

II. The National Soil and Water Resources Research and Development/ Extension Agenda (NSWRRD/EA), 2017 - 2022

2.1 Goal

To ensure sustainable management of soil and water resources of the country to contribute towards productivity of the agriculture and fishery sector.

2.2 Objectives

General:

To generate science-based soil and water resources information; develop and deliver innovative technologies on soil and water management to stakeholders to address land degradation, agro-biodiversity loss and climate change.

Specific:

1. To enhance and sustain the productivity of prime agricultural lands, and rehabilitate degraded lands;
2. To create opportunities for agri-based livelihood while sustaining productivity of soil and water resources;
3. To enhance institutional capacity including human resources development and upgrading of facilities;
4. To strengthen partnership, collaboration and networking of all stakeholders in planning and implementing RD/E agenda and programs for sustainable land management systems; and
5. To formulate and advocate environmental policy options, including issues concerning equity (i.e. gender, resource access, tenure).

2.3 NSWRRD/EA Framework

The development of the NSWRRD/E Agenda is guided by the framework as presented in Figure 5. The Philippines is committed to address major environmental concerns – the international commitment on combating soil/land degradation, climate change mitigation and adaptation, and biodiversity conservation; and national commitment towards improving agricultural productivity, ensuring food and nutrition security, and environmental protection.

The updated NSWRRD/E Agenda addresses the challenge on declining quality of soils/agricultural lands as manifested by the following top ten soil threats according to the Food and Agriculture Organization of the United Nations (U.N.): soil erosion, soil organic carbon loss, nutrient imbalance, soil acidification, soil contamination, waterlogging, soil compaction, soil sealing, salinization and loss of soil biodiversity. A paradigm shift is needed to ensure that soil and water resources which serve as sustainable habitat for agriculture and agri-based livelihood. Two major strategies could be carried out to which will include soil carbon stock development and surface and shallow groundwater development. To implement these strategies, the following activities should be considered: a) soil health improvement; b) long-term monitoring and data warehousing and c) water resources development and management. The geographical domains include both the prime and marginal/degraded lands. The former are the key production areas while the latter are the idle and underutilized areas subject to various forms of degradation.

Through the conduct of research and development/extension projects that will improve soil and water quality, it is expected that the outputs that will be generated can contribute to the attainment of the following outputs:

- Enhanced and sustained productivity of prime, marginal and degraded lands;
- Effective, efficient and environmentally sound strategies for soil and water conservation, management and utilization;
- Strengthened partnership, collaboration and networking;
- Enhanced institutional capacity including human resource development and upgrading of facilities;
- Created soil and water resource-based livelihood opportunities; and
- Formulated and advocated environmental policies

