The Current State, Challenges and Plans for Philippine Agriculture[1]

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ABSTRACT

This paper provided brief discussion of the current state of Philippine agriculture, the challenges being faced by the sector as well as the plans at least for the medium-term. It highlighted the importance of agriculture in the country and the challenges faced by the government to accelerate agricultural transformation. It also provided discussion on what will the agricultural sector look like in the next 3 to 5 years and what institutional framework or development plan to boost agricultural productivity. Policies were outlined in a legislative agenda to expand economic opportunities in the country. Key institution such as PCAARRD was identified to play crucial role in realizing the targets of the medium-term agricultural development plan.

Key words: Philippine Development Plan, R&D investment, agricultural transformation, agricultural development

THE CURRENT STATE OF PHILIPPINE AGRICULTURE

Agriculture remains of crucial importance in the economy of the Philippines, albeit its relative contribution to gross domestic product (GDP) has been declining over the years. From 1998 to 2009, the sector accounted for 13 to 14 % of the total GDP. This steadily declined to 10 % by 2017 (Table 1). However, gross value added (GVA) to agriculture in constant prices has been

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growing during the same period (Table 2), which means agriculture is not shrinking in absolute size. The declining contribution of agriculture to the total GDP is due to structural transformation as industry and services grew relatively much faster (Fig. 1) thereby accounting for increasing contribution to the growing economy.

Table 1. Agricultural GDP in relation to total GDP

Value of GDP, 2017 (PhP)	15.806 Trillion
Value of Agricultural GDP, 2017 (PhP)	1.526 Trillion
Agricultural GDP as percent of GDP	10%
Total Investment in Agricultural Research, 2017 (PhP)	16.787 Billion

Source: DOST-PCARRD (http://bch.dost.gov.ph) as cited in Ebora et al. (2018)

Table 2. Gross National Income and Gross Domestic Product by Industrial Origin (constant prices), 1998-2017

	2013	**2014**	**2015**	**2016**	**2017**
Agriculture, Hunting, Fishery and Forestry Sector		718,797	719,742	710,926	739,029
Agriculture and Fishing	701,577	713,276	715,715	707,280	735,650
Forestry	5,380	5,521	4,027	3,647	3,379
Industry Sector	2,219,068	2,391,268	2,545,411	2,750,034	2,947,103
Mining and Quarrying	72,893	81,695	80,500	83,106	86,222
Manufacturing	1,538,912	1,666,514	1,760,989	1,885,514	2,043,118
Construction	381,747	409,277	456,932	512,113	539,267
Electricity, Gas and Water	225,516	233,781	246,990	269,301	278,497
Service Sector	3,824,606	4,055,413	4,335,022	4,661,781	4,979,575
Transportation, Communication and Storage	505,415	538,044	581,289	611,902	636,577
Trade & Repair of Motor Vehicles, Personal & Hhld Goods	1,121,102	1,185,810	1,270,526	1,367,438	1,467,855
Finance Intermediation	480,683	515,484	546,714	590,112	635,064
Real Estate, Renting & Business Activity	739,025	798,081	854,747	930,685	999,493
Public Admin & Defense, Compulsary Social Security	282,323	293,850	297,449	318,540	343,251
Other Services	696,058	724,144	784,297	843,105	897,335
GROSS DOMESTIC PRODUCT	6,750,631	7,165,478	7,600,175	8,122,741	8,665,708
Net Primary Income	1,401,578	1,474,725	1,542,980	1,632,345	1,729,139
GROSS NATIONAL INCOME	8,152,210	8,640,203	9,143,155	9,755,087	10,394,846

