The Harmonized National R&D Agenda: Paving the Road to the Fulfillment of the Philippine Development Plan for the Agriculture, Aquatic and Natural Resources Sector through Science and Technology[1]

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INTRODUCTION

The Philippine Development Plan (PDP) for 2017 – 2022 is the country's blueprint for economic development under the new administration. The Plan aims for inclusive growth, high-trust and resilient society, and competitive economy. Recognizing the importance of rural sector productivity and environmental security to inclusive economic growth, the PDP also targets to increase investments in research and development (R&D). Thus, the Department of Science and Technology (DOST) initiated the development of the Harmonized National R&D Agenda (HNRDA).

The HNRDA has five major sections: Section I for the National Integrated Basic Research Agenda (NIBRA); Section II for Health; Section III for the Agriculture, Aquatic and Natural Resources; Section IV for the Industry, Energy and Emerging Technology; and Section V on Disaster Risk Reduction and Climate Change Adaptation. The Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) of the DOST spearheaded the formulation of Section III of this Harmonized Agenda. Recognizing, however, the importance of AANR sector as a source of food, the other chapters of the agenda also address R&D issues for AANR.

The Agenda was developed to promote complementation in R&D, avoid duplication of R&D efforts, and serve as basis for R&D capability building initiatives. For AANR, the agenda items are an integration of the existing agenda of government agencies conducting R&D in the sector, as well as inputs from various stakeholders. Needless to say, this is a product of multi-

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[1] Policy paper submitted to the Food and Fertilizer Technology Center (FFTC) for the project titled "Asia-Pacific Information Platform in Agricultural Policy". Policy papers, as corollary outputs of the project, describe pertinent Philippine laws and regulations on agriculture, aquatic and natural resources.

stakeholder consultations, starting with roundtable discussions to presentations to national conferences for validation and eventual dissemination.

R&D AGENDA FOR THE AGRICULTURE SECTOR

Chapter III contains the R&D agenda for the AANR sector for 2017 – 2022. In general, the agenda aims to develop and promote the adoption of new and improved technologies, processes, new knowledge and information for the production of products as well as for the sustainable management of resources and the environment. The broad R&D areas include crops, livestock, fisheries and aquaculture, marine resources, forestry, natural resources and environment, climate change mitigation and adaptation, technology transfer, socio-economics and policy research and capacity building.

The agenda supports the use of advanced technologies, such as biotechnology, genomics, bioinformatics, nanotechnology, nuclear technology, space technology, electronics and automation, information and communication technology, and other emerging technologies as R&D tools to find S&T solutions to AANR problems, or develop new products with significant potential impact to the sector. It also supports biodiversity, organic agriculture, halal food production, food safety and traceability initiatives, and the development of genetically modified organisms as long as these are compliant with biosafety rules and regulations. Farm mechanization is also supported in recognition of the need to modernize the sector, increase productivity, improve efficiency and attain competitiveness. Socio-economics R&D ensures the understanding of people, markets and policies and programs, while technology transfer provides for mechanisms that would allow for the optimum utilization of R&D products by its end-users.

The seven main priority areas and programs under the AANR R&D agenda are:

1. **Agriculture, including both crops and livestock**

   Under crops R&D are germplasm evaluation, conservation, utilization and management; varietal improvement and selection; production of good quality seeds and planting materials; cultural management practices; production systems research; and postharvest, processing and product development.

   The focus commodities are plantation crops like coconut, cacao, coffee, and sugarcane; grains like rice and corn; fruit crops including mango, banana, and tropical fruits; legumes including mungbean peanut and soybean; pili and cashew, plantation crops such as cacao, coffee, and sugarcane; rootcrops including sweet potato and cassava; vegetables like tomato, white potato and mushrooms. Non-food R&D areas include abaca and other fiber crops, natural dye sources, oil palm, rubber, ornamentals such as cutflowers and foliage, sericulture and apiculture.