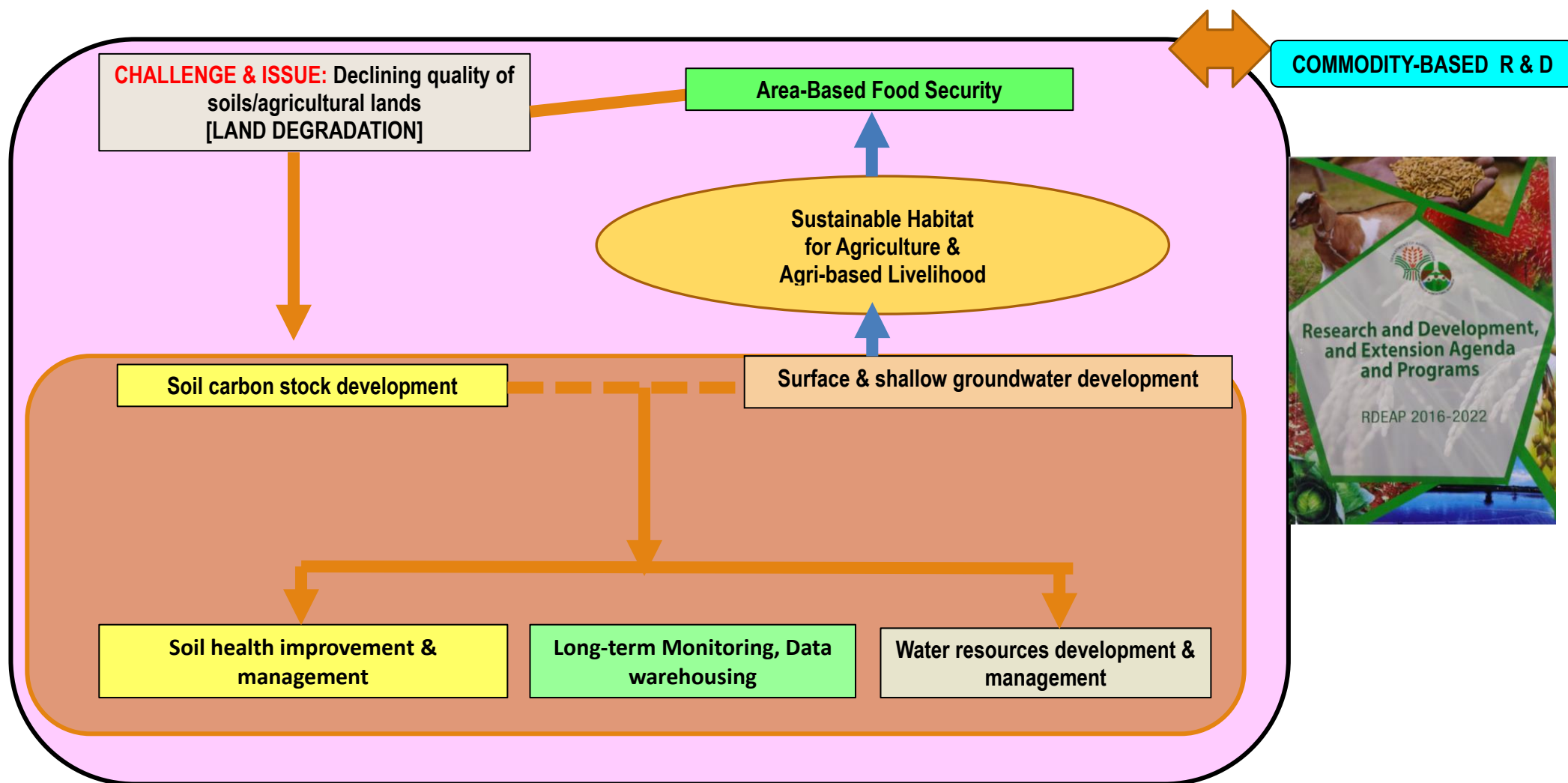


Figure 5. Strategic Framework for the National Soil and Water Resources R & D/Extension Agenda and Inter-sectoral Partnership for Climate Change Adaptation and Biodiversity (Food Security, Environment and Climate Change Nexus Relative to Soil & Water R & D)

2.4 Updated NSWRRD/E Agenda & NAP-DLDD Complementmentation

Recognizing the significance of conserving and managing land and water resources to address the challenges of land degradation, drought, climate change and food insecurity, the DA-BSWM spearheaded the formulation of the updated Philippine National Action Plan to Combat Desertification, Land Degradation and Drought (NAP-DLDD) (2015-2025) and the NSWRRD/E Agenda 2017-2022.

As the UNCCD Philippine Focal Agency to fulfill the country's commitment, the BSWM initiated the participatory updating of the NAP-DLDD in accordance with the 10-year strategic framework of the UNCCD to enhance its implementation at the country level. The NAP-DLDD is a land and water centered action plan and it serves as a comprehensive and well-focused policy instrument and provide the platform of convergence of actions of the four umbrella agencies in the country, namely; DA, DAR, DENR and DOST. The over-all goal of the aligned NAP-DLDD is to support the national agenda on poverty reduction and ensuring environmental sustainability through strengthened partnership and convergence of actions to prevent land degradation and mitigate the impacts of droughts.

The NAP-DLDD complements the NSWRRD/EA in terms of objectives, programs and priority landscapes and geographical domain. It has five (5) strategic approaches, namely: a) sustainable land management in agriculture and natural resources; b) watershed level management; c) building partnership for resource mobilization; d) mainstreaming SLM as adaptation platform for climate change; and scaling- up SLM best practices. Both plans focus on sustainable soil/land and water resources conservation, utilization and management; strengthening institutional capacity and partnership; harmonization of enabling policies and raising awareness on land and water concerns through information, education and communication campaign. On priority geographical landscapes, both will give due emphasis on degraded soils/lands in areas with high poverty incidence of the country.

The program/project proposals that are listed in the NAP-DLDD and NSWRRD/EA will be reviewed by the National and Regional Technical Coordinating Committees under the Interagency Committee on DLDD. Appropriate implementing mechanisms will be developed to increase collaboration and

networking among NGA, Civil Society Organizations (CSO), Local Government Units (LGU) and the academe thereby strengthening convergence of actions.

2.5 NSWRRD/E Agenda

The NSWRRD/E Agenda sets the direction of soil/land and water resources research in the Philippines for the next five (5) years. It serves as planning tool to prioritize and allocate resources for agricultural R & D. It is supplemental to the current RDEAP 2016-2022 of the DA- BAR.

The NSWRRD/E Agenda focused on the following programs:

- ✓ Soil Health Improvement
- ✓ Conservation and Management of Soil Biodiversity
- ✓ Organic Agriculture
- ✓ Mitigation of Soil and Water Pollution
- ✓ Effective Watershed Management for Improved Agricultural Productivity
- ✓ Assessment and Control of Soil Erosion and Sedimentation
- ✓ Soil and Water Conservation and Management
- ✓ Enhancement of Rainwater Harvesting and Utilization
- ✓ Water Resources Development and Water Productivity Enhancement
- ✓ Management and Fertility Rehabilitation of Problem Soils
- ✓ Soil and Water Resources Database and System Development
- ✓ Laboratory Test Methods Validation and Verification
- ✓ Extension Modalities

The Agenda is presented in matrix form in terms of the following: problems/ issues/ concerns, the researchable areas, expected output and technology to be derived, possible implementing agencies, thematic areas including the priority commodities and timeline of implementation.

The National Soil and Water Resources Research and Development / Extension Agenda (2017-2022)

