DEPARTMENT OF TRADE AND INDUSTRY

Policy Briefs

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The Philippines' Agribusiness Innovation

Introduction

The Philippine agricultural sector is inherently linked to poverty. Nevertheless, it remains vital in achieving inclusive growth as it employs about 30 percent of the country's workforce (World Bank, 2016). Moreover, innovation in agriculture could lead to increases in productivity, income and employment. For instance, an innovation in mango disease management technology could improve yields for some 2.5 million smallholder farmers engaged in mango production, and effectively improve sales for input providers, traders, and processors. More than inventing the technology however, the complex dynamics of the innovation ecosystem should also be considered as this can either facilitate or constrain the generation, dissemination or adoption of such innovations.

An agricultural innovation is defined as a new technology or practice that is used in agribusiness to improve operations. It typically results to higher yields, better quality of products, lower costs and increase sustainability. An innovation ecosystem on the other hand, refers to all factors involved in research and innovation. This encompasses policies and social norms that affect the behavior of actors in the ecosystem. The general structure of the RTI innovation ecosystem is shown in Figure 1.

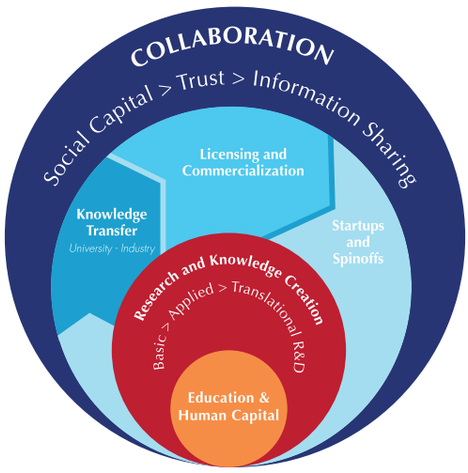

Figure 1. RTI Innovation Ecosystem Model

It is worth noting that the innovation ecosystem for agriculture is unique in comparison with other sectors, because it is often associated with socio-economic factors such as poverty and food security. Additionally, major agricultural institutions were founded based on the idea that agricultural innovations are for public benefit, as funding for agricultural research and technology transfer are heavily sourced from public funds. Furthermore, users of agricultural technology are quite dispersed, constraining the diffusion process for innovation.

This policy brief presents the summary of the United States Agency for International Development - Science, Technology, Research and Innovation for Development's (USAID-STRIDE's assessment of the Philippines' innovation ecosystem for agribusiness. It aims to provide an overview of the various actors in the ecosystem, illustrate their linkages, and identify the strengths, weaknesses and opportunities for intervention. The assessment focuses on three specific value chains namely, cacao, coffee and mango, which are taken as representative samples for the agribusiness sector. These three value chains are dominated by smallholder farmers, requiring innovations and adoption of new technology in order to meet the growing demand.

Innovation for Growth Pathway

Innovation translates to agricultural growth through five stages. Figure 2 outlines each of these stages and identifies the key actors, relationships, as well as critical factors that facilitate a successful innovation.