   For livestock R&D, the agenda focuses on breed development and genetic improvement, reproductive biotechnologies, nutrition, feeds and feeding system, conservation and improvement of native animals; vaccine, biologics and diagnostic development; detection of chemical residues and anti-microbial resistance; production and management decision support systems; and product development and processing.

   Livestock commodity focus are swine, goat, sheep, dairy and meat cattle, and rabbit. For poultry, the focus are chicken meat and egg, duck meat and egg, and quail eggs. Native animal research include chicken, duck, swine and goat. In addition, feed resources for the poultry and livestock sector are included.

2. **Aquatic**

There are nine R&D agenda in the aquatic sub-sector. These include application of genomics in the study of diseases, and improving fish resistance; new cultivable species for culture; development or refinement of culture systems; fish health, disease diagnostics and disease management; nutrition, feeds and feeding systems; postharvest handling, processing and new product development; mechanization and automated systems for feeding, water and culture management and post production; fish kill warning and management of fisheries.

Focus commodities for inland aquatic R&D are mangrove crab, milkfish and other brackish water fishes such as Kitang and Pompano; tilapia and other freshwater fishes such as Goby/Pojango and Pigek; shrimp, and aquafeeds. For marine aquatic R&D, the commodities are abalone; blue swimming crab; cephalopods such as cuttlefish, octopus; and squid; oyster and other shellfish; sardines; sea cucumber; seaweeds; and tuna.

3. **Forestry**
The forestry agenda supports the government's National Greening Program. This include the development and sustainable management of tree plantation, high yielding variety development of priority timber species; production of protocols for propagation of planting materials; and the sustainable cultural management practices, harvesting and postharvest technologies and marketing strategies.

The commodity focus for forestry include timber, particularly tree plantations such as yemane and falcata; non-timber such as bamboo, rattan sago, tiger grass, vines and other non-timber, biodiversity focusing on ecosystems such as mangrove, marine and freshwater, as well as microbial, flora and fauna, and ecotourism.

4. **Natural Resources and Environment**
The R&D agenda under this area include biodiversity; watershed management and utilization; soil management and rehabilitation; agricultural and forest waste product development; climate change strategies and decisions support tools; resource assessment and monitoring; habitat management; marine environmental management; innovative systems for unique landscapes and ecosystems.

5. **Climate Change Adaptation and Disaster Risk Reduction**
This is a special concern in the AANR sector. The focus areas include mitigation and adaption studies including protected and vertical agriculture; development of smart farming approaches and other climate-resilient agricultural production technologies; development of strategies/decision management tools for climate change resilient environment; and sustainable development through lifescape-landscape approach.

6. **Technology transfer**
Technology transfer is given an important consideration given its role in disseminating R&D results to the end-users. There are two types of technologies that is being generated by the R&D agencies: those for immediate deployment through the extension system of various institutions, and those intended for commercialization in the market. This priority area on technology transfer follows the two-pronged pathway: development of innovative and improvement of traditional extension modalities for the efficient transfer of technologies to end-users; and upscaling of agricultural technology transfer and commercialization, including technology business incubators.

7. **Socio-Economics and Policy Research**
Socio-economics and policy research provides understanding of the policy and social environment where all the technical R&D operate. The R&D focus includes continuing

review of existing policies affecting the sector; policy research on natural resources and environment-related issues, agricultural trade, supply and value chain related issues and governance, and compliance to standards across the value chain; impact assessment; socio-economics studies on production and marketing efficiencies, role of institutions in technology adoption, labor migration, development of social enterprise models, gender and development; agriculture and resource economic studies including market research, agrarian/asset reform, environmental valuation and collective farming; and global competitiveness

Playing a significant role in the Agenda are the Industry Strategic S&T Programs (ISPs). The ISP is the platform of S&T intervention and embodies PCAARRD's S&T Agenda for various AANR commodities. ISPs are medium-term plans for strategic commodity industries articulated by various stakeholders including farmers, planners, researchers and industry players. The ISP approach envisions that science-based solutions and innovations will contribute to poverty reduction, food security, global competitiveness and sustainability.