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
SOIL HEALTH IMPROVEMENT	Soil fertility decline and physical constraints	Improvement in the efficiency of fertilizer use	Validated site-specific fertilizer recommendations based on SSNM (Site- specific Nutrient Management) and RCM (Rice Crop Manager) Improved nutrient use efficiency (using nanotechnology, tracer techniques and other technologies)	BSWM, DA- RFOs, Academe, PhilRice, LGUs, DOST-PNRI	Rice, corn, sugarcane, high value commercial crops (i.e. coffee, cacao, fruits and vegetables crops)	2018- 2022
		Updating and validation of fertilizer recommendation for conventionally grown crops and development of fertilizer recommendation for organically grown crops	Updated and validated fertilizer recommendation for conventionally grown crops Developed fertilizer recommendation for crops cultivated under organic production system	BSWM, DA- RFOs, academe, PhilRice, LGUs	Rice, corn, cassava, adlay, sugarcane, vegetable crops	2018- 2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
	Soil degradation	Assessment and mapping of soil carbon stock in different production systems	Database and maps on soil carbon stock as input to soil fertility maps Land Management Unit (LMU) map with soil carbon stock	BSWM, DA RFOs Academe	Rice, corn, vegetables, adlay, coffee and cacao	2018-2022
		Nationwide determination and monitoring of soil health	Soil health maps Philippine soil health atlas (soil physical, chemical, biological characteristics including land use & vegetation) Thematic and derived maps such as suitability and fertility maps	BSWM, DA RFOs, PhilRice DENR, Academe	Rice, corn, adlay, cassava, fruit and vegetable crops, (i.e. mango, pineapple, lanzones, citrus, papaya, guyabano, dragonfruit, durian, mangosteen, jackfruit, passion	2019-2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
					fruit,banana, citrus), plantation crops (i.e.. coffee and cacao)	
		Improvement of soil conservation and rejuvenation process	Location specific recommendations on appropriate soil conservation management technologies and practices Soil conservation and rejuvenation techno- guidebook	BSWM, DA RFOs Academe	Rice, corn, cassava, fruits and vegetable crops, root crops	2018- 2019
		Assessment of soil degradation	Soil degradation map	BSWM, DA-RFOs Academe	Corn, upland rice and high value commercial crops	2018- 2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
	Zinc deficiency in irrigated/ water-logged areas	Assessment and mapping of zinc-deficient areas	Assessment report and map of zinc-deficient areas	BSWM, DA-RFOs, Academe, LGU, Farmers	Rice	2018-2022
CONSERVATION AND MANAGEMENT OF SOIL BIODIVERSITY	Decreasing level of soil biodiversity	Soil biodiversity analysis in different types of production systems and climatic conditions	Biodiversity analysis of different production system & climatic patterns Development of Philippine soil biodiversity atlas	BSWM, Academe, DA RFOs, LGUs	Rice, corn, cassava, fruit and vegetable crops	2018-2022
		Identification of beneficial soil micro-organisms for improving crop productivity	Identified new strains of beneficial micro-organisms for enhancing crop productivity Identification of PGPRs (<i>Plant Growth Promoting Rhizobacteria</i>) and PSM (<i>Phosphorus Solubilizing Microorganisms</i>)	BSWM, Academe, DA RFOs, LGUs	Rice, corn, cassava, fruit and vegetable crops, (<i>i.e. mango, pineapple, lanzones, citrus, papaya, guyabano, dragonfruit, durian,</i>	2017-2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
			Development of bio-indicators for improving crop productivity		<i>mangosteen, jackfruit, passion fruit, banana, citrus),</i> plantation crops (i.e. coffee and cacao)	
		Impacts of invasive alien species (IAS) on soil quality (SQ)	Assessment report on the negative impacts of IAS on SQ	BSWM, DA RFOs, Academe	Rice, corn, high value commercial crops	2017-2022
ORGANIC AGRICULTURE	Soil fertility decline (macro and micro-nutrient deficiency)	<p>Management of soil and water resources as habitat for organic agriculture</p> <p>Microbial-based inoculants/ bio-fertilizers</p>	<p>Site-specific soil and water management technologies and practices under organic production systems</p> <p>Improved quality and efficacy of microbial-based inoculants/bio-fertilizer</p>	BSWM, DA RFOs, Academe	Rice, corn, high value commercial crops	

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
			Technology on use of MBI/BF (microbial-based inoculants/biofertilizers)			
	Improper disposal of agricultural, market and food wastes; and Low quality/non- compliance of organic soil amendments with the minimum requirements specified in the Philippine National Standards	Improvement of organic fertilizer/composting methods/processes	Guidelines/Standards on composting method/procedures to meet quality requirements Improved technology on organic fertilizer/compost/organic plant supplement production and application Updated information on the efficiency of organic fertilizer coupled with soil health and environmental quality measurements	BSWM, Academe, DA-RFOs, LGUs, BAFS	Rice, corn, coconut, banana, pineapple, dragonfruit, plantation crops (i.e. abaca and coffee)	
	Presence of pesticide residues/	Identification of appropriate buffer zones; and	Developed protocols for soil and water	BSWM,	Rice, corn, vegetable crops	2018- 2020

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
	contaminants in soil and water	technologies & practices to control contamination/pollution from surrounding farms	management in organic rice production systems	DA-RFOs, Academe, BPI		
		Efficiency of catchment/ filter ponds	Appropriate design of catchment/ filter ponds			
	Limited information on science-based bio-fertilization	Development, pilot testing, and verification trials of aloevera + micronutrients- based biofertilizer	Bio-fertilizer for rootcrops developed and tested; certification and registration of products developed	PhilRootcrops, NPRCRTC, Private Sector, LGUs, selected NGOs & POs, DA, BPI	Rootcrops	2018- 2022
	Inadequate information on certified and non- certified/non- registered organic soil amendment producers; and level of imports of organic soil amendments	Updating of organic soil amendment industry profile	Identification and geotagging of organic soil amendment local producers, and importers Updated industry profile on local production and importation of organic soil amendments	BSWM, DA RFOs, SCUs BAFS	Rice, corn	2018- 2020

