FFTC Agricultural Policy Platform (FFTC-AP)
Available online at: http://ap.fftc.agnet.org/index.php

CLIMATE-SMART AGRICULTURE INITIATIVES IN THE PHILIPPINES

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ABSTRACT

Climate-smart agriculture (CSA) is an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. CSA aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions, where possible. CSA is an approach for developing agricultural strategies to secure sustainable food security under climate change. CSA provides the means to help stakeholders from local to national and international levels identify agricultural strategies suitable to their local conditions. CSA is one of the 11 Corporate Areas for Resource Mobilization under the FAO's Strategic Objectives. It is in line with FAO's vision for Sustainable Food and Agriculture and supports FAO's goal to make agriculture, forestry and fisheries more productive and more sustainable".

Keywords: Climate-smart agriculture, Per capita food consumption, Rice crop manager, Leaf color char, AgriDOC

INTRODUCTION

The Philippines is an agricultural country with a land area of 30 million hectares, 47% of which is agricultural land. Of the total area under food crops, coconut accounted for the biggest average harvest area of 4.25 million hectares, Sugarcane with 673 thousand hectares; Industrial crops with 591 thousand hectares; 148 thousand hectares for fruits; 270 thousand hectares for vegetables and rootcrops; 404 thousand hectares for pasture and 133 hectares for cutflowers.

The country's main agricultural crops are rice, corn, coconut, sugarcane, bananas, pineapple, coffee, mangoes, tobacco, and abaca. Secondary crops include peanut, cassava, camote (a type of rootcrop), garlic, onion, cabbage, eggplant, *calamansi* (a variety of lemon), rubber, and cotton. The Philippines is still primarily an agricultural country despite the plan to make it an industrialized economy. Most citizens still live in rural areas and support themselves through agriculture. The country's agriculture sector is made up of 4 sub-sectors: farming, fisheries, livestock, and forestry (the latter 2 sectors are very small), which together employ 39.8% of the labor force and contribute 20% of GDP. The fisheries sector is divided into 3 sub-sectors: commercial, municipal, and aquaculture (cultivation of the natural produce of bodies of water). The Philippines exports its agricultural products around the world, including the United States, Japan, Europe, and ASEAN countries (members of the Association of Southeast Asian Nations). Major export products are coconut oil and other coconut products, fruits and vegetables, bananas, and prawns (a type of shrimp). Other exports include the

Cavendish banana, Cayenne pineapple, tuna, seaweed, and carrageenan. Imported agricultural products include unmilled wheat and meslin, oilcake and other soybean residues, malt and malt flour, urea, flour, meals and pellets of fish, soybeans and whey.

The Philippines has been identified as one of the country's most at risk from climate change, with the Global Climate Risk Index 2018, released by Bonn-based NGO German watch, ranking the country as the 5th most affected by changing weather patterns over the past 20 years. Among the changes in climatic conditions has been the more frequent occurrence of El Niño weather cycles, often characterized by lower rainfalls and higher temperatures, threatening crop outputs. The last major El Niño event, in 2015 and 2016, reduced harvest yields by 4.5% and cut returns along the food production and processing chain. Agriculture grew by 1.80 percent in the fourth quarter of 2018. Crops, livestock, poultry and fisheries contributed to the higher production during the quarter. The Philippines is making efforts to modernize and strengthen its agriculture sector, with both the state and private companies promoting the adoption of advanced technology and smart farming methods to increase harvests and minimize losses

Food consumption

The annual per capita food consumption in the Philippines is shown in Table 1.

Table 1. Annual Per Capita Food Consumption in the Philippines (kg/year)

Rice	114.2
Banana	39.5
Corn	21.9
Pineapple	10.6
Mango	8.2
Coconut	7.4
Cassava	2.6
Sugarcane	2.5
Papaya	1.6
Calamansi	1.5
Onion	1.9
Garlic	0.4
Cabbage	1.2
Peanut	0.9
Potato	0.9
Mongo	0.6
Coffee	0.3
Pomelo	0.3
Pork	18.8
Chicken	12.8
Tuna	4.3
Beef	2.5
Shrimp/Prawns	0.5
Oyster	0.2

CLIMATE-SMART STRATEGIES

School on the Air (SOA)

The success of the SOA project on climate change is laudable. Distance learning is a good tool to consider especially in the dissemination of good practices on climate change. We need to get our acts together and make a difference in the lives of our farmers and fishers worldwide.