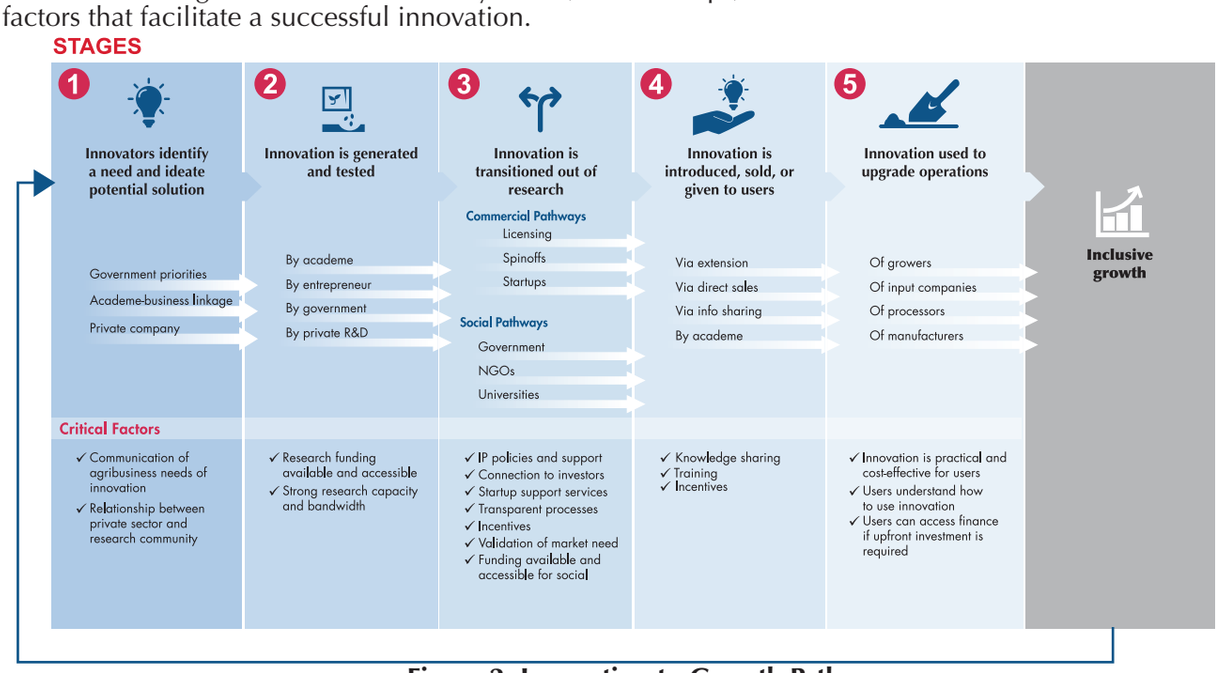

Figure 2. Innovation to Growth Pathway

The assessment of the agribusiness innovation ecosystem is based on 65 interviews done in 2016, over the course of five months. The following discussions present the key findings from the interviews, in consideration of each stage of the innovation-to-growth pathway.

1. Identification of Need

Identifying the need for innovation is the first stage in the innovation-to-growth pathway. During this stage, farmers, agro-input companies or processors should be able to identify the challenges or inefficiencies in their operations. Accuracy is most critical at this point; hence, strong linkages between researchers and industries are highly useful.

In the Philippines, the government performs the lead role in identifying the need for agricultural innovation and guides university researchers towards such needs. Additionally, it provides financial assistance through the Department of Science and Technology (DOST) and Department of Agriculture (DA) for the conduct of research that would generate useful innovations.

- Both the DA and DOST conduct a multi-stage evaluation process for research proposals to ensure the industry applicability of the research. However, the interviews reveal that ***the private sector views funded research as less useful to the industry***. It was also noted that researchers are not required to identify real market demand prior to receiving the research grant.
- Another problem raised is that ***there are very few instances of direct academe-business linkages***. Although faculty researchers may be able to partner with private companies, it appears that most consulting opportunities arise due to pre-existing relationships. Administrative barriers also limit universities from benefitting from faculty consulting arrangements and institutionalizing relationships with industry.
- ***Private agribusinesses hardly rely on the expertise of Philippine universities*** because of their access to international researchers through their affiliation with large international buyers.

2. Generation and Testing of Innovations

After the need has been identified and communicated to the researchers, the next stage is generation and testing of innovation. The following section discusses how agricultural innovations are generated in the country and how factors such as funding and research capacity are affecting the overall process.

University Research

Majority of the agricultural research and innovation in the country is performed in universities. Universities access research funding from government agencies such as the DOST-Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (DOST-PCAARRD) and DA-Bureau of Agricultural Research (DA-BAR). Aside from these agencies, the DOST-Philippine Council for Industry, Energy and Emerging Technology Research and Development (DOST-PCIEERD) and the Commission on Higher Education (CHED) are likewise providing research funding for agriculture and food processing.