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
	Indigenous knowledge systems on organic farming not documented comprehensively	Documentation of Indigenous Knowledge Systems on Organic Farming	Publication on Indigenous Knowledge Systems on organic farming	BSWM, NCIP, Academe, DA-RFOs		2019-2022
	Difficulty to assess objectively the contribution of organic farming in addressing major environmental concerns as well as its impact on human health	Quantification of contribution of organic agriculture in climate change mitigation/reduction of greenhouse gases, biodiversity conservation, combating land degradation, and human health/wellness	Measurements on reduction of GHGs, carbon sequestered and soil biodiversity conserved in organic farms (per hectare) Studies on the inter-relationship of soil quality-crop quality-human health	BSWM, DA-RFOs, Academe, CSOs	Rice, fruit and vegetable crops, coconut, banana, pineapple, coffee and cacao	2019-2022
MITIGATION OF SOIL AND WATER POLLUTION	Long-term and inappropriate timing & method of fertilizer application	Effects of organic and inorganic fertilizer to the environment	Quantified effect of long-term and inappropriate use of organic and inorganic fertilizers on soil and water quality	BSWM, DA RFOs Academe	Rice, corn, vegetable crops, sugarcane, banana, pineapple,	2018-2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
			Policy recommendations on the production and utilization of organic and synthetic fertilizers		coffee, cacao, abaca	
	Improper agri-waste disposal	Development, characterization and assessment of sludge from agri-industrial wastes	New soil amendments developed using sludge from agro-industrial wastes Efficacy test reports based on multi-crop and multi-location field trials	BSWM, DA-RFOs, Academe	Rice, corn, sugar cane, fruit and vegetable crops coffee indigenous crops (Adlai)	2018-2022
		Energy generation using agri-wastes	Improved technology on renewable energy generation	BSWM, DA RFOs, Academe	Rice, corn, sugarcane, coconut, banana, pineapple, abaca	2018-2022
		Development of soil ameliorants Identification of microorganisms that could degrade biodegradable materials	Soil ameliorants that passed quality standards List of microorganisms that could degraded highly cellulosic agri-wastes			

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
	Heavy metal accumulation in soils due to proximity of crop production areas from agro-industries and mining sites	Assessment and mapping of soil pollution in agricultural production areas near mining sites and large-scale agro-industries	Assessment report and maps of areas with high levels of soil pollution	BSWM, DA RFOs, Academe, DENR	Rice, corn, sugarcane, coconut banana pineapple vegetable crops, plantation crops (i.e. abaca, coffee cacao)	2019-2022
		Development of technologies and management strategies to mitigate the impacts of accumulation of heavy metals and pesticide residues	Technologies and management strategies that can improve soil and water quality in highly polluted areas			
		Nanotechnology using soil minerals				
		Phytoremediation and use of organic soil amendments for restoration of mined out areas	Identified plant species and organic soil amendments that have capacities to accumulate heavy metals	BSWM, DA-RFOs, Academe, DENR	Rice, corn, sugarcane, coconut banana pineapple vegetable crops, plantation crops	2019-2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
					(i.e. abaca, coffee cacao)	
	Possible contamination of soil and water with Persistent Organic Pollutants (POPs)	Levels of POP contaminants particularly in soil and water used for agriculture and fishery production	Identification of contaminated areas; Policy recommendations IEC materials	FPA, BSWM, Academe	Rice, corn, vegetables, high value commercial crops that are exported	2019- 2022
Development of climate-smart and cost-efficient soil conservation cropping system and management practices in critical areas (i.e. uplands – highlands being used for agriculture and SWIP watersheds) for productivity enhancement and	Land degradation	Bio-physical resources evaluation and socio- economic characterization of principal/ major watersheds	Updated information and database on biophysical resources of major watersheds based on available decision support tools Watershed characterization report, GIS based watershed maps, land use plans, Assessment report and map on soil carbon stocks	BSWM, DA-RFOs, Academe LGUs	Rice, corn, sugarcane, coconut banana pineapple vegetable crops, plantation crops (i.e. abaca, coffee and cacao)	2019- 2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
environmental sustainability		Assessment of carbon sequestration in watershed areas				
	Deterioration of soil quality in sloping upland and highland areas that are used for agricultural production		Maps showing land use change of different watersheds Improved soil management approaches and technologies on sustainable land management Enhanced and sustained adoption of soil conservation measures	BSWM DA RFOs Academe	Rice, corn, sugarcane, coconut banana pineapple abaca	2018- 2022
	Changing weather patterns and climatic conditions	Adjustment of location specific cropping calendar	• Adjusted/updated location specific cropping calendar/ cropping pattern; climate resilient agri tech; installation of mobile agromet stations	BSWM DA RFOs Academe•LGUs	Rice Corn Regional Priority Commodities	2018- 2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
ASSESSMENT AND CONTROL OF SOIL EROSION AND SEDIMENTATION	Soil erosion	Soil erosion measurement using smart tools & techniques like nuclear/isotopic analysis and remote sensing technologies	Database; maps of hot spots (soil erosion and gully formation hot spots)	BSWM Academe	Rice, corn, coconut banana pineapple, dragon fruit, plantation crops (i.e. abaca and coffee)	2018-2022
		Modified erosion control measures to address soil conservation and productivity and on field plant residue management	Innovative and location-specific soil and water conservation strategies (i.e. vegetative and engineering technologies)	BSWM Academe DA RFOs NGO	Corn, coconut banana pineapple, dragon fruit, sweet potato, plantation crops (i.e. abaca, cacao and coffee)	2017-2022
		Long-term impacts of new soil conservation technologies (e.g. zero tillage cum herbicide use)	Guide for faster adoption of appropriate adoption and proper application of new soil conservation	BSWM, Academe, DA RFOs, NGOs, LGUs	Corn	2017-2020