The PCAARRD ISPs 2017 – 2021 are as follows: for crops, these are for abaca, banana, cacao, coconut, coffee, mango, legumes such as mungbean and peanut, rice, rootcrops such as sweet potato, sugarcane, vegetables, and tropical fruits like citrus, durian, jackfruit, papaya, pineapple and pummelo. For livestock, the ISPs are for dairy buffalo and cattle, duck, dairy and slaughter goat, native chicken, commercial and native pigs, and feed resources. For inland aquatic ISPs, these cover mangrove crabs, milkfish, mussel, shrimp, tilapia and aquafeeds, while for marine aquatic ISPs, these are on abalone, blue swimming crab, oyster, sardine, sea cucumber, seaweeds and tuna. Three ISPs are identified under forestry, including bamboo, industrial tree plantation and rubber. In addition, there are five S&T programs addressing environmental services including biodiversity, coral, climate change, harmful algal blooms and watershed. The projects under each ISP or S&T program covers strategic research and development, socio-economics and policy, capability building and technology transfer and commercialization.

AGENDA ITEMS ADDRESSING FOOD IN OTHER CHAPTERS

As mentioned, the other sections of the HNRDA also address the issue of food in their R&D programs.

Section I on NIBRA is being coordinated by the National Research Council of the Philippines, a collegial body of researchers, scientists, and experts. The Council is mandated to promote and support fundamental and basic research. There are six priority areas that will be attended to by the R&D agenda of the NRCP including water security, food and nutrition security, health sufficiency, clean energy, sustainable community and inclusive nation-building.

Of the six areas, five have major implications for the AANR. Water security R&D has areas focusing on watershed studies, water quality, accessibility and availability. These include priorities on the characterization of both ground and surface water resources as well as the impact of various climate change scenarios on water supply. Food and nutrition security is another area of concern, specifically focusing on food safety and biodiversity studies. For food safety, the important components of the agenda are safety analysis of food supplements, livestock and poultry diseases, diseases and pathogens of important crops, identification and characterization of food/feed contaminants. Under biodiversity study are biological pollution biology and population dynamics of pests, diseases and natural enemies, taxonomy of flora and

fauna. Thus, studies will look into the taxonomy, bio-ecology and systemics of flora and fauna for food as well as safety analysis of raw and processed food products, among others.

Health sufficiency, particularly fundamental studies on potential sources of natural products, basic veterinary studies especially focusing on economically important animal diseases and those transmitted to humans, herbal veterinary pharmacopeia, and identification and characterization of zoonotic diseases. Social dimensions on health is another area that will be studied under this component.

Sustainable communities is also part of the agenda, particularly on vulnerable ecosystems such as lakes, rivers and wetlands, social science, carrying capacity models, among others; data analytics on natural phenomena, environmental and anthropogenic activities. Inclusive nation-building, focusing on documentation of indigenous knowledge, data collection on social phenomena, education, national security and sovereignty, arts, history and culture. Clean energy is also a main priority.

Of the ten components of Health R&D Priority Programs and Projects, under Section II of the HNRDA, the areas on Nutrition and Food Safety is the most relevant to the agriculture sector. In particular, the health R&D area focuses on food quality and safety.

Section IV coordinated by the Philippine Council for Industry, Energy and Emerging Technologies R&D (PCIEERD) also has R&D areas on food and nutrition security, which focuses on nutritious, safe and affordable food; countryside development, particularly on the small and medium enterprises. This include agro processing, utilization and value adding, halal processing technologies for food.

CONCLUSION

PCAARRD and DOST is one in fulfilling the mission of improving the lives of the Filipinos through science and technology. The Council, through the agenda in general, and through the ISPs in particular, promises to provide the S&T direction to all its stakeholders based on the demands and needs of the industries. The ISPs also aim to articulate the priorities, initiatives, and underlying actions of PCAARRD towards achieving its vision and development outcomes together with the Philippine government for the attainment of the Philippine Development Plan objectives.

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