Source: PSA, 2018

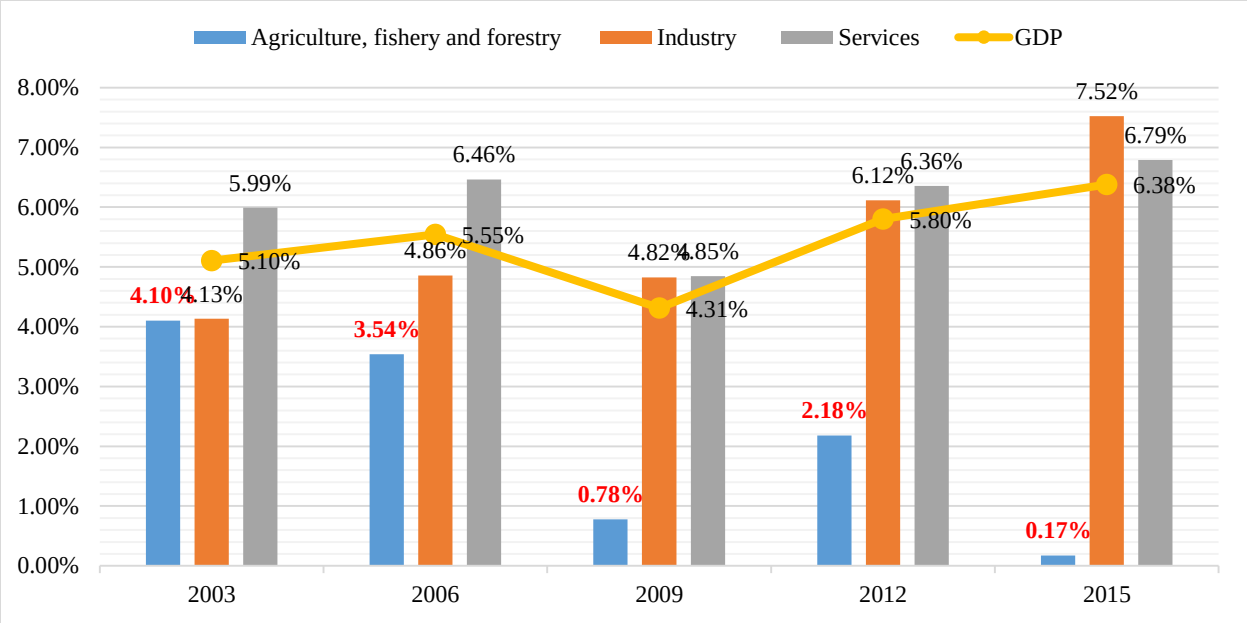

Fig. 1. GDP annual growth rates by sector, Philippines 2003-2015 *(Source of basic data: PSA, 2018).*

One of the critical roles of agriculture is as source of employment. While agriculture accounts for merely 10 % of the country's GDP, it still provides employment to close to 30 % of the country's labor force (Fig. 2). This suggests that labor productivity in agriculture is lower relative to the other sectors and that the structural transformation taking place in the Philippine economy is rather slow and weak.

Philippine agriculture may be characterized among others, by limited diversification and low productivity. The traditional crops such as rice, corn and coconut account for more than 50 % already of total area harvested and it was only recently that high value crops are given increasing attention. Other ASEAN countries have generally more diverse agriculture than the Philippines and have been exhibiting better agricultural performance. For instance, crop yields are generally lower in the Philippines compared to other countries in the region (Table 3). The country is also clearly lagging behind in long term total factor productivity in agriculture (Table 4).

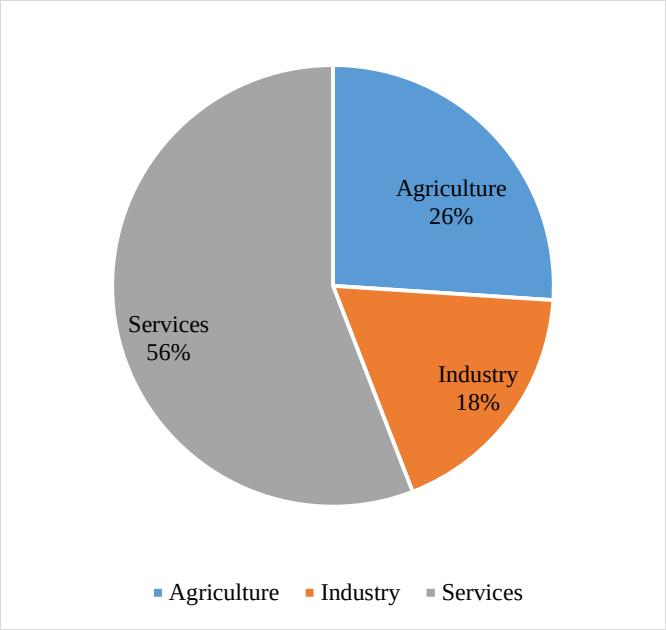

Fig. 2. Employment by Industry Group, January 2018 *(Source of basic data: PSA, 2018)*

Table 3. ASEAN farm yields, tons/ha, 2012-2014 average

Crops	Indonesia	Malaysia	Philippines	Thailand	Vietnam
Banana	57.1	10.3	19.9	25.5	16.5
Cassava	22.4	20	10.9	22	18.0
Coconut	6.2	6.7	4.3	4.9	9.7
Coffee (Green)	0.54	2.85	0.40	0.84	2.29
Corn	4.9	8.0	2.9	4.3	4.4
Pineapple	112.3	27.5	40.7	25	16.5
Rice (Paddy)	5.1	3.8	3.9	3.1	5.7
Rubber (Dry)	0.87	0.80	0.70	1.61	1.71
Sugarcane	61.9	92.1	62.7	76.4	64.3

Source: FAO and UA&P Analytics as cited in Dy (2017).