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
		on soil physical and chemical characteristics				
		Sediment yield estimation using GIS (watershed approach)	Guide for sediment yield	BSWM, DA-RFOs, LGUs, NGOs Academe	Rice, corn, coconut banana pineapple, dragon fruit, plantation crops (i.e. abaca and coffee)	2018- 2021
		Economic valuation of impacts of deposition/ sedimentation	Valuation of off-site impacts of erosion	BSWM, DA-RFOs, LGUs, NGOs Academe	Rice, corn, coconut banana pineapple, dragon fruit, plantation crops (i.e. abaca and coffee)	2019- 2022
					Upland crops	

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
	Loss of soil organic matter (SOM)	Development/ updating of decision support tools to assess soil erosion and loss of SOM [e.g. Application of Modified Universal Soil Loss Equation (USLE), available climatic data]	Decision support tools to determine soil erosion/loss of SOM/loss of nutrients	BSWM, Academe, DA-RFOs, LGUs, NGOs		2019-2021
		Soil organic matter enhancement	Strategies and soil management technologies	DA-BSWM, Academe, DA-RFOs	Rice, corn, coconut banana pineapple, dragon fruit, plantation crops (i.e. abaca and coffee)	2018-2022
		Integrated nutrient management	Nutrient management technologies	DA-BSWM, Academe, DA-RFOs	Rice, corn, coconut banana pineapple, dragon fruit, plantation crops (i.e. abaca and coffee)	2018-2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
SOIL AND WATER CONSERVATION AND MANAGEMENT	Insufficient environmental policy on soil and water conservation and management	Formulation of soil and water conservation policies	National institutional framework for monitoring implementation of sustainable soil and water management and overall state of soil resources	BSWM	Rice, corn, sugarcane, coconut banana pineapple plantation crops	2018- 2020
		Development of soil and sediment quality standards for agriculture	Soil and sediment quality standards for agriculture approved	BSWM Academe BAFS		
		Updating and mapping of land use (GIS-based) and suitability	Updated land use maps Crop suitability maps	BSWM		
	Land use reclassification and conversion (from agricultural land use to industrial and commercial, land uses)	Assessment of economic, social and environmental impacts of land use reclassification and conversion	Policy recommendations/ guidelines	BSWM DAR HLURB Academe	Rice, corn, sugarcane, coconut banana pineapple plantation crops	2019- 2021

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
		Assessment of the implementation of CLUP; and mainstreaming of sustainable land management (SLM) in CLUP	Policy recommendations/ guidelines	BSWM DAR HLURB Academe	Rice, corn, sugarcane, coconut banana pineapple plantation crops	2021-2022
ENHANCEMENT OF RAINWATER HARVESTING AND UTILIZATION	Surface water harvesting	Innovations in design of SSIP that will include climate-resilient designs	Design for climate-proofing SSIP	BSWM DA RFOs	Rice, corn, sugarcane, coconut banana pineapple vegetable crops plantation crops	2019-2021
		Assessment & development of farmer training modules (for enhanced water use utilization)	Relevant and customized farmer training module for improved rainwater harvesting	BSWM DA RFOs		2019-2021
		Wastewater reuse for irrigation (<i>Adaptation of Aerobic Wastewater Treatment as Wastewater Reuse for Irrigation</i>)	Improved technologies for wastewater reuse	BSWM DA RFOs Academe	Rice Corn Other Crops	2019-2021

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
		Cost –efficient and robust design of rainwater harvesting facilities; development of other runoff management technologies	Improved design of rainwater harvesting facilities Innovative run-off management technologies	BSWM NWRB, NIA, LGUs, DA-RFOs (RAED), Academe	Rice, corn, high value commercial crops)	2019-2022
	Conflicting water use policies from different agencies	Review and analysis of various laws/rules/ issuances in terms of implementation, appropriateness, and the need for amendment	Harmonized water use policies	NWRB BSWM, NIA, DA-RFOs	Rice, corn, high value commercial crops	2019-2022
		Harmonization of conflicting policies	Water use policies	NWRB, SWM, NIA, DA-RFOs, LGUs	Rice, corn, high value commercial crops	2019-2022
WATER RESOUR-CES DEVELOPMENT AND WATER PRODUCTIVITY ENHANCEMENT	Lack of information on available water management technologies for upland/ non-irrigated farmland	Water resource assessment and wastewater reuse for irrigation	Groundwater assessment & monitoring Information of available water resources for potential development	BSWM DA RFO Academe	Rice, corn, sugarcane, banana pineapple vegetable crops plantation crops	2019-2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
		Promotion of indigenous water mgt. technologies for upland or non-irrigated (rainfed)	Knowledge products on indigenous water management technologies	BSWM, DA-RFO, LGU, Academe	Rice, corn, sugarcane, coconut banana pineapple vegetable crops plantation crops	2019-2022
		Assessment/monitoring/ profiling creeks discharges that are utilized for irrigation	Knowledge product/ policies/data base	BSWM, DA-RFO, LGU, Academe	Rice, corn, banana pineapple vegetable crops plantation crops	2019-2022
		Documentation of best water resources management practices	Data base	BSWM, DA-RFO, LGU, Academe	Rice, corn, sugarcane, banana pineapple vegetable crops plantation crops	2019-2022
	Low water-use efficiency in irrigated agriculture	Performance and impact evaluation of Small Scale Irrigation Systems (SSIS)	Output/efficiency (SSIS)	BSWM, DA-RFO	Rice, corn, sugarcane, banana pineapple vegetable crops plantation crops	2018-2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
	Need for sustainable development and management of groundwater	Raw water pricing and modalities	Decision support tool	BSWM, DA-RFO	Rice, corn, sugarcane, banana pineapple vegetable crops plantation crops	2019-2022
	Uncertainties of water supply availability due to climate change	Micro-watershed Management	Strategies on water mgt. and decision support tool	BSWM, DA-RFO	Rice, corn, sugarcane, banana pineapple vegetable crops plantation crops	2018-2022
		Cloudseeding operation and application of recent methodologies in rain stimulation to mitigate drought	New techniques or methods for cloudseeding	BSWM	Rice, corn, sugarcane, banana pineapple vegetable crops plantation crops	2019-2021
		Technologies for enhanced conservation of soil and water resources that will include water conservation techniques, renewable and non-conventional energy for small-scale irrigation,	Water-resource use efficient technologies	BSWM Academe	Rice, corn, sugarcane, banana pineapple vegetable crops plantation crops	2019-2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
	Issue of improving efficiency of water management technologies under changing climate	water saving technologies, methods to minimize seepage and percolation in Small Farm Reservoirs (SFR).				
		Assessment/monitoring/ profiling of creeks discharge that is utilized for irrigation	Management of water (water allocation (flooding, drought) Knowledge product	NWRB, BSWM, NIA, DA-RFO, LGU	Rice, corn, sugarcane, banana pineapple vegetable crops plantation crops	2019- 2022
		Impact evaluation of soil and water quality using vacuum-dried salt in cloud seeding operation	Recommended strategies/technologies for cloud seeding operation	BSWM, PAGASA, AFP, Private Sector, LGU	Rice, corn, sugarcane, banana pineapple vegetable crops plantation crops	2019- 2021
		Enhancing precision of weather predictions	Climate projections	BSWM, PAGASA, Academe	Rice, corn, sugarcane, banana pineapple vegetable crops plantation crops	2019- 2021

