant and farming logistics and inputs to use. Such information can

also help users develop its cropping schedule, identifying the ideal time for planting crops to take advantage of favorable climate conditions or for introducing interventions to minimizing crop loss when climate conditions are poor. Climate data are also fed to a land allocation model, that can help farmers estimate the most profitable crop mix, assess how much land area is needed for planting, and identify ways to diversify crops to minimize cropping failures given certain climatic events and environmental conditions. Municipal agricultural technicians, provincial and regional level agricultural officials and state colleges and universities experts will be trained to operate the CAMDT and analyze information for agricultural planning and for dissemination of advisories to farmers.

Schematic diagram of the CAMDT



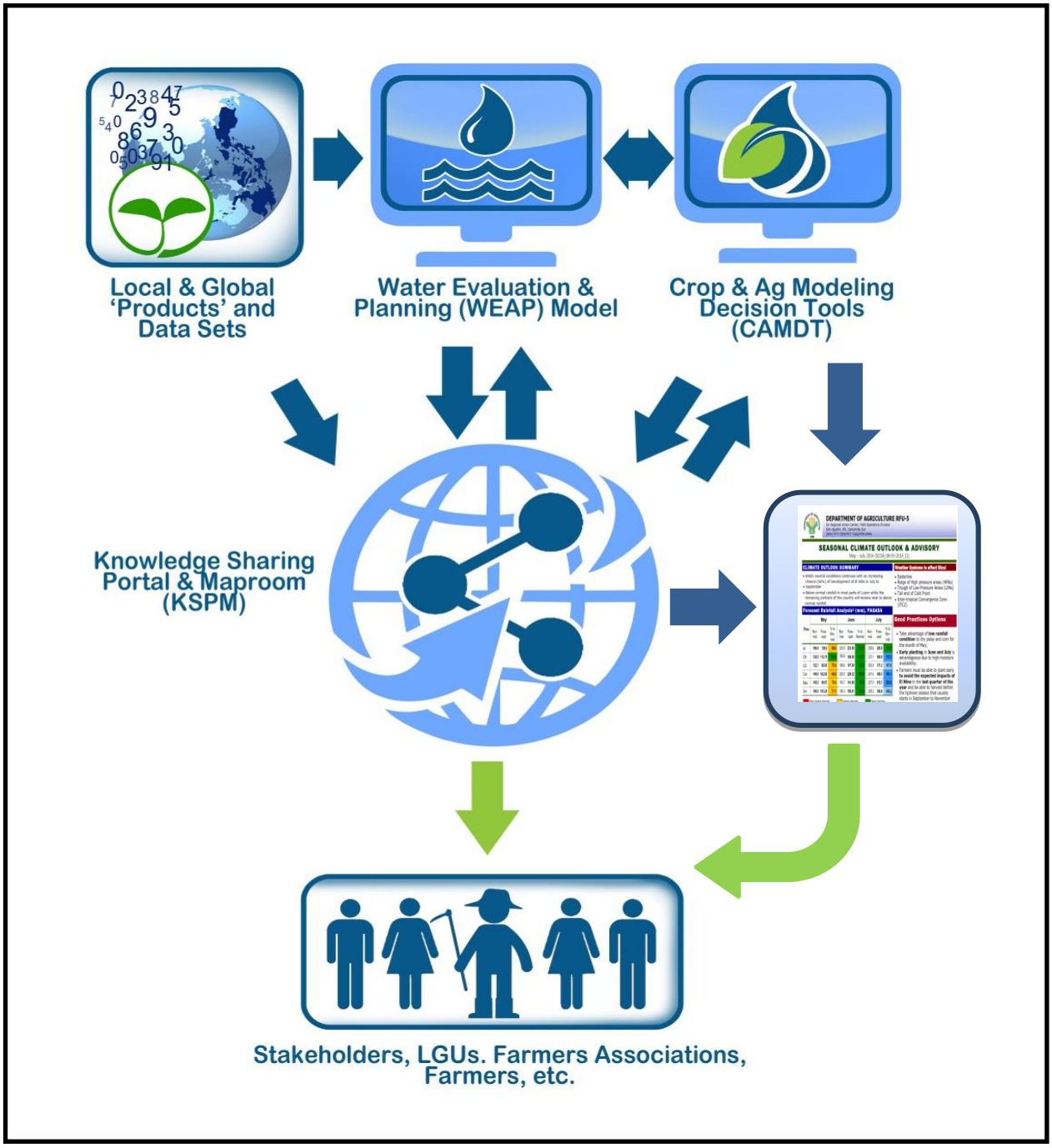
Interlinked with WEAP-Bicol and KSPM, the CAMDT also serves as a data source and user. For instance, CAMDT outputs can feed into WEAP-Bicol to assess the impact of water demand for irrigation on water management plans. CAMDT will also feed data to the KSPM, while relying on KSPM to provide climate forecasts to run crop models and to display outputs and make them accessible online.

Knowledge Sharing Portal and Maproom (KSPM)

The KSPM is a web-based tool that consolidates, hosts, and displays in one location all data and models generated from local and global products and datasets, CAMDT and WEAP-Bicol. It provides users with easy and convenient access to manage and show (as maps, time series plots, tables) climate, water and agricultural data generated by the tools described above.

KSPM is built using the IRI Data Library and Maproom technologies and hosted at the IRI website. Once in place, it can be accessed and used by agriculture technicians and extension workers at the regional and municipal levels as well as agriculture specialists in partner state universities and colleges. Project partners will request user feedback on KSPM functionalities to further enhance its applications and uses.