Radio broadcasting campaign on Climate Smart Agriculture (CSA)

The radio campaign on CSA is an on-going activity of PFRB in tandem with the Philippine Agricultural Journalists, Inc. (PAJ) and DA-RFOs in selected regions wherein localized interviews on the experiences of farmers, experts and LGUs are aired in radio stations. It discusses integrated farming and other strategies in the adaptation and mitigation of climate change.

Small-scale native pig production

Climate change knows no gender and spares no-one. Gender, however, matters at the societal level. Women, who are often socially restricted to upholding specific roles within their households, are highly vulnerable to the impacts of climate change. With their current status in the society, they lack the necessary means to adapt to these impacts, which range from floods, typhoons and droughts, among others.

In a case study in the Guinayangan Climate-Smart Village (CSV) in the Philippines, small-scale native pig production was introduced as a low-cost investment that women can manage. It was tested in Arbismen, a barangay in the Guinayangan CSV, to show that women may still participate in climate-smart agriculture (CSA) initiatives that can enhance the adaptive capacities and reduce the greenhouse gas emissions of communities. This case study exhibits the transformative potential of CSA, which can provide livelihood options for farmers and empower women inside and outside their households. The study was implemented by the International Institute of Rural Reconstruction (IIRR) and World Agroforestry Centre (ICRAF) and was supported by the CGIAR Research Program on Climate Change, Agriculture and Food Security in Southeast Asia (CCAFS SEA).

Revolutionary guide map

A revolutionary guide map (www.farmersguidemap.gov.ph) plots which crops are best grown for each area in the Philippines and where there are shallow water tables. It also indicates fertilizers needed to make up for the nutrients lacking in the area's soil and the poverty incidence of the community selected.

Solar-powered irrigation system

The use of solar-powered irrigation system costs less from the traditional irrigation systems. The NIA (National Irrigation Administration) computes that for every hectare of irrigated farm, the government must spend Php450,000. With the solar-powered irrigation system, it can only spend Php150,000 per hectare and can be constructed in just a matter of 60 days. With the first solar-powered irrigation already set in place, the DA is eyeing to set up 170 units nationwide.

Drones

In terms of smaller scale technology, the DA also began the use of drones, which were intended to be used in vegetable farms to spray fertilizers and pesticides on a strawberry farm in Benguet.

Smart farm

A smart farm which is part of the SPICE project is designed to develop and promote urban farming and high-tech plant conservation. It is located at the Department of Science and Technology's nursery of indigenous and endemic plants in Quezon City, and operated in coordination with the University of Philippines Diliman and the University of Philippines Los Baños, the facility will serve as a greenhouse for new technology and modern farming methods. Techniques such as vertical farming, micropropagation, cryopreservation and hydroponics will be practiced, with the aim of developing technology to boost crop production and reduce the need for manual labor

The Department of Agriculture, through its Agricultural Training Institute, has partnered with the Social Institute for Poverty Alleviation and Governance to deliver courses teaching farmers in Central Luzon about climate-smart practices, including the use of modern technology, and crop and soil management. Education programs are vital to raising awareness of the potential benefits of technology in farming.

In addition, the Philippine subsidiary of multinational agricultural firm Monsanto launched a smart farm initiative in February to provide training to corn growers. The nationwide program see farmers learn about how new technologies can improve corn planting and cultivation, including the use of high-yield and disease-resistant strains of corn. Taking place at 16 smart farm centers across the country, the program aims to reach 20,000 growers in its first year. The focus on sustainable farming techniques is also expected to generate a number of business opportunities for service providers in the agriculture sector. The anticipated take up of new farming practices, including the deployment of machinery to ease the manual workload, will increase demand for farm equipment and support services in rural areas, while greater use of irrigation, greenhouses and a potential move towards organic production could bolster demand for related materials, technology supplies, and fertilizer and seeds.