- Based on the interviews, ***the access to funding varies for universities and researchers***. Prestigious universities that are closer to Manila are highly favored in terms of research grants and are sometimes directly approached by funders for targeted research. It would appear that ***universities that are closely linked to farmers are those that are least likely to access funding.***
- ***Government funding also prefers experienced researchers***, making it difficult for young researchers to access financial support especially if they are from lesser-known universities. On the other hand, first-time researchers find it challenging to access national funding due to a long list of guidelines and documentation requirements; while some researchers feel anxious to send their research proposal online for fear of losing ownership over their work.
- ***Enrolment in agricultural disciplines is declining,*** posing a threat to the future supply of agricultural research.
- There also exists a ***financial competition between universities' teaching and research objectives,*** revealing the inability of government research grants to compensate for faculty research time.
- **Research facilities are mostly lackin**g in rural universities.

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Private Sector Research and Development

- Large multinational companies in agricultural production are relying on their international headquarters for their R&D needs.
- Similarly, manufacturers of chemical fertilizers and pesticides in the Philippines are often part of multinational corporations, wherein R&D is conducted internally but not locally.

Startups and Entrepreneurs

- Startups are currently not a significant source of innovation in agriculture in the Philippines, and are usually managed by students.

Government Research

There are several government agencies that are involved in generating and testing agriculture-related innovations. Crop research for example, is handled by the DA's Bureau of Plant Industry (BPI). However, BPI's role in research has decreased as a consequence of the expansion of its regulatory responsibility. Meanwhile, the DOST's Industrial Technology Development Institute (ITDI) performs research on food processing and manufacturing, in line with the DOST's industry roadmap priorities. In fact, around 20-30 percent of its research budget is awarded to SMEs that have weak in-house R&D capabilities. Conversely, the DA's Philippine Center for Postharvest Development and Mechanization (PhilMech) oversees the development of new post-harvest technology for priority commodities. The beneficiaries of the agency are smallholder farmers, small-scale processors and manufacturers that have limited investment capacity.

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3. Transition Pathways

The transition of R&D from development to usage can be facilitated through several pathways. There are mainly two categories: social pathways –mainly related to the transfer of knowledge; or commercial pathways –more specific to technologies that can be sold to users. This transition is often referred to as technology transfer. The transfer of technology and agricultural practices usually depend on the funding agency and the nature of innovation. For instance, physical technologies such as fertilizers are transferred through manufacturing and distribution, while research-informed practices are disseminated through information drive and trainings.

Social Pathways

- Based on the interviews, there appears to be ***no clear system for identifying mature research that are ready for dissemination or transfe***r. Instead, the process is highly affected by the researcher's connection and entrepreneurialism.
- Also, ***researchers are stuck at the te***sting phase because of the unavailability of funding for the second phase.
- Other social pathways involve nongoverment organization (NGO) actors, foundations, and international donors that aim to support smallholders. However, respondents of the interviews note that these actors are minor sources of technology transition in the Philippines.

Commercial Pathways

- Respondents reveal a ***notable shift in universities' and funders' desire for commercialization of technologies,*** although, there remains a need for training scientists in terms of entrepreneurship and IP education. Most respondents also cited the difficulty in setting-up a spin-off from a university.
- ***There is minimal information flow between universities and industries***. In general, the agribusiness sector is unaware about new technologies and developments from universities.
- A frequently mentioned frustration of respondents is the ***slow process***

of registering and/or certifying new agricultural inputs, particularly for pesticides.

- While the availability of startup investors is generally considered adequate in the Philippines, ***agriculture startups outside Metro Manila experience difficulty in accessing funding support and startup services.*** It was also revealed that Filipino investors are relatively less tech-savvy than international angel investors.

