Institutional Building of Agricultural Research in Indonesia

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Introduction

Agriculture is a key strategic sector in Indonesia. The main policy priorities for this sector include achieving self-sufficiency in key commodities (rice, corn, soybean, sugar, and beef), achieving national food security, diversifying food sources, increasing the competitiveness of agricultural production and value-added processing, balancing the needs of producers and consumers, increasing farmer welfare through higher incomes, and managing the effects of climate change.

One of the important roles to play in addressing the above-mentioned policy priorities is agricultural research and development. Institutionally, agricultural research in Indonesia is managed by the Indonesian Agency for Agricultural Research and Development (IAARD). This agency is one of the first-echelon units in the Ministry of Agriculture (see Appendix Figure 1) which was the tasked of carrying out research and development in agriculture.

Key Features

The IAARD is the research arm of the Indonesian Ministry of Agriculture. The main mandate of this agency includes: (1) supporting the technical agencies (e.g. Directorate General) especially on technology and institution innovation and information development; and (2) formulating and proposing the policy synthesis and analysis on agricultural development. The agency is responsible for the allocation of public sector research and development spending in agriculture***.*** A number of concerns have been raised regarding the performance of agricultural research and development in Indonesia.

The Existence of IAARD

Organizational Structure

Institutionally, the IAARD comprises of 11 Research and Development Centers in which each of them manages research and development on food crops, horticulture, estate crops, livestock, veterinary, soil and agro-climate, agro-socioeconomic, machinery, postharvest, biotechnology and agricultural technology assessment. Within these centers, IAARD manages 15 research institutions, 3-research stations and 33 assessment institutions located throughout various provinces in the country (see Appendix Figure 2)**.**

Main Duties and Functions

There are four duties and functions of IAARD. It includes: (1) preparing technical policy as well as agricultural research and development program plans; (2) implementing agricultural

research and development; (3) carrying out monitoring, evaluation, and reporting the implementation of research and agricultural development; and (4) administering agricultural research and development.

***Vision and Mission**s*

The vision of the IAARD is to produce and develop agricultural innovations towards supporting the realization of the industrial agricultural system. To achieve this mission, the IAARD has set the missions. ***Firstly***, producing and developing technological innovations and policy recommendations in the agricultural sector to support the realization of the industrial agriculture system. ***Secondly***, to improve the quality of agricultural research resources as well as enhance the efficiency and effectiveness uses. ***Thirdly***, to develop national and international networks in line with science and technologies and improve the role of IAARD in agricultural development.

The IAARD strives to foresee and respond to changes in the strategic environment. It has reoriented its research and development component as follows: (1) from centralized to decentralized management; (2) from a focused on commodities to a resource-oriented approach based on farming systems and agribusiness; (3) from a focused on production techniques to one which is based on a balance between strategic and adaptive technologies; (4) from a general approach to one which is based on the needs of specific areas, within an agribusiness framework; and (5) from a focused on production to one which is based on market demand.

Research and Development Strategies

The IAARD has a number of research and development strategies. They are:

1. Optimizing the use of data and information as well as the existing science and technology innovation.
2. Improving the assembly and supply of superior variety, seeds, and seed system innovation system competitiveness, as well as strengthening the seed resources management unit.
3. Improving the adaptive postharvest technology innovation based-local resources.
4. Increasing the innovations of fertilizers, bio-pesticides, vaccines, agricultural tools and machineries, and agricultural infrastructure management.
5. Enhancing the intensities of mentoring, apprenticeship, training, and consulting agribusiness.
6. Improving the accessibility of farmers to agricultural financing resources and strengthening institutional farmers.
7. Optimizing the research resources in order to spur the productivity and quality of research improvements (scientific recognition), and environmentally friendly products, safe, healthy,

intact, and permitted (*halal*) which are produced in a short time, efficient, and high impact (impact recognition) through intensive dissemination activities.