Capital needed to meet smart farming goals

In addition to education and training, the successful transition to more sustainable practices will also require greater access to credit for farmers, according to some industry figures. Farmer cooperatives receive more support from the government, particularly in terms of credit. Adequate support could see the Philippines go from being a net agricultural importer to a net exporter. Supporting the call for more finance, the Philippines Mindanao Jobs Report, released by the World Bank in June last year, stated that greater access to credit was key to improving the productivity of farmers on the Philippines' second-largest island, and was essential to facilitating a shift towards high-yield and high-value crops.

APPS

The Philippine Rice Research Institute (PhilRice), more known for its invention and promotion of hybrid rice seeds, has been tinkering with the computer to develop mobile and desktop applications.

Rice Crop Manager (RCM)

A desktop application launched in 2013 intended to be used by the agency's extension workers who reach out to the farmers nationwide. The RCM recommends what farmers need to increase their crop yield. It has so far generated 1.46 million recommendations. The RCM can give out as only as much as three recommendations per farmer. The slow internet connectivity is the main problem and the financial capacity of the farmers to buy fertilizers, the prices are very high [or] not all the fertilizers recommended can be found in the area. Some other issues are also in receiving the RCM recommendations. Among the farmers covered by the RCM, about 20% were unable to receive the recommendation or did not understand the data. In some instances, the extension workers are unable to explain the results of the RCM to the farmers.

Leaf Color Chart (LCC)

In the past, the LCC, was simply printed on paper and costs about P50. The usual chart has four green panels. Users would compare the leaves of the rice plant to the green panels. If it falls below the least green panel, there is a recommendation on how much nitrogen fertilizer should be applied. An app was made since the original model was based on the user's perception so there may be variations on how to see color. Since the app is camera-aided, the variation will be minimized

AgriDOC App

PhilRice has developed the AgriDOC App which is expected to help farmers to rise in the value chain. The AgriDOC App is a farm management tool which can keep records on expenses and activities. It also allows farmers to view their farm area through Google Maps. There is also a calendar to remind users of farm-related tasks.Since it was made available on the Google Play store, farmers have already been using the offline app.

METOS instruments

These instruments enable farmers to monitor weather patterns and model forecasts for their fields such as temperature, humidity, rainfall, leaf wetness, and insect pressure. Collected data are sent to the farmer's mobile phone. ImPACT Philippines introduced Climate-Smart Agriculture to smallholder farmers to increase farming productivity and to improve food security in the country through the

installation of Pessl-manufactured METOS solution. For its part, ATI will lead the skills training of farmers and agricultural technicians. ATI will also manage their exposure to new farming methods driven by Climate-Smart concepts in the 4th stage of the project. The municipality of Buguias in Benguet is the project's pilot site, aiming to help the farmers manage their use of farming inputs. The METOS technology, developed by the project partner Pessl Instruments, is provided free for the farmers in the said municipality. ImPACT Philippines is implemented under the DeveloPPP program of the German Federal Ministry for Economic Cooperation and Development through DEG. Moreover, it is supported by ATI and Calata Corporation.

Climate resilience rice

This is the use of drought, submergence, and saline tolerant rice varieties. Farmers participated in the selection of these rice varieties, paving the way for a need-based selection of rice varieties and promoting faster adoption of these varieties in the farming community.

Review and adjustment of cropping calendar

Farmers in the MASIPAG1 (Farmers Scientist) network have developed early-maturing rice varieties which 1 MASIPAG (*Magsasaka at Siyentipiko para sa Pag-unlad ng Agrikultura* or Farmers Scientist) is a farmer-led network of people's organizations, non-government organizations and scientists are harvested before the main typhoon season starts, and they do staggered planting and use diverse crops to help reduce crop failure risks.

***Sloping Agricultural Land Technology* (SALT)**

This promotes contour farming and other soil conservation measures in sloping lands, i.e., using tree legumes to improve the fertility and stability of agricultural soils. SALT is a form of alley farming in which field and perennial crops are grown in bands 4-5 m wide between contoured rows of leguminous trees and shrubs. The latter are thickly planted in double rows to form hedgerows.