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
		Establishment/rehabilitation of automatic weather stations in strategic areas	Expanded/upgraded weather facilities	BSWM, PAGASA, Private Sector, LGU, Academe	Rice, corn, sugarcane, banana pineapple vegetable crops plantation crops	2020-2022
	Polluted/contaminated water for irrigation use e.g. surface water due to discharge of wastewater from industry, urban areas, etc.	Reducing contamination/pollution through biological and other treatments of possible sources of irrigation from surface waters	Microbial-based water treatment technologies	BSWM DA-RFO Academe	Rice, corn, sugarcane, banana pineapple vegetable crops plantation crops	2019-2022
		Characterization /profiling and monitoring of surface waters that are being utilized for irrigation and determine impacts of water quality on crop quality	Water quality information of water sources.	BSWM, Academe, DA-RFO	Rice and non-food crops	2019-2020
		Characterization and monitoring of wastewater from different sources • Point sources • Non-point sources	Knowledge products; policy recommendations	BSWM, DENR-EMB, Academe, DA-RFO	Rice and non-food crops	2019-2020

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
		Establishment of wastewater quality thresholds or limits for irrigation and other agricultural purposes under Philippine condition	Wastewater quality thresholds for irrigation and other agricultural uses under Philippine condition	BSWM, DENR-EMB, Academe, DA-RFO	Rice and non-food crops	2019-2020
		Determination of mineralization rate of these wastewater as fertilizer	Knowledge product/policy	BSWM, Academe, DA-RFO	Rice and non-food crops	2019-2020
		Utilization of wastewater as irrigation water and as fertilizer and impacts on crops, soils and groundwater	Enhanced water availability for irrigation and reduced dependency on chemical fertilizer	BSWM, Academe, DA-RFO	Rice and non-food crops	2019-2022
		Safe application of wastewater for irrigation and other agricultural purposes	Methods of application with less impacts to human health and the environment	BSWM, DENR-EMB, Academe, DA-RFO	Rice and non-food crops	2019-2021
	Pollution of surface and groundwater resources	Development and promotion of best agricultural technology/practices that minimize surface and groundwater pollution	Cost-efficient and environment-friendly technologies and practices	BSWM, DA-RFO, Academe	Rice, corn, vegetable crops	2018-2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
		Evaluation of impacts of organic and inorganic fertilizer application on nitrate leaching in shallow groundwater	Appropriate methods and quantities (i.e. optimum yield with less nitrate leaching) for organic and inorganic fertilizers application in various crops	BSWM, Academe, DA-RFO	Rice, corn, vegetable crops	2018-2022
	Intrusion of sea water due to sea level rise and excessive pumping of ground water in coastal areas	Management of saline affected areas	Technologies and practices on nutrient management in saline affected areas	BSWM, Academe, DA-RFO	Rice, corn, vegetable crops	2019-2022
		Profiling, characterization and monitoring of salt water intrusion	Technical report and maps of areas affected by saltwater intrusion	BSWM, DA-RFO, Academe, LGU	Rice, corn, vegetable crops	2018-2020
		Field trials of salt tolerant crop varieties	Saline-tolerant crops	BSWM, DA-RFO, Academe, LGU	Rice, corn, vegetable crops	2019-2022
	Low water use efficiency in irrigated agriculture	Evaluation of irrigation system losses using a system approach (i.e. considering system losses upstream are gains downstream)	Knowledge product and policy recommendations	BSWM, NIA, Academe, DA-RFO	Rice, corn, vegetable crops	2019-2022
		Develop appropriate technologies to use return flows/drainage from irrigation systems	Appropriate technologies and policy recommendations	BSWM, NIA, Academe, DA-RFO	Rice, corn, vegetable crops	2019-2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
		Climate-resilient cropping pattern and calendar for optimum rainwater utilization and reduction of production losses due to extreme climate events	Updated climate-type specific cropping pattern and calendar	BSWM, NIA, Academe, DA-RFO	Rice, corn, vegetable crops	2019-2022
	Inappropriate methods and timing of irrigation	Studies on water conservation techniques, water harvesting and recycling, improved irrigation methods and conjunctive use	Appropriate technologies and policy recommendations	BSWM, NIA, Academe, DA-RFO	Rice, corn, vegetable crops	2018-2022
		Methods to minimize seepage and percolation in small farm reservoirs and farm ponds	Recommended methods for farmers adoption	BSWM, NIA, Academe, DA-RFO	Rice, corn, vegetable crops	2018-2022
	Over Extraction of Groundwater Supply	Aquifer characterization including inventory of existing STWs and their extraction level vis-à-vis groundwater supply available for extraction within a basin/sub-basin (sustainable yield concept)	Knowledge product and policy recommendations STW location maps using GIS	BSWM, NWRB, Academe, DA-RFO	Rice, corn, vegetable crops	2018-2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
		Development of GIS-based decision tools in the development of shallow and deep aquifers	Knowledge product and policy recommendations	BSWM, Academe, NWRB, DA-RFO	Rice, corn, vegetable crops	2018-2022
		Identify and evaluate appropriate technologies on MAR (Managing Aquifer Recharge) and managing discharge to enhance groundwater storage	Appropriate technologies and policy recommendations	BSWM, Academe, NWRB, DA-RFO	Rice, corn, vegetable crops	2018-2022
		Assessment on the effect of rainwater harvesting storage facilities Such as SWIP and SFR to groundwater recharge	Technical report	BSWM, DA-RFO, Academe	Rice, corn, vegetable crops	2018-2022
	Flooding	Flood mitigation and management (<i>Establishment of modified SFRs, flood diversion structure</i>)	Enhance water availability for supplemental irrigation Flood mitigation	BSWM, DA-RFO, Academe, PhilRice	Rice, corn, vegetable crops	2018-2022
		Identification/ characterization of flood prone areas	Flooding map	BSWM, DA-RFO, Academe, PhilRice	Rice, corn, vegetable crops	2019-2021