Table 4. Long-term TFP, 1981-2013 (% growth per year)

	1980s	1990s	2001-2013
Malaysia	3.01	1.88	2.85
Indonesia	0.38	0.62	2.65
Vietnam	1.17	2.33	2.53
Thailand	0.06	2.39	2.22
Philippines	0.18	0.53	1.87

Source: USDA Economic Research Service and UA&P Research as cited in Dy (2017).

Cognizant of the crucial role of agriculture, the previous administration attempted to put the sector into higher growth trajectory (Table 5). The previous medium term development plan aimed an annual growth rate by 2013 of around 5 % for crops, about 2 % for livestock, 5 % for poultry and 3 % for fisheries. These targets have largely been achieved in livestock and poultry,

but hardly been approximated in crops and fisheries. The situation became even worse in 2016 when the crops and fisheries sectors exhibited 3.5 % and 4.5 % decline, respectively.

Table 5. GVA Growth Targets and Accomplishments, 2013 and 2016

Subsector	PDP Target		Accomplishment	
	2013	2016	2013	2016 (Q1-Q3)
Crops	4.5 – 5.5	4.0 – 5.0	0.1	-3.5
Livestock	1.2 – 2.2	1.6 – 3.5	1.8	5.0
Poultry	4.2 – 5.2	4.2 – 5.2	4.2	1.4
Fisheries	1.5 – 3.0	2.8 – 3.5	0.7	-4.5

Source: PDP, 2017

The poor performance of the crop subsector was due to typhoons and El Niño affecting rice and corn production, coconut scale insect infestation, and limited adoption of high-yielding varieties. Fisheries sector's dismal performance was due to extreme weather condition and implementation of closed fishing season in some areas.

CHALLENGES TO ACCELERATING AGRICULTURAL TRANSFORMATION

Limited diversification and low productivity are two of the most important challenges which constrain agricultural transformation in the country. The combined area of high value crops with great market expansion potential is smaller than combined area of rice, corn and coconut, which are the traditional crops in the country. This limits the capacity of the country to harness the full potentials of the growing local and international markets.

Low agricultural productivity is an even bigger challenge. The cultivation frontier in the Philippines has long come to a close. This means that increasing agricultural production in the country can solely come from productivity improvement (increasing output per unit of area) since no new area can be opened up for new cultivation. Long standing challenges that hamper productivity include limited access to credit and agricultural insurance, low farm mechanization and inadequate postharvest facilities, inadequate irrigation, scant support for research and development (R&D), weak extension service, incomplete agrarian reform program implementation, and ageing farmers and fisherfolks. There is also limited connectivity between production areas and markets, and poor compliance with product standards resulting to low competitiveness of agriculture, forestry and fisheries (AFF) products.

Climate change is also an important challenge as its adverse impacts such as increased flooding incidence, drought, soil degradation, water shortages and increased pests and diseases constantly threaten agricultural output and productivity. The Philippines is third among the 173 countries in the world in terms of disaster risk index (World Risk Report, 2011).

Natural resource degradation is likewise an important challenge – deforestation leading to loss in biodiversity, soil erosion, flood and water quality; intensive cultivation resulting to depletion of nutrients in various ecosystems; loss of biodiversity resulting to increased incidence of pest and diseases and loss of natural predators. The impact of resource conservation on productivity was demonstrated in an earlier study (SEARCA, 2013) which showed that adoption of conservation practices was a significant determinant in improving the productivity of corn, especially those planted in marginal lands.

Investment in technology and innovation and the necessary support services is an important requisite to achieving successful agricultural transformation. In the Philippines, the inadequacy

of such investment has long been a significant constraint to agricultural growth. Investment in agricultural R&D as percentage of agricultural GDP has typically hovered to just around 0.3 % annually—way below the 1 % recommended by World Bank. There have been significant increases in R&D investment during the past few years, although the total investment would still be very low to even approximate the recommended rate.

PHILIPPINE AGRICULTURE IN THE NEXT 3-5 YEARS

The prospects for Philippine agriculture within the next five years appear to be modest, although the period may mark the beginning of real transformation taking place in the agricultural sector. The country's medium term development plan, which accords priority focus to agricultural development, is already in full swing. The full implementation of the plan is expected to significantly address the challenges and constraints being faced by the agricultural sector. Foremost is the serious effort of the present administration to achieve significant annual growth in the various sub-sectors (crops, livestock and poultry, forestry and fisheries) (Table 6). Various strategies are currently underway, adequately supported by a clear investment program to ensure the achievement of the targets. The targets have also been made more realistic by taking into account the inherent risks and vulnerabilities being faced by the sector.