Farm diversification in the rainfed and upland ecosystems

Farmers are intercropping corn with cassava, because the 2nd cropping of corn is no longer successful. Cassava is harvested after 10 months. In addition, many farmers are diversifying their production systems, growing other cereals, vegetables and rearing fish and animals such as swine and chickens. The residues and waste from each system are being composted and used on the land. This diversification has increased incomes, improved nutrition, built resilience to shocks and minimized financial risks.

Rice intensification in the farm

This refers to an integrated farming system for rice and vegetable components, as well as fish and livestock. It also integrates crop management system to improve productivity, profitability and environment safety. This technology is widely adapted by farmers in irrigated rice ecosystems.

Rain water harvesting

This provides irrigation water during the dry season and at the same time slowing down inundation of lowland areas during extreme rainfall events. Rainwater storage tanks were constructed made of wire-framed ferrocement, with capacities varying from 2 to 10 m^3. The tanks were then plastered both inside and outside, thereby reducing their susceptibility to corrosion relative to metal storage tanks (http://www.unep.or.jp/Ietc/ Publications/Urban/UrbanEnv2/9.asp).

System of Rice Intensification (SRI)

This is a methodology for increasing the productivity of irrigated rice by changing the management of plants, soil, water and nutrients. SRI leads to healthier soil and plants supported by greater root growth and the nurturing of soil microbial abundance and diversity (http://sri.ciifad.cornell.edu/). A local group SRI-*Pilipinas*, an Oxfam-assisted organization, records an average of 6.4 tons per hectare, which is a

yield gain of around 114% over the current national average; and higher returns on investment (Oxfam 2011).

Mitigating methane emissions through new irrigation schemes called Alternate Wetting and Drying (AWD)

This was developed by the International Rice Research Institute (IRRI) in cooperation with the Philippine Rice Research Institute (PhilRice). The visible success of AWD in pilot farms, as well as specific training working towards the sustainable use and management of biodiversity through farmers' control of genetic and biological resources, agricultural production and associated knowledge. The adoption of AWD facilitated an optimum use of irrigation water, so that the cropping intensity could be increased from 119% to 160%. (Bouman *et al.* 2007 and Wassman, R. 2012).

Farmers using biotechnology

The additional income from planting Genetically Modified (GM) corn is approximately US$ 107.8 million covering 125,000 small farmers (Halos, S. 2012). Farmers had additional income because Bt corn yielded more compared to the traditional varieties per hectare, the average yield is at around 6 to 7 metric tons according to Dr. Randy A. Hautea the Global Coordinator and Southeast Asia Center director of International Service for the Acquisition of Agri-biotech Applications (ISAAA). Experts led by National Scientist Dr. Emil Javier, president of the National Academy of Science and Technology (NAST), say that the additional income gained by farmers from Bt cotton could have reached 2 to 3 billion in 2009.

Promotion of organic agriculture

Farmers are now encouraged to shift to organic agriculture by virtue of the Organic Agriculture Act of 2010. According to Muller (2010), adaptation and mitigation based on Organic Agriculture (OA) can build on well-established practice as OA is a sustainable livelihood strategy with decades of experience in several climate zones and under a wide range of specific local conditions. The potential of this strategy to adapt to the adverse effects of climate change and at the same time contribute to the reduction of GHG emissions and to carbon sequestration is huge.

Enhanced Farmers Field School (EFFS)

The aim of the EFFS is to build farmers‟ capacity to analyze their production systems, identify problems, test possible solutions and eventually adopt the practices and technologies most suitable to their farming system. The DA Agricultural Training Institute (ATI) have encourage farmers to build up their knowledge, skills and climate response by making close observations and experimenting on the farm on various aspects of agriculture –crop response to various types of nutrients and amounts of water, soil and water management, how to build organic matter in soil, pest-predator relationship and growth cycles for ecological pests control. Farmers are making their own weather observations and use these and other agrometrological information in taking farming decisions (DA-ATI 2010).