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
		Adaptability trials of submerged rice varieties	Recommended submerged rice varieties	BSWM, DA-RFO, Academe, PhilRice	Rice, corn, vegetable crops	2019-2022
	Too much water in the wrong time and wrong place	Development of drainage technologies Integrating micro-watershed Protection in SWIS	Excess runoff water management and flood mitigation	BSWM, DA-RFO, Academe, PhilRice	Rice/crops suitable to flood-prone areas	2019-2022
MANAGEMENT AND FERTILITY REHABILITATION OF PROBLEM SOILS	Soil salinity/salini-zation	Fertilization strategy (sources, methods, timing and volume)	Water quality guide for irrigation water	BSWM, DA RFO Academe	Rice and other crops suitable to saline-prone areas	2019-2022
		Vulnerability and impact assessment in salt-affected areas	Vulnerability maps, impact assessment report	BSWM, Academe, DA-RFO, PhilRice, IPB, LGU, NGO	Rice and other crops suitable to saline-prone areas	2019-2022
		Soil and water management				
		- Flushing of salts	Soil and water management technologies	BSWM, DA-RFO, LGU	Rice and other crops suitable to saline-prone areas	2019-2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
		- Application of organic soil amendments	Appropriate organic fertilizers, compost and soil conditioners	BSWM, DA-RFO, LGU	Rice and other crops suitable to saline-prone areas	2019-2022
		- Adaptation using saline tolerant varieties	Adaptable varieties tested	BSWM, DA-RFO, LGU	Rice and other crops suitable to saline-prone areas	2019-2022
	Soil Acidity	Soil management using amendments such as animal manure, liming materials like calcite, dolomite, gypsum	Soil management technologies	BSWM, DA-RFO Academe	Rice, corn, sugarcane, banana pineapple vegetable crops plantation crops	2019-2022
		Adaptation measures: - Screening of acid-tolerant microorganisms as inoculant	Inoculants for acid soil condition	BSWM, Academe, DA-RFO	Rice, corn, sugarcane, banana pineapple vegetable crops	2019-2022
		- Screening of acid-tolerant crop varieties	Cultivars tolerant to soil acidity	BSWM, PNRI, Academe	Rice, corn, sugarcane, banana pineapple vegetable crops	2019-2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
	Heavy cracking clays	Residue management (method and timing of application)	Soil management technology	BSWM, DA- RFO, Academe	Rice, corn, sugarcane, banana pineapple	2019- 2022
	Poorly drained soils	Bio-remediation (inoculation)	Soil and water management technology	BSWM, DA- RFO, Academe	sugarcane, banana, vegetable crops	2019- 2022
	Poor soil and variable growing conditions	Improvement on the nutrient use efficiency (using tracer technique) to different soil fertility levels	Appropriate fertilizer recommendations	BSWM, DA -RFO Academe	corn, sugarcane, banana, vegetable crops,	2019- 2022
	Poor soil fertility due to degradation and acidity	Development/ improvement of soil amendment technologies (organic fertilizers, soil enhancers/ conditioners)	Appropriate soil amendment technologies	BSWM, DA -RFO Academe	Rice, corn, sugarcane, banana pineapple, vegetable crops	2018- 2022
		Development of farming systems technology in sloping areas	Technology for farming system in sloping areas	BSWM, DA-RFO Academe	Rice, corn, sugarcane, banana pineapple, vegetable crops	2018- 2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
	Low Productivity	Field validation/ promotion of macronutrients (i.e. Ca, Mg, S) and micronutrients (i.e. Bo, Zn) fertilization	Updated micronutrients and macronutrients fertilization guide	BSWM, DA RFO Academe	Rice, corn, sugarcane, banana pineapple, vegetable crops	2018-2022
		Development of site-specific small scale irrigation systems in corn-based areas	Appropriate small scale irrigation technologies	BSWM, DA RFO Academe	Rice, corn, sugarcane, banana pineapple, vegetable crops	2018-2022
		Verification trial to improve nitrogen use efficiency using tracer technique	Appropriate N fertilizer guide for corn	BSWM, DA RFOs Academe	Corn, sugarcane, banana pineapple, vegetable crops	2018-2022
		Adaptation of corn farming to climate change : Improvement of farming system/ pattern to optimize moisture availability and reduce soil degradation in sloping areas (SALT/ SCoPSA)	SALT/ SCoPSA Model	BSWM, DA RFOs Academe	Corn	2018-2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
		Development of crop production model (water availability, temperature, variety, soil type)	Database; crop models	BSWM, DA RFOs Academe	Rice, corn, vegetable crops	2018- 2022
		Assessment of water and carbon footprint of corn varieties under different management and agro-ecosystem	Data on water and carbon footprint; Recommendation on the improvement of water use efficiency	BSWM, DA RFOs Academe	Corn	2018- 2022
	Compaction	Soil management • Tillage practices • Organic soil amendment application	Best management practices	BSWM, Academe, DA- RFO, LGU, NGO	Sugarcane; corn; pineapple; forage crops	2019- 2022
	Soil Crusting	Soil management • Tillage practices • Organic soil amendment application • Sub-soiling	Best management practices	BSWM, Academe, DA- RFO, LGU, NGO	All crops	2019- 2022
	Peat soils	Characterization/ evaluation of peat soils	Physical, chemical and biological data of peat soils	BSWM, DA-RFO, Academe, LGU	High value commercial crops, Rice	2019- 2022
			Soil and crop management technologies			
		Crop suitability studies	Suitable crops			