Table 6. Plan Targets, 2017-2022

Indicators	Baseline		End of Plan Target – 2022
	Year	Value (%)	
Growth of GVA in AFF increased	2015	0.1	2.5 – 3.5
Crops	2015	-1.8	2.0 – 3.0
Livestock	2015	3.8	3.0 – 4.0
Poultry	2015	5.7	3.0 – 4.0
Forestry	2015	-26.7	2.0 – 3.0
Growth in Value of Production of Fisheries increased			
Commercial	2015	-3.3	2.5
Municipal	2015	-2.2	1.0
Aquaculture	2015	0.8	5.0
Growth in the value of AFF exports increased	2015	-21.6	9.0
Growth in labor productivity of farmers and fisherfolks increased	2015	4.6	5.0 – 6.0

Source: PDP, 2017

The continued expansion of the Philippine economy and improvement in per capita income are projected to further increase food demand. Together with the ambitious spending program of the government to build various infrastructure (dubbed as Build-Build-Build Program), agriculture within the next five years might enter a truly transforming phase. Sustained increases in food demand may significantly increase farm income and induce farmers to seek productivity improving technologies and practices. Most of these technologies are already available, albeit adoption has somehow been limited. The infrastructure program of the government may also draw labor from agriculture. The resulting decline in agricultural manpower may induce

increases in agricultural mechanization and lead to improvement in agricultural labor productivity.

While the sector may face vibrant food demand though, competition with imported food is expected to intensify. Rising food prices will lead to greater clamor for more free trade in food, which is already happening in the case of rice. Such competition however, should be viewed positively as it would place greater pressure to accelerate and intensify all agricultural productivity and efficiency enhancement needed to boost the competitiveness of the agricultural sector.

As mentioned though, the prospects may just be modest and what could be witnessed is just the inception of a transforming phase. It would take more than 3 to 5 years to significantly free the sector from all the structural constraints, inherent vulnerabilities and adverse conditions it is in, resulting from decades of neglect.

AGRICULTURAL DEVELOPMENT PLAN AND POLICIES[3]

The country's institutional framework or national agricultural development plan is embedded in the Philippine Development Plan 2017-2022, particularly on Chapter 8: Expanding Economic Opportunities in Agriculture, Forestry and Fisheries (Fig. 3). A legislative agenda has also been formulated to support this framework (Table 7). In the medium term, the plan aims to expand economic opportunity for those who are already engaged in producing agricultural products and increase access to economic opportunities for small farmers and fisherfolks who are typically subsistence farmers and have limited market participation. Over the plan period, the target is to increase agricultural GVA from the baseline value of 0.1 % to 2.5 to 3.5 % in 2017 and maintain this growth rate over the plan period. A reversal of the negative growth of fisheries production and export is likewise aimed for. The strategy of the plan is anchored on improving productivity and increasing access. The sector outcomes were clearly identified in the plan and the strategies for achieving them are as follows:

Sector outcome A: Economic opportunities in AFF expanded

To expand economic opportunities for existing AFF producers: (a) productivity must be improved sustainably; and (b) the number and capacity of AFF based enterprises must increase. Sustained productivity improvement will be achieved by striking a balance between utilization and regeneration of land and water resources. New AFF based enterprises will be encouraged and existing ones will be expanded to increase value added and to tap better markets. The resulting rise in income will attract new entrants, especially the youth to pursue agriculture. Sustainable productivity improvement will entail the following:

Sub-sector outcome 1: Sustained productivity improvement

a. Develop an integrated color-coded agricultural map to identify the comparative advantage of specific areas

It will contain updated sub-national information on soil characteristics, water availability, climatic types, topography, and socioeconomic conditions. The map will inform production

[3] This section is drawn from Chapter 8 of the Philippine Development Plan, 2017-2022.

decisions about suitable crops and agricultural activities. It will also guide the identification and prioritization of programs, projects, and activities in the sector.

Accelerate construction of disaster- and climate-resilient small-scale irrigation systems and retrofit existing ones. Irrigation systems must be disaster- and climate- resilient and compliant with construction standards. Priority will be given to small and communal irrigation systems, especially water harvesting technologies. Large-scale irrigation systems will be constructed if deemed hydrologically appropriate (i.e., water source is available and stable) and economically feasible.

b. Facilitate the use of appropriate farm and fishery machinery and equipment

Funding will be provided for the full implementation of the Agricultural and Fisheries Mechanization Law or RA 10601 to encourage local manufacturing and assembly of machinery and equipment for production, post-harvest, and processing activities. Government will intensify information, education and communication (IEC) activities on available local machinery (e.g., tractors, tillers, and harvesters), equipment, (e.g., mechanical dryers, threshers, and milling equipment) and fishing technologies (e.g. fiberglass hull and small engines in fishing boats).

c. Strengthen the AFF extension system

The existing extension system will be strengthened through the engagement of a pool of professional extension workers that will provide technical and business advisory services. This should shorten the lag from R&D to adoption. Priority extension activities will include encouraging farmers and fisherfolk to use: (a) certified seeds and quality planting materials, especially high- yielding and stress-tolerant varieties (e.g., drought and flood); (b) quality semen of animals and eggs for poultry; and (c) quality fish fry and fingerlings. The government will recognize and advocate for the adoption of good practices (e.g. integrated pest management, integrated nutrient management, and sustainable fishing practices), and food safety and product standards (e.g. good agricultural practices, good aquaculture practices, good handling practices, code of practices for fresh fruits and vegetables, food hygiene practices, and packaging and transport practices).