Aquasilviculture

This constitutes the integration of mangrove ponds and pens for fish and crabs (Primavera, 2000). Such systems not only sequester carbon, but they are also more resilient to shocks and extreme events and also lead to increased production due to improved ecosystem services. There are more than 50 mariculture parks distributed in fourteen regions of the country. Each mariculture park is established with a purpose as a breeding facility, tourism destination or research and development area. Activities in these parks include integration of research results and business trends for sustainable ventures for local community development (DA-BFAR 2008).

Livestock industry

The DA Bureau of Animal Industry (BAI) is focusing on strategic research such as: (1) breeding and screening for heat tolerant livestock Box 3: IPCC on AWD According to the revised IPCC methodology (IPCC 2007), „multiple aeration", to which the AWD corresponds, potentially reduces methane emissions by 48% compared to continuous flooding of rice fields. AWD therefore generates multiple benefits related to methane emission reduction (mitigation), reducing water use (adaptation where water is scarce), increasing productivity and contributing to food security. and poultry, indigenous species and breeds will be evaluated for their adaptability and climate resiliency, (2) novel feed formulations that will reduce the production of CH_4 from livestock and from livestock waste, (3) systems to efficiently and cost effectively capture GHG from farm wastes and converted into an energy source to replace more carbon-intensive fuels such as firewood, coal, and kerosene.

Agroreforestation

This integrates perennial and annual crops in a two canopy or multicanopy production system. The DA is aggressively promoting tree-based farming systems as part of a low carbon emissions development pathway and adaptation strategy. In the watershed areas of the Soil and Water Impounding Projects (SWIP) of the DA Bureau of Soil and Water Management (BSWM), indigenous agroforestry species are planted to provide watershed protection and additional source of food to the farming community.

Non-conventional irrigation programs

The BSWM is pursuing the development of water resources in the country for Small-Scale Irrigation Projects (SSIPs) including, Small Water Impounding Projects (SWIPs), Small Diversion Dams (SDDs) Small Farmer Reservoir (SFR) and Shallow Tube Wells (STW). These provide supplemental irrigation to about 8,100 hectares of rainfed rice-based area that benefited more than 5,500 farmers that are not within the coverage of the National Irrigation Administration (NIA) (http://bswm.da.gov.ph/).

ENABLING LAWS

Legal Basis 1. Climate Change Act of 2009 (Republic Act 9729) - An Act Mainstreaming Climate Change into Government Policy Formulations. Legal Basis 2. Disaster Risk Reduction Act of 2010 (Republic Act 10121). An Act Strengthening the Philippine disaster risk reduction and Institutionalizing the National Disaster Risk Reduction and Management (DRRM). Legal Basis 3. Agriculture and Fisheries Modernization Act of 1997 (Republic Act No. 8435). An Act Prescribing Urgent Related Measures to Modernize the Agriculture and Fisheries Sectors of the Country.

POLICY AND STRATEGIC INITIATIVE IN ADDRESSING CLIMATE CHANGE

The DA has devised appropriate adaptation and/with mitigation measures to respond to projected increases in the intensity of weather events. In an Asia and Pacific Economic Cooperation (APEC) seminar on climate change adaptation and mitigation potential in agriculture hosted by the Philippines in 2012, the resolution was signed in which one of the major recommendation is the launching of the Adaptation and Mitigation Initiative in Agriculture (AMIA). The AMIA objectives are: (1) to reduce the risks posed by climate change to project activities, stakeholders and results, (2) to ensure that project or program activities maximize their contribution to adaptive capacity of target populations and do not inadvertently increase vulnerability to climate change, and (3) to build resilience while achieving development goals.

To further strengthen AMIA and the above policy framework, the DA Secretary approved four strategic objectives and the seven systems-wide programs. The four strategic objectives are: 1) To increase the adaptive capacity and productivity potentials of agriculture and fisheries livelihood by modifying commodity combinations to better meet weather issues and natural resource endowments. 2) To redefine or remap Strategic Agricultural Fisheries Development Zone (SAFDZ) by including climate change vulnerabilities as part of mapping variables. 3) To redefine the agriculture development planning framework as basis for agricultural planning by including key factors/variables associated with climate change, and 4) To develop a new framework and plan for the provision of "new" government agriculture services towards the accelerated development of climate smart agriculture and fisheries industries.