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
		Tillage practices	Appropriate tillage practices	BSWM, DA-RFO, Academe, LGU	HVC, Priority crops, Rice	2019-2022
		Soil fertility management	Soil fertility management			
SOIL AND WATER RESOURCES DATABASE AND SYSTEM DEVELOPMENT	Large data holdings require systematize storage and retrieval	Development of soil health information system and water resources information system	Database; Integrated Information Management System (IIMS)	BSWM; Academe	Not applicable	2017-2022
		Data warehousing and online reporting system	Database: Soil and Water Resources Integrated Information Management System (SWRIIMS) Easy to use data base management and online reporting	BSWM; Academe	Not applicable	2017-2023
LABORATORY TEST METHODS VALIDATION AND VERIFICATION	Regulation and control for the establishment and operation of all soil laboratories	Development of rapid test methods needs assessment of soil and water analytical laboratories	Soil Test Protocols Controlled and validated rapid soil test methods Upgraded soil and water analytical laboratories	BSWM; DA RFO Academe	Not applicable	2018-2020

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
		Development of soil and water laboratory information management system	Soil and water laboratory information management system (SW-LIMS)	BSWM DA RFO (Integrated Laboratory Division) BAFS ICTS	Not applicable	2018-2020
	Need to validate/ assess fertilizer recommendation	Soil analysis and nutrient management (sugarcane)	Updated fertilizer guide for sugarcane	BSWM; SRA	Not applicable	2018-2020
EXTENSION MODALITIES	Problems of farmers in the adoption of technologies; problems of extension workers in the delivery of technologies	Monitoring of adoption of soil and water-related technologies; Improvement in extension methodologies	Improved extension methodologies	BSWM; ATI; LGU	Not applicable	2018-2022
	Lack of mechanisms for participatory and community-based soil and water resource	Capacity and capability assessment for community-managed soil and water resource	Developed mechanisms for a community-managed soil and water resource development	ATI, DA-RFO, LGU, Academe, BSWM	Not applicable	2019-2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
	development and management					
	Need for integrating supplemental livelihood with soil and water resource conservation and management	Integration of supplemental livelihood into soil and water resource conservation and management	Integrated supplemental livelihood into soil and water resource conservation and management	ATI, DA-RFO, LGU, Academe, DTI	Not applicable	2019- 2022
	Issue on sustaining/ enhancing adoption of soil and water-related technologies (SWT) under changing climate	Identification and scientific evaluation of indigenous soil and water management technologies being practiced at different ecosystems	Indigenous soil and water management technologies with solid scientific basis for dissemination	DA-RFO, Academe, LGU, NGO	Not applicable	2019- 2022
		Development of decision support tools				
		Capacity assessment and potentials of the beneficiaries in the adoption of SWT under changing climate (including risk)	Enhanced technology transfer	ATI, BSWM, LGU, DA-RFO, Academe	Not applicable	2019- 2022

PROGRAM	PROBLEMS/ ISSUES	RESEARCHABLE AREAS	EXPECTED OUTPUT AND TECHNOLOGY TO BE DERIVED	POSSIBLE IMPLEMENTING AGENCIES	PRIORITY COMMODITIES	TIME LINE
		Product packaging and promotion of SWT				
	Need for capacitating intended/ current beneficiaries	<p>SWT Training design and modules for capacitating farmer-beneficiaries through “learning by doing” concept</p> <p>Determination of technological needs of farmers and development of appropriate training modules to suit their needs</p> <p>Training on maximum utilization of SSIP and on-farm water management</p>	Acceptable training design and modules to enhance farmers’ ability to implement what they learned.	ATI, BSWM, DA-RFO	Not applicable	2019-2022