8. Increasing research and development collaboration with national and international institutions.
9. Increasing the promotion and dissemination of research results through the entire spectrum of national and international stakeholders to accelerate the process of achieving the objectives of agricultural development (impact recognition), international scientific recognition (scientific recognition), and the acquisition of research funding sources outside the state budget (external funding).
10. Increasing the quantity, quality, and capability of research resources through improving recruitment and training of human resources system, adding up the infrastructure and facilities, restructuring budget allocation suited the needs of IAARD.
11. Encouraging leads on technological innovations to recognize and protect Intellectual Property Rights (IPR) in the national and international levels.
12. Improving the accountable and good governance of agricultural research and development managements.
13. Utilizing high technology for genome and gene expression analysis in accelerating the creation of new varieties, genetically modified (seedless), tissue culture, and somatic embryogenesis for seed distribution campaign, chromatography-mass spectrometry gas for flavor based commodities, portable chromatography gas for measuring the greenhouse gas emissions towards climate change anticipations, liquid chromatography-mass spectrometry for detecting residues, biosafety laboratory, non-destructive test technology application and image processing for grading the size and quality of tropical fruits.

Focused Commodities

Research and development undertaken by the IAARD are focused on six major community groups. ***Firstly***, food crops cover rice, maize, soybeans, cassava, sweet potato, mungbeans, and peanuts. ***Secondly***, vegetables include chili, tomatoes, shallots, string beans, and potato. ***Thirdly***, fruits comprise banana, mango, citrus, mangosteen, melon, papaya, and durian. ***Fourthly***, ornamental crops consist of roses, orchids, gladioli, chrysanthemums, carnations, lilies, and anthuriums. ***Fifthly***, estate crops contain palm oil, rubber, coffee, cacao, tea, cinchona, sugarcane, coconut, black pepper, cashew, cloves, tobacco, cotton, ginger, greater galingale, turmeric, patchouli, nutmeg, vanilla, kapok, knave, jute, and sago. ***Sixthly***, livestock involves beef cattle, sheep, goat, native chicken, duck, and dairy cattle.

Activity and Funding Strategies

Based on its output and outcome orientations, the research and development activities of IAARD are directed at two-categories. ***Firstly***, category I (scientific-based activities) is an upstream research activities generating technological innovations and institutional support scientifically, phenomenal, and futuristic which support the agricultural productivities. ***Secondly***, category II (impact-based activities) is adaptive research and development to support the achievement of agricultural development of the Ministry of Agriculture.

In line with the above directions, the agricultural research and development activities funded by internal budget (state budget) are grouped into: (1) upstream research which is allocates about 50-60% of the budget; (2) adaptive research and dissemination allocates 20-30% of the budget; and (3) upstream and adaptive research collaboration allocates 10-20% of the budget.

Agricultural Technology Assessment

As a response to the changing strategic environment and decentralized development including research and development activities, the IAARD established the Assessment Institute for Agricultural Technology (AIAT) to support the agricultural development region-based agro ecosystem and regional commodity. The institution was formed to produce agricultural technology specific location and area of agricultural development policy alternatives.

The AIATs has several programs related to decentralization of agricultural research and development. It is aimed at improving the quality of research and assessment results (outputs) and its benefits (outcomes) for agricultural development and the welfare of farmers and other related stakeholders at the regional level. These programs include: (1) agro-ecological zones; (2) local specific commodity researches; (3) local specific agricultural technology assembly researches; (4) agriculture systems assessments; (5) research and assessment result disseminations; and (6) local socioeconomic researches and agricultural development policy analysis. The planning and implementation of these programs are tailored in line with the priorities of agricultural development in the respective AIATs. Responsibility for further expansion was then given to the local governments.

It is noted that AIATs thus exists as a linkage interface between research and extension in Indonesia. The AIATs are crucial to strengthen the linkages between research at the central level and extension agents at the local level. A system by which the AIATs are positioned with agro-ecological zone specializations and serving all provincial concerned would foster cross-province cooperation.