The seven systems-wide programs on climate change

1. Mainstreaming AMIA, which aims to minimize DA‟s institutional risks and protect government investments and adjust development programs/projects and approaches to address CC risks.

2. Climate Information System (CIS), which has the objective of having a common database to generate timely and reliable data for disaster risk reduction, planning, and management through the conduct of vulnerability and risk assessments of productive areas, and the establishment of agro-meteorological stations in highly vulnerable areas.

3. Philippine Adaptation & Mitigation in Agriculture Knowledge Toolbox that will inventory, generate, and disseminate adaptive tools, technologies, and practices, which users can readily use through the extension services of the country, while research will pursue new tools and knowledge in partnership with the scientific community.

4. Climate-Smart Agriculture Infrastructure, that will support the development of new designs and construction protocols for agricultural infrastructure to withstand adverse effects of extreme weather events, repair of existing systems to enhance resilience where necessary and improvement of the design and management of irrigation systems to reduce leakage and optimize water use. Likewise, production and postharvest facilities, including fishery infrastructure, will be made more climate-resilient.

5. Financing and Risk Transfer Instruments that will develop new innovative financing schemes to help the agriculture producers obtain financing, insurance, and guarantees for climate change related projects and events especially vulnerable stakeholders in the agriculture and fishery sector. A quick response fund will be set up to provide emergency support to farmers in affected production areas.

6. Climate-Smart Agriculture and Fisheries Regulations where regulatory agencies will redesign their services to take into consideration new technologies towards the promotion/development of climate-smart agriculture. This is to ensure, among others, that new kinds of pesticides, fertilizers and other inputs, as well as genetically modified crops and organisms, that may be created or brought in to address the changing weather patterns will comply with effectiveness and safety standards, and

7. Climate-Smart Agriculture Extension Systems, under the leadership of ATI and in partnership with the LGUs, SCUs, NGOs, and the private sector, that will mobilize the entire agriculture and fishery extension infrastructure to develop and implement a national extension system that will educate and equip the stakeholders to deal with climate change including adaptation and mitigation measures available for the agriculture and fishery industries. These core system‟s wide programs will allow the Department to better address climate change vulnerabilities and risks in crafting and implementing the nation‟s agriculture and fisheries modernization programs. The systems-wide program also addresses the five key principles in the social contract of President Aquino as enumerated above.

Adopt a watershed management framework

Watershed or catchment or basin or drainage area refers to any topographically delineated area that can collect water and is drained by a river system with an outlet. It includes all land areas extending from the ridge down to the stream for which water is collected (Brooks, *et al.*, 1981). The National Convergence Initiative (NCI) compose of the DA, DENR, and Department of Agrarian Reform (DAR) and headed by the DA Secretary adopted the watershed and ecosystem management approach in the implementation of the NCI project. The GIZ strongly supports the NCI in adopting the integrated ecosystem management approach through the Environment and Rural Development (EnRD) Program. A watershed approach in agriculture and natural resources (ANR) will allow stakeholders to focus on issues that transcend administrative boundaries and greatly increase their understanding of poverty and environment challenges.

A watershed approach is needed because planning and management decisions in one part of a watershed can have significant impacts on natural resources elsewhere. Watershed and ecosystem management is holistic, collaborative, multiple use and sustainable management of all resources within a watershed A successful community stewardship of a watershed requires "top down" interventions such as (1) policy, (2) funding, (3) institution building, and (4) technical support, and (5) enforcement. Illustrated in Figure 2 is a holistic framework on watershed management that includes the coastal and marine ecosystems (from ridge-rivers-reef) and catchment basin. The framework can be divided into three major pillars. Pillar one deals with the green economy (land based), Pillar 2 deals with urban development where settlement and urban agriculture could co-exist, and Pillar 3 on the blue economy (coastal and marine ecosystems). For each pillar, major zones are identified and the possible interventions that the community and Local Government Units (LGUs) can implement. One of the major benefits that the stewards can derive is on the water rights which could provide income to the community. Responsible mining is being advocated. Figure 2. Watershed management framework (source: Godilano, E.C. 2009, 2011) The Green Pillar could be divided into six major components namely: (1) core zone, (2) protection forest, (3) plantation forest, (4) upland ecosystems where green mining could be located, (5) lowland ecosystems, and (6) water resources particularly sources of fresh water for domestic consumption. We anticipate the critical issues on water rights once the watershed is sustainably managed by the communities. The yellow pillar consists of settlements in the urban and rural areas that form the catch basin of a watershed. They are most vulnerable to impacts of sea level rise, storm surge, and coastal erosion. The blue pillar consists of the coastal and marine ecosystems. We believed that the survival of the communities living in the coastal areas as well as the ecosystems is dependent on a well-managed watershed.