Subsector Outcome 2: AFF-based enterprises increased

a. Diversify into commodities with high value-adding and market potential

Commodities that can be developed based on vulnerability, suitability, and value chain analyses of Department of Agriculture include mango for Ilocos, coffee for the Cordillera Administrative Region (CAR), dairy cattle for CALABARZON, calamansi for MIMAROPA, abaca for the Bicol Region and Eastern Visayas, rubber for the Zamboanga Peninsula, banana for Northern Mindanao, and cacao for the Davao Region. The adoption of integrated farming systems such as intercropping, livestock-crops, crops-livestock-fish, and agro-forestry will be promoted to maximize the use of land. The integrated color-coded agricultural map can be utilized for this purpose.

b. Expand AFF-based enterprises through new and innovative production and marketing schemes

New forms of linkages such as contract farming and corporate farming that will connect AFF enterprises to markets and other upstream services will be established. The government will lead in market facilitation through the conduct of domestic and international trade fairs and market-matching activities. It will also intensify enterprise-based capacity building and business advisory services for farmers and fisherfolk organizations, including agrarian reform beneficiaries (ARB) organizations. The capacity building and advisory will help the organizations manage.

c. Strengthen community-based enterprises in upland areas

The government will continue to implement and monitor programs and projects that foster community-based enterprises in upland areas. At the same time, efforts will be undertaken to address issues of accessibility and connectivity, as well as vulnerability to climate and disaster risks.

Sector Outcome B: Access to economic opportunities by small farmers and fisherfolk increased

To increase the access of small farmers and fisherfolk to economic opportunities, the government will facilitate their access to value chains, technology, and financing. At the same time, it will ensure that their rights and welfare are defended and asserted.

Subsector Outcome 1: Access to value chains increased

a. Physically link production areas to markets through road and rail-based transport, inter-island water transport and logistics system

Farm-to-market roads, bridges, tramlines, and railways will be constructed to connect small farmers and fisherfolk to the agricultural value chain. Inter-island water transport (e.g., roll-on roll-off nautical highway) and port facilities such as fish ports, will be improved to foster greater inter-regional trade of agriculture and fishery produce.

Subsector Outcome 2: Access to technology increased

a. Raise investments in R&D for production and post-harvest technologies

This aims to reduce losses, maintain quality and food safety, and increase the value of agricultural and fishery commodities (e.g., ice-making and storage technologies). Investments will be increased to cover the direct cost of R&D, build a critical mass of human resources, and improve infrastructure in support of the Harmonized National R&D Agenda for Agriculture, Aquatic and Natural Resources 2017-2022. This agenda espouses the use of advanced and emerging technologies such as biotechnology, genomics, bioinformatics, nanotechnology, and

ICT as tools to find science and technology solutions to AFF problems and to develop new products with significant impact to the sector.

The following will continue to be priorities for the sector: (a) development of climate and disaster-responsive technologies and innovations; (b) development of fishery culture system for species with high market potential; and (c) improvement of fishery culture for traditional species.

b. Enhance capacity of small farmers and fisherfolk to adopt better and new technologies

This entails information dissemination and capacity building on the use of certified seeds as well as post-harvest, processing and packaging technologies.

Subsector Outcome 3: Access of small farmers and fisherfolk to land and water resources increased and protected

a. Ensure and protect the land tenure security of Agrarian reform beneficiaries by completing the Land acquisition and distribution (LAD) and immediately install ARBs in awarded lands upon the issuance of emancipation patent or Certificate of Land Ownership Agreements (CLOAs)

An inventory of lands and profiling of ARBs will be conducted to ensure an updated status of land distribution in the country and guide the delivery of support services in agrarian reform communities and clusters.

b. ***Fast track the resolution of agrarian-related cases involving large numbers of affected farmers***

Timely and free legal assistance will be provided to ARBs, including counselling and representation in judicial and quasi- judicial bodies.

c. ***Revisit Section 20 of the Local Government Code (RA 7160), which authorizes LGUs to reclassify agricultural lands for other uses***

This law does not include any provision for sanctions or penalties to LGUs that reclassify agricultural lands more than the allowable limit (i.e., 15% for highly urbanized cities, 10% for component cities, and 5% for 4th- 6th class municipalities). Hence, it is critical that LGUs provide baseline information about the LGU's land types, and this information will be the basis for implanting land classification.

d. Complete the delineation of municipal waters

Local ordinances must be issued to smallholder farmers and fisherfolk who are not yet organized into associations and cooperatives. Efforts to integrate them into larger agribusiness enterprises and institutional buyers will also be pursued.