Currently, there are 33 AIATs representing the number of provinces in Indonesia. These institutions are coordinated by the Indonesian Center for Agriculture Technology

Assessment and Development (ICATAD). The roles of ICATAD are: (1) performing program formulation, evaluation, collaboration; (2) making efficient use of agricultural technology assessment and development; and (3) assessing and developing standard methods, excellent technology packages, and regional and national agricultural technology models. In other words, the ICATAD coordinates the direct functioning of 33 AIATs and provides the central link between them and the IAARD research units.

Intellectual Property Rights

One of the important aspects of agricultural research and development is related to Intellectual Property Rights (IPR). This aspect is fundamentally regulated under Government Regulation No. 20/2005 and the Agricultural Minister Regulation No. 6/2012. The former states that IPR includes the license, co-operation, science and technology services, and publications of agricultural research and development results. Meanwhile, the later regulates the guidelines to obtain the legal protection of IPR.

The IPR is one of research and development strategies of IAARD in which it is aimed at encouraging technological innovations to the recognition and protection of national and international inventions and researches. This aspect is organized by one of task units of IAARD, namely the Office for Agricultural Technology Transfer and Intellectual Property Management (OATTIPM). The management services of this institution cover: (1) five types of IPR (patent, copyright, trademark, plant variety protection, and variety registration); (2) drafting patent assistances; (3) monitoring the process of IPR registration; (4) budget provisions for IPR registration, accelerating the publication (patent), substantive examination (patent and plant variety protection), IPR certificate, IPR maintenance, and for the new, unique, stable, and similarity examination; (5) Mediation between inventors and patent examiners; and (6) IPR socialization (campaign) to researchers for raising awareness and enhancing the registration.

In terms of technology transfer, it is managed through a number of services. They are: (1) implementing the promotion (business meeting, door to door, agricultural innovative books, website, etc.); (2) selecting the companies; (3) organizing the mediation between the inventors with companies; (4) signing the licensing agreement; and (5) completing the annual verification on licensing agreement.

There are several aspects in improving IPR management and technology transfer program. It includes: (1) organizing the agreement among the research center to put the IPR and number of licensing out of technology as the component of Index Performance Indicator, especially for the year 2015-2019; (2) addressing the IPR as a output of the research activities (criteria in research proposal evaluation); (3) facilitating the assessment process to get IPR information (patent search); (4) providing the special awards for researcher that get more IPR

certificate and licensing out of technology and awards for licensees; (5) initiating some private partnership in research activities (special meeting between private sector and researcher); (6) performing the customization before licensing out of technology (consistency and will be ready to manufacturing, regulation adjustment); (7) improving the database of technology and friendly user and access for the end user of technology; and (8) advancing the tools to evaluate a technology that is ready for licensing out and getting the IPR.

Concluding Remarks

Since its establishment in 1974, the IAARD has several reorganizations to adapt the changing demands of the country's agricultural sector and national development programs. In an endeavor to further bridge the diffusion process of technology and innovation from research institutions to the farmers, the IAARD has altered the paradigm from “research and development” to “research for development”. Hence, in the new paradigm, the role of disseminating research results is considered parallel with its research activities.