CONCLUSION

CSA measures are integrated into the overall development approaches and agenda in the Philippines. Adaptation and mitigation measures, which require poverty reduction and food security, benefit the neediest of the needy and at the same time benefit the most vulnerable communities without harming the environment. CSA measures meet ecological, economic, and socially sustainable goals towards achieving food security and poverty reduction.

RECOMMENDATIONS

The following are suggested and important commitments and actions that can be undertaken among the ASEAN member countries to tackle the challenges of food and water security, nutrition, poverty, climate change, sustainable development, environmental sustainability, and CSA.

Policy reforms

1. Enhance integrated, systems based approaches, strategies and institutional arrangements that span across different sectors, ministries and intergovernmental organizations;

2. Address the sustainable management of oceans for food security and livelihoods, including addressing illegal, unreported and unregulated fishing;

3. Promote international cooperation and avoid unilateral measures, such as export bans;

4. Encourage private sector investment by reducing or insuring gain-risk (for example, through funding transitional programs that enable eventual private sector investment.

5. Support low income food importing countries, with particular attention for vulnerable families and children.

Research and development

1. Address the scientific, technical and socio economic aspects of adaptation and mitigation in agriculture and their synergies, within international food security and climate change processes, for example through further work under the UNFCCC SBSTA.

2. Investing in the research and development of non-proprietary plant varieties and breed that require nutritional, productivity, and diseases and climate resistant traits needed by different producers;

3. Partnerships between the private sector and farmers/farmer groups and cooperative to promote the production of high quality products. Partnership enhances knowledge sharing between stakeholders, including scientists, farmers, private sector, civil society and governments, with participatory agenda setting, for example, through initiatives such as the Global Research Alliance.

Extension and education

1. Strengthen the knowledge base on sustainable practices, as well as on financial and policy options that would enable countries and communities to meet their food, water and nutritional security and development goals;

2. Improve farmers‟ access to and awareness of knowledge services, finance, agricultural inputs, rights (for example, land tenure rights) as well as increase the availability of these resources.

3. Implement and scale-up innovative successful programs and best practices that combine sustainable agriculture and land use, forestry and sustainable fisheries and aquaculture, through local, regional, sub regional, and national programs and institutions, as a matter of priority;

4. Sharing existing technologies off the shelf and into the hands of (small holder) farmers, thereby improving their access to information, technical knowledge, for example ICT options;

5. Creating platforms/learning hubs (such as CSA knowledge platforms) and bringing together farmer groups/associations at the grassroots level to facilitate dialogue and knowledge sharing, and to building capacity to innovate and adopt CSA practices.

REFERENCES

Agricultural Indicators System (AIS) from the Philippine Statistics Authority:
https://psa.gov.ph/sites/default/files/foodconsumptionnutrition2015.pdf
https://www.nationsencyclopedia.com/economies/Asia-and-the-Pacific/Philippines-AGRICULTURE.html# ixzz5lV2ti28H
http://masipag.org/cms/)
http://www.agriculture-ph.com/2009_02_01_archive.html
http://www.gardeninthecity.net/philippine-urban-garden-planting-uide
www.da.gov.ph
www.philrice.gov.ph

Date submitted: May 28-29, 2019

Reviewed, edited and uploaded: Jun. 18, 2019