e. Provide capacity building for small farmers and fisherfolk on value-adding activities

Professional agricultural extension workers will be tapped to provide trainings to small farmers and fisherfolk in the farmer field schools and demonstration farms that will be established. The trainings will include processing, packaging, marketing, and compliance with product standards and certification.

f. Provide non-farm livelihood options to seasonal farm and fishery workers whose incomes are irregular and who are vulnerable to shocks

The government will continue to implement community- based employment programs as alternative income sources during the off-season. Seasonal workers will also be trained on off-farm and non-farm activities to enable them to take advantage of alternative employment opportunities, including their involvement in the development of agri-tourism.

Subsector Outcome 4: Access to innovative financing increased

a. Increase the number of small farmers and fisherfolk that are provided with agricultural insurance

This will be done by improving the awareness and appreciation of small farmers and fisherfolk of risk insurance. Innovative agricultural insurance schemes such as weather index-based and area-based yield index insurance will be promoted.

b. Provide small farmers and fisherfolk easy access to affordable formal credit

The government will develop and implement innovative loan products with responsive credit delivery mechanisms.

c. Complement strategic efforts with environmental and governance strategies

To strengthen the efficiency and effectiveness of the strategies, the government will: (a) expand the existing human resource base by increasing scholarship opportunities in AFF-related courses; (b) continue to pursue the national convergence initiative using the ridge-to- reef approach; (c) strengthen resilience to climate and disaster risks; (d) regularly update the Registry System for Basic Sectors in Agriculture and Fisheries Registration, especially the information used in targeting for credit and agricultural insurance; (e) conduct a comprehensive market scoping to analyze competition issues in priority sectors, which may include land market; (f) ensure the meaningful participation of all stakeholders (i.e., through organized groups) in planning, monitoring and implementation; and (g) strengthen coordination and convergence of the efforts of national government agencies, LGUs, civil society organizations, and SUCs on AFF concerns and cross-cutting issues such as food security and nutrition.