4. Innovation Introduced to Users

If the innovation was successfully transitioned from R&D phase and prepared for use, the next step is to introduce it to the users whom it was designed for. Options for user introduction include private sector promotion, publication and information sharing, or agricultural extension. This stage of innovation-to-growth pathway is more complex for the agriculture sector because of the heavy involvement of public agricultural extension services, along with the scattered location of farmers in the Philippines. Figure 3 particularly illustrates the complexity of actors and relationships involved in agricultural extension.

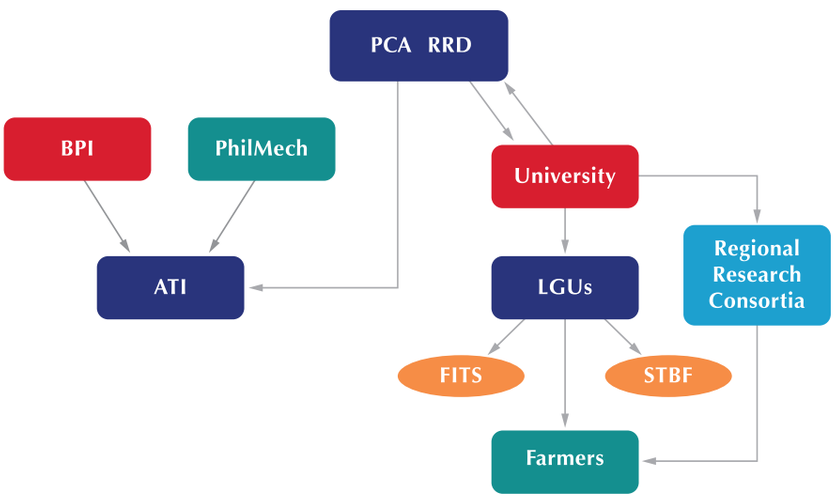

Figure 3. Technology Transfer Actors in the Agricultural Extension System

- Respondents cited the multiplicity of players involved in agricultural extension as a source of confusion when transitioning technologies into the system.
- It was also noted that the private sector seldom access university or government research.

5. Innovation Used to Upgrade Operations

The main requirement for an innovation to generate impact is for it to be utilized by farmers of agribusinesses in terms of upgrading their operations. Therefore, simply introducing the innovation is not enough. The following discussions offer an overview on the actors involved in the process.

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Food companies are the typical users of innovations in processing, packaging, and waste related to agricultural products. Large multinational companies introduce new products in the Philippines that are largely based on local market research, but developed through in-house R&D in parent companies abroad.

Contract and managed farms run by large buyers usually employ agronomists and perform their own research, in collaboration with universities. These farms are most likely the users of new technology and adopt research-based practices.

Smallholder farmers are the main producers of cacao, coffee, and mango in

the Philippines. These farmers tend to have low capital, unable to invest in technologies and are rarely involved in the pursuit of innovation. As indicated in the interviews, ***the extension of existing, as well as basic technologies is more crucial for smallholders than the development of new and more advanced innovations.***

Key Findings and Recommendations

The assessment reveals a positive momentum, strong university capacity, and existing government support for agricultural research and innovation in the Philippines. Outlined below are the main findings along with specific recommendations aimed at facilitating the development and diffusion of agricultural innovation that can result to inclusive growth.

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Universities and government research funders demonstrate substantial momentum for the adoption of pro-commercialization practices.

Funders and universities should solicit the feedback of stakeholders regarding new programs and policies related to commercialization to ensure continuous improvements. More importantly, initiatives that aim to improve commercialization should not only concentrate on one solution; but rather, integrate several solutions from various components of the innovation ecosystem.

The intrinsic mindset that agricultural innovations are public goods can ultimately hinder users' abilities to access those innovations.