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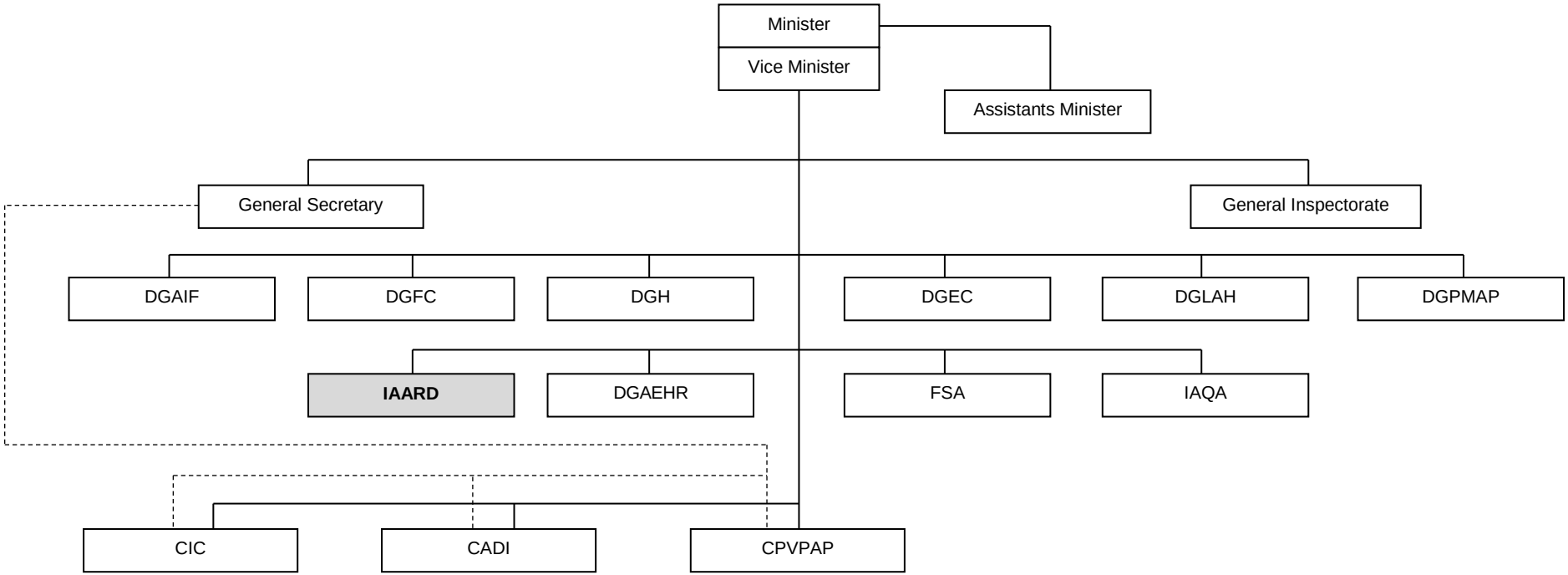
APPENDICES

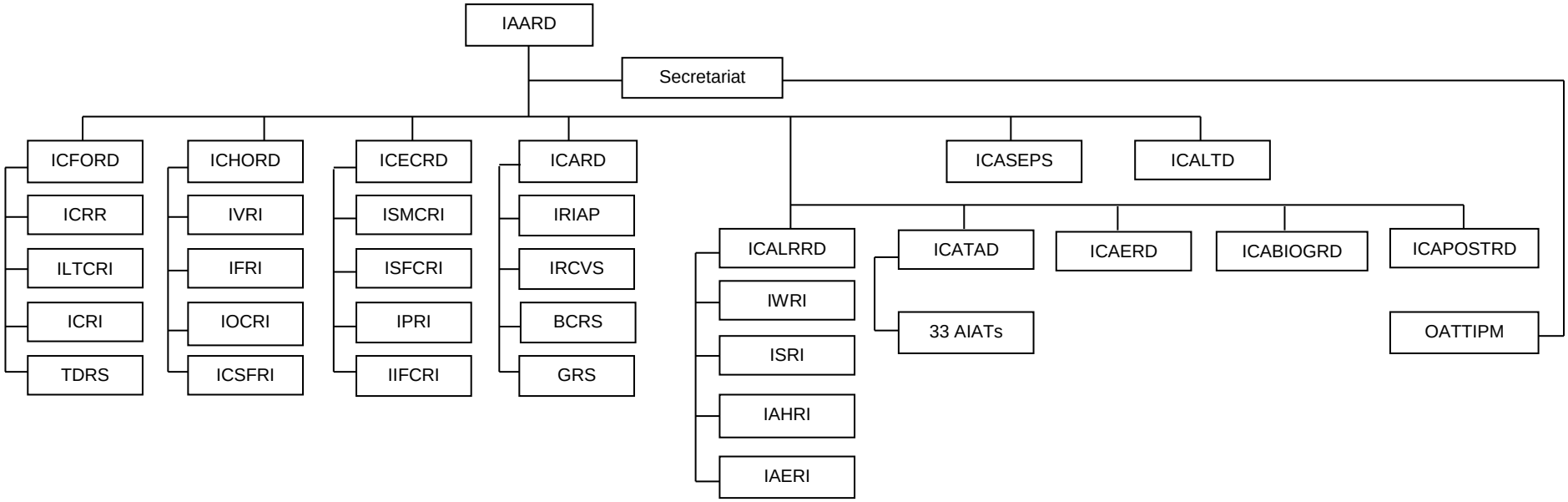
Appendix Figure 1
Organizational Structure of Indonesian Agricultural Ministry