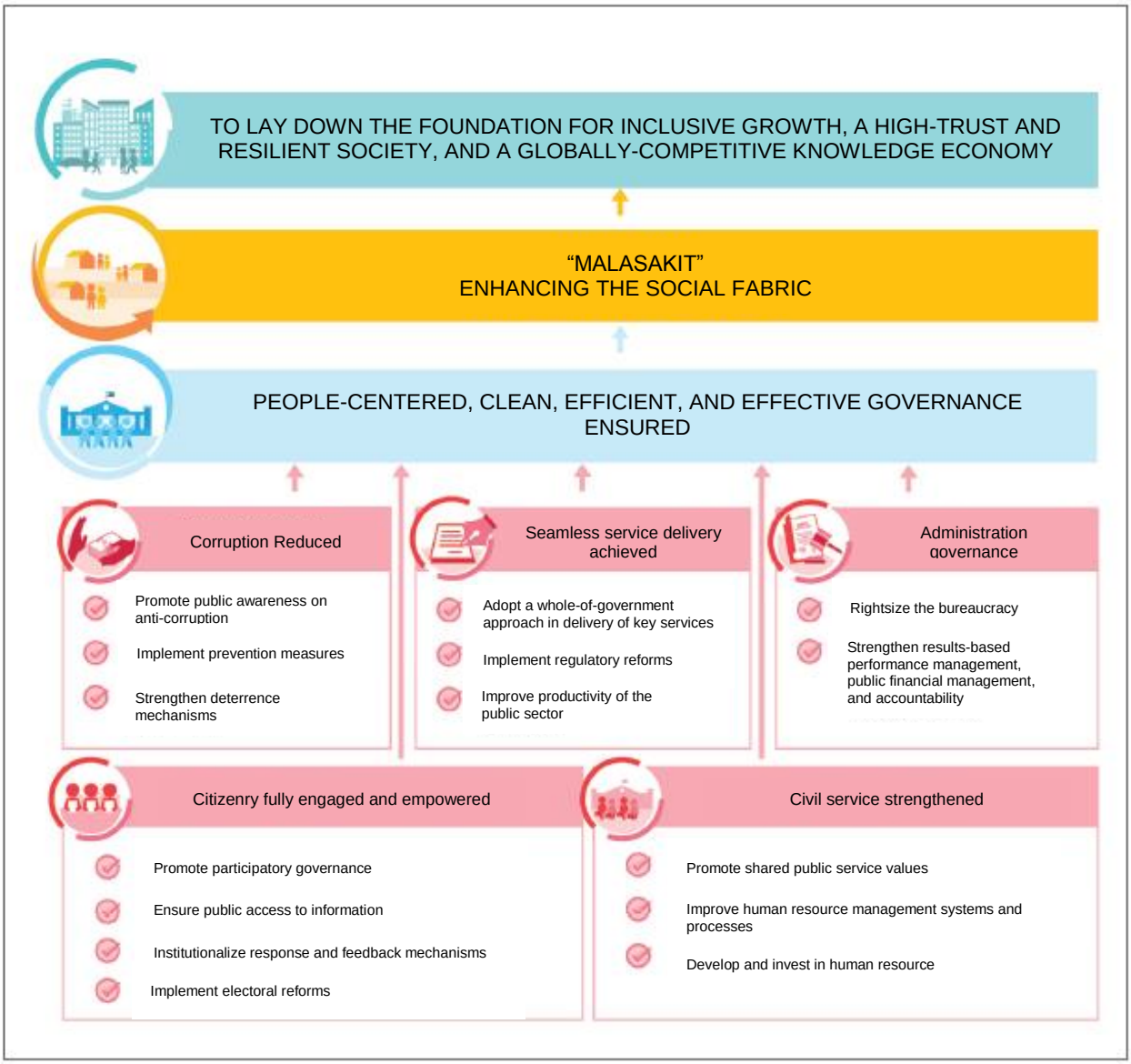

Fig. 3. Framework for the agricultural development plan, 2017-2022 *(Source: PDP, 2017)*

Table 7. Legislative agenda in support of the medium term plan, 2017-2022

LEGISLATIVE AGENDA	RATIONALE
Sector Outcome A: Economic opportunities in AFF expanded	
Subsector Outcome: AFF productivity improved within ecological limit	
Abolish the irrigation service fees for small farmers	Waive the irrigation service fees to small farmers as many of them cannot afford to pay the fee imposed by the National Irrigation Administration on its national irrigation system. A minimal fee may be imposed on pump-driven irrigation systems as they have higher operating expenses. Wholesale condonation of past-due irrigation service fees of farmers and corporations with large landholdings (e.g., those owning 5 ha) may have to be restructured under mutually agreed terms and conditions so as not to additionally burden them, but at the same time to be fair to those who religiously paid the required fees.
Comprehensive Forestry Law, and Delineation of the Specific Forest Limits	*See Chapter 20*
Sector Outcome B: Access to economic opportunities by small farmers and fisherfolk increased	
Subsector Outcome: Access to innovative financing Increased	
Amend the Revised Charter of the PCIC Act of 1995 or RA 8175 as well as other relevant laws	Reorganize the Philippine Crop Insurance Corporation (PCIC) and increase its authorized P2 billion capital stock to cater more effectively to the demands of small farmers and fisherfolk.
Cross-cutting	
Amend or Repeal Presidential Decree No. 4 of 1972 as well as other relevant laws	Decouple the regulatory and proprietary function of the National Food Authority (NFA). The NFA will continue to exist but its role will focus on rice buffer stocking for food security
Amend the Agricultural Tariffication Act of 1996 or RA 8178	Replace QRs on rice with tariffs. The tariff proceeds from rice imports will be ploughed back to the rice sector.
Provide guidelines for the utilization of the Coco Levy Fund.	Consolidate all assets and benefits emanating from the coconut levy. Create a Coconut Farmers and Industry Trust Fund to exclusively benefit coconut farmers and farm workers.
Pass the National Land Use Act (NALUA)	Protect prime agricultural lands thereby ensuring the viability and sustainability of on-farm employment and overall rural development. The definition of prime agricultural lands in the NALUA should represent a socially acceptable minimum agricultural land requirement that would maintain a certain level of agricultural industry in a given economic or spatial context at a given point in time. *See Chapter 20*.
Land Administration Reform Act	*See Chapter 20*
Genuine and Comprehensive Agrarian Reform Program.	Distribute for free or without amortization agricultural lands to landless farmers and agricultural workers. Its coverage will include: all public and private agricultural lands exceeding five ha; lands that have been declared and/ or reserved for non-agricultural uses but remain unutilized and undeveloped; and lands that have been reclassified or converted for commercial, industrial or residential uses but have remained undeveloped and being used for agricultural purposes.