Firstly, it is crucial for universities and funding agencies to designate a central body that would be responsible in classifying a technology (i.e. whether social or commercial), and set standard criteria for classification; which should be done in the early stage of the research process. Secondly, it is equally important for universities to direct the mindset of the faculty towards commercialization, and ensure that useful technologies reach farmers through the help of the private sector. Lastly, incentives related to extension services should always be carefully studied. Although the extension system suffers from numerous issues, incentives should not always have to be about funding. Alternatives such as monitoring and effective feedback mechanism could also serve as effective tools in improving extension services (Jones & Kondylis, 2015, Masset & Haddad, 2014).

Weak relationships between academe and agribusiness hinder innovation.

- Publicly-accessible information on university agricultural expertise, research and innovations are limited.
- Academic expertise is often perceived as not relevant to private agribusiness, and there is mutual mistrust between industry and academe.
- University systems for faculty consulting arrangements do not facilitate institutional relationships.

Universities can promote stronger linkages with industries through the following platforms: regular meetings or networking events, industry days, research showcases or internship programs. Such activities could result to greater impact as they will expose researchers in non-agriculture fields (e.g., chemists, engineers, and computer scientists) to issues in agro-industry. Likewise, universities can institutionalize consulting agreements and develop revenue-sharing guidelines and protocols for university-industry partnerships in order to gain mutual trust.
On the other hand, University Knowledge Transfer and Technology Offices (KTTO) should be able to device a communications mechanism that would update the industries on the latest research and technologies being developed at the university. Activities such as in-person presentations, guest industry lectures, faculty 'externships' (or immersions) and 'innovation workshops' would also be helpful.

To market the research capabilities of university faculties, the website of universities should detail the qualifications and provide up-to-date research experience and outputs of faculties. In addition, it should provide information on the university's research initiatives, mature research, and technology transfer achievements, to support industry engagements. Further, the websites of PCAARRD and DA-BAR should contain a "technology marketplace" that provides details on technologies that have already been tested and are ready for transfer. Information posted on the website should be geared towards providing useful information for potential investors.

Systematic constraints limit university supply of agricultural research and innovation.

- Teaching loads are heaviest in rural universities where agriculture is more prominent.
- Funding opportunities and guidelines are perceived by some as non-transparent.
- To be able to encourage more research outputs, faculties should be allowed to use research grants funds to "de-load" their teaching obligations. On the supply side, research funders should ensure that their websites are up-to-date and contain detailed information on funding guidelines for the benefit of the researchers. Funding calls could also be promoted to less-connected universities by means of information sessions, webinars, or university visits.

Opaque and inefficient public technology transfer and extension systems impede the diffusion of agricultural innovations.

- Agricultural extension is de-prioritized by researchers and universities.
- Additional stages of grant funding are required for technology transition.
- Transfer from research to extension within government funders can be inefficient.
- The process for public technology transfer is opaque, which discourages researchers from pursuing it.

Government-funded technology transfer offices [including the Agricultural Training Institute (ATI)] can be more proactive in responding to their mandate by being involved at the early stages of the research. This will allow them to identify, track, and manage research that has the potential for technology transfer. Additionally, funding agencies such as the DA-BAR and PCAARRD should provide more definite guidelines and expectations for their technology transfer grants.

Government-funded technology transfer offices can be more proactive in responding to their mandate by being involved at the early stages of the research.

To increase research incentives and decrease barriers to extension services in the universities, governing bodies should tie the incentives for faculties with technology success. One option is to match the release of funding grant with certain targets set by university/funder. In the case of extension, it would be best to encourage faculties to work with the local government and private sector.

Lengthy processes for new agricultural product registrations slow and deter innovation.

Government agencies such as the Fertilizer and Pesticide Authority (FPA) and the Food and Drug Administration (FDA), which manages pesticide and new food product registrations, respectively, should transition towards online registrations to facilitate more efficient processes. These agencies should likewise harmonize their regulations in line with globally accepted policies.

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