Note:

Assistants Minister for Environment, Agricultural Development Policy, International Cooperation, Innovation and Technology, and Agricultural Investment
IAQA Indonesia Agricultural Quarantine Agency
IAARD (Indonesian Agency for Agricultural Research and Development)
DGFC (Directorate General of Food Crops)
DGEC (Directorate General of Estate Crops)
DGH (Directorate General of Horticulture)
DGLAH (Directorate General of Livestock and Animal Health)
DGPMAP (Directorate General of Processing and Marketing for Agricultural Products)
DGAIF (Director General of Agricultural Infrastructure and Facilities)
DGAEHR (Directorate General of Agricultural Extension and Human Resource)
CADI (Centre for Agricultural Data and Information)
CIC (Center for International Cooperation)
CPVPAP (Center for Plant Variety Protection and Agriculture Permit)

Appendix Figure 2
Organizational Structure of Indonesian Agency for Agricultural Research and Development



Note:

IAARD (Indonesian Agency for Agricultural Research and Development)
ICFORD (Indonesian Center for Food Crops Research and Development
ICRR (Indonesian Center for Rice Research)
ILTCRI (Indonesian Legumes and Tuber Crops Research Institute)
ICRI (Indonesian Cereals Research Institute)
TDRS (Tungro Diseases Research Station)
ICHORD (Indonesian Center for Horticulture Research and Development)
IVRI (Indonesian Vegetables Research Institute)
IFRI (Indonesian Fruits Research Institute)
IOCRI (Indonesian Ornamental Crops Research Institute)
ICSFRI (Indonesian Citrus and Subtropical Fruits Research Institute)
ICECRD (Indonesian Center for Estate Crops Research and Development)
ISMCI (Indonesian Spice and Medicinal Crops Research Institute)
ISFCRI (Indonesian Sweetener and Fiber Crops Research Institute)
IPRI (Indonesian Palma Research Institute)
IIFCRI (Indonesian Industry and Freshener Crops Research Institute)
ICARD (Indonesian Center for Animal Research and Development)
IRIAP (Indonesian Research Institute for Animal Production)
IRCVS (Indonesian Research Center for Veterinary Sciences)
BCRS (Beef Cattle Research Station)
GRS (Goats Research Station)
ICASEPS (Indonesian Center for Agricultural Land Resources Research and Development)
ICALTD (Indonesian Center for Agricultural Library and Technology Dissemination)
ICALRRD (Indonesian Center for Agricultural Land Resources Research and Development)
IWRI (Indonesian Wetland Research Institute)
ISRI (Indonesian Soil Research Institute)
IAHRI (Indonesian Agro-climate and Hydrology Research Institute)
IAERI (Indonesian Agricultural Environment Research Institute)
ICATAD (Indonesian Center for Agricultural Technology Assessment and Development)
AIAT (Assessment Institute for Agricultural Technology)
ICAERD (Indonesian Center for Agricultural Engineering Research and Development)
ICABIOGRD (Indonesian Center for Agricultural Biotechnology and Genetic Resource Research and Development)
ICAPOSTRD (Indonesian Center for Agricultural Post Harvest Research and Development)
OATTIPM (Office for Agricultural Technology Transfer and Intellectual Property Management)