Source: PDP, 2017

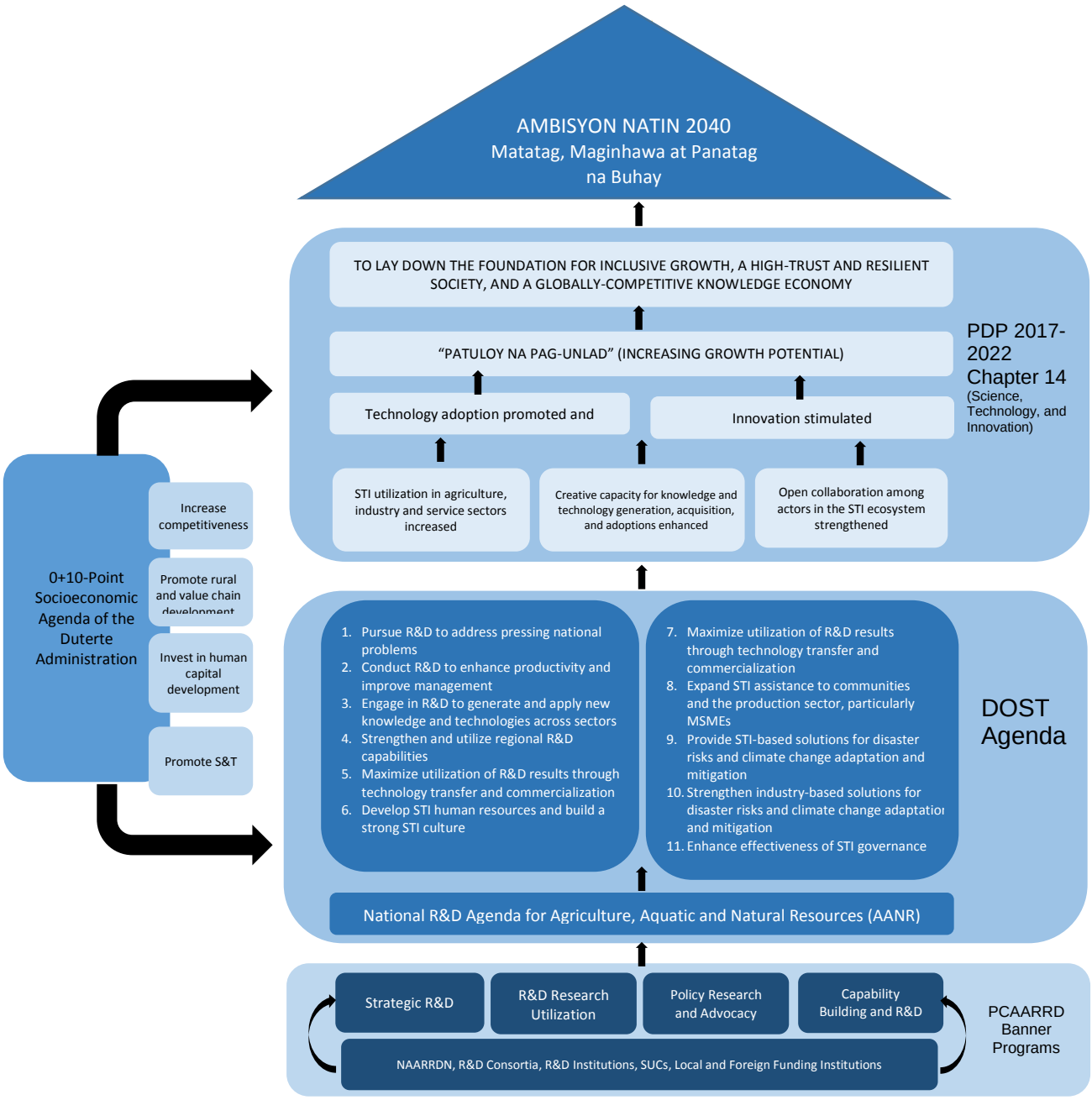

Fig. 4. PCAARRD CorPlan Framework
Source: PCAARRD CorPlan 2017-2022, 2018

CONCLUSION AND POLICY INSIGHTS: R&D PROGRAM TO SUPPORT THE AGRICULTURAL DEVELOPMENT PLAN

The country's agricultural innovation system plays a crucial role in realizing the targets of the medium-term agricultural development plan. The Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD), which is a planning council under the Department of Science and Technology has formulated its Corporate Plan (CorPlan) in complete support of the agricultural development plan. The framework for this plan is shown in Figure 4.

To implement this framework, the following strategic S&T interventions are laid out:

A. Translation and operationalization of the Harmonized National R&D Agenda for the agriculture, aquatic and natural resources 2017 – 2022. Under this agenda are the broad R&D areas for crops, livestock, fisheries, forestry, natural resources and environment, climate change mitigation and adaptation, technology transfer, socio-economics and policy research, and capacity building.
B. Science for Change Program (S4C), a DOST program that aims to accelerate science, technology and innovation in the country. Under this program are four categories namely:
    i. Program expansion in 10 areas, including agricultural and aquatic productivity, biotechnology, and nuclear science for agriculture;
    ii. New programs in 5 areas, including ICT development and artificial intelligence;
    iii. Science and Technology Human Resources Development Plan; and
    iv. Areas in accelerated R&D programs for capacity building of R&D institutions and industrial competitiveness.
C. PCAARRD Banner Programs including strategic R&D for crops, livestock, aquatic, forestry, natural resources and environment, and climate change adaptation; R&D results utilization; policy research and advocacy; and capability building and governance.

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