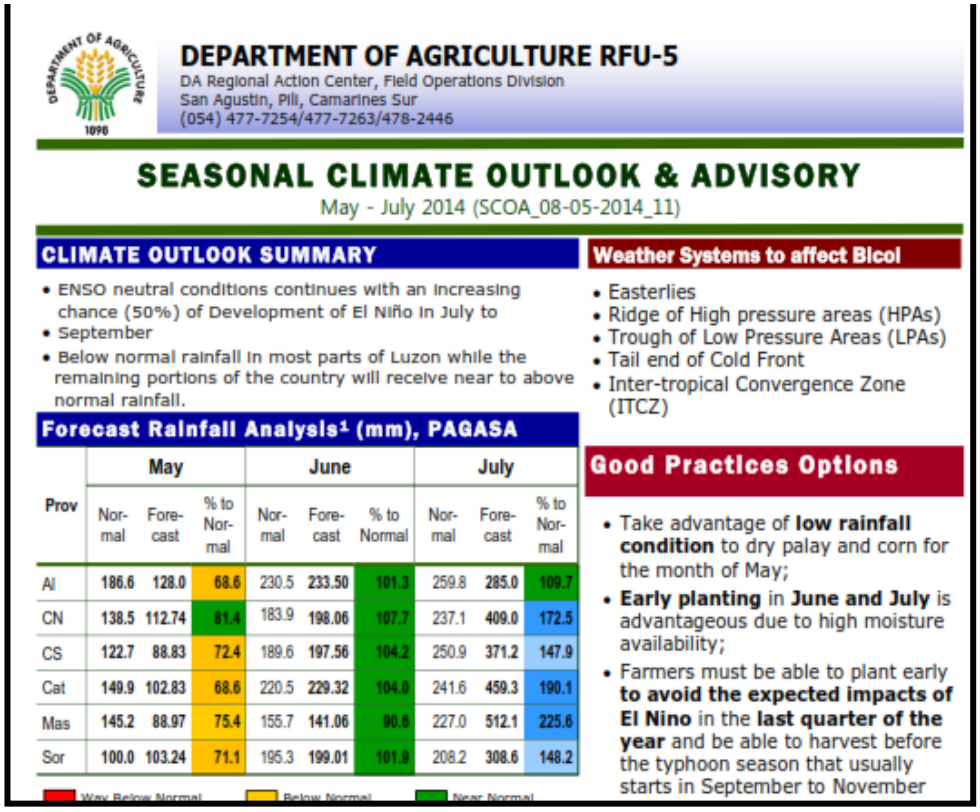
Schematic diagram of the Interrelationship of BAWP Decision Support Tools



Seasonal Climate Forecast and Extension Advisory (CLEA)

The Seasonal Climate Forecast and Extension Advisory (CLEA) is a one page bulletin that contains the climate outlook six months ahead and advisories by the agricultural extension office regarding the planting times, crops or varieties to plant, crop and water management practices suitable to the climate outlook and the ideal harvesting time. The climate information will be coming from PAGASA and the advisories will be outputs of the CAMDT.

DARFO5 Sample Seasonal Climate Outlook and Advisory



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SEASONAL CLIMATE OUTLOOK & ADVISORY
May - July 2014 (SCOA_08-05-2014_11)

CLIMATE OUTLOOK SUMMARY

- ENSO neutral conditions continues with an increasing chance (50%) of Development of El Niño in July to
- September
- Below normal rainfall in most parts of Luzon while the remaining portions of the country will receive near to above normal rainfall.

Forecast Rainfall Analysis[1] (mm), PAGASA

Prov	May			June			July		
	Nor-mal	Fore-cast	% to Nor-mal	Nor-mal	Fore-cast	% to Normal	Nor-mal	Fore-cast	% to Nor-mal
Al	186.6	128.0	68.6	230.5	233.50	101.3	259.8	285.0	109.7
CN	138.5	112.74	81.4	183.9	198.06	107.7	237.1	409.0	172.5
CS	122.7	88.83	72.4	189.6	197.56	104.2	250.9	371.2	147.9
Cat	149.9	102.83	68.6	220.5	229.32	104.0	241.6	459.3	190.1
Mas	145.2	88.97	75.4	155.7	141.06	90.6	227.0	512.1	225.6
Sor	100.0	103.24	71.1	195.3	199.01	101.9	208.2	308.6	148.2

Way Below Normal | Below Normal | Near Normal

Weather Systems to affect Bicol

- Easterlies
- Ridge of High pressure areas (HPAs)
- Trough of Low Pressure Areas (LPAs)
- Tail end of Cold Front
- Inter-tropical Convergence Zone (ITCZ)

Good Practices Options

- Take advantage of **low rainfall condition** to dry palay and corn for the month of May;
- **Early planting** in **June and July** is advantageous due to high moisture availability;
- Farmers must be able to plant early **to avoid the expected impacts of El Nino** in the **last quarter of the year** and be able to harvest before the typhoon season that usually starts in September to November

Project Partners in data collection and input, and scenario evaluation: IRI-Columbia University; Department of Agriculture-Region 5; Central Bicol State University of Agriculture; Bicol University; Provincial Governments of Albay and Camarines Sur; Municipal Governments of Buhi, Nabua and Polangui; Department of Environment and Natural Resources 5; National Irrigation Administration 5; National Power Corporation 5; Philippine Atmospheric, Geophysical and Astronomical Services Administration 5; University of the Philippines Los Baños; Irrigators' Associations in Quinale A Watershed

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