



## Enabling Innovation in The Philippine Rice Industry: The Roles and Key Capabilities of Innovation Intermediaries

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### ABSTRACT

The innovation studies literature finds that innovation intermediaries or innovation-enabling organizations perform roles that promote knowledge transfer, organizational development, and network collaboration. Furthermore, these organizations require building necessary key capabilities that allow them to conduct these roles more successfully. However, a gap remains in understanding how intermediaries perform their roles and develop key capabilities as global value chains and innovation systems interact, especially in agri-food business industries. To address the research gap, we employed a descriptive case study of 11 innovation intermediaries found in the Philippine rice industry. It shows how innovation intermediaries in the industry support the upgrading, participation, and innovation of their stakeholders to compete against cheaper rice produced abroad. It provides several policy and management implications for maximizing the role performance and key-capability building of innovation intermediaries in agri-food business industries. This article is part of a more extensive dissertation on how innovation intermediaries in agri-food business industries perform roles and build key capabilities as their organization types, value chain segment participation, and industry market orientation vary.

## I. INTRODUCTION

For developing countries to maximize access to the global economy, their local industries will need to participate in Global Value Chains (GVCs) (Gereffi & Fernandez-Stark, 2018). Participation may entail being a supplier or service provider for a process in a value chain. However, it also means competing with incumbents or new entrants in

the same value chain processes. Similarly, an enterprise may compete for inclusion in new value chain functions. However, for local industries to successfully integrate and participate in GVCs, they will need support for upgrading and innovation. Different innovation system actors of a country may provide the forms of support necessary for upgrading and innovation (Lee et al., 2018).

Several studies posit that GVCs participation is contingent on a country's innovation system (Lema, Pietrobelli, Rabellotti, 2018;

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Lema, Rabellotti, Sampath, 2018; Pietrobelli & Rabellotti, 2011). The interaction between these creates a co-evolutionary relationship, signaling the needs of firms and the responses to address the necessary capabilities for upgrading and innovation. Thus, developing countries must develop their innovation systems to support their local industries, especially those heavily involved in local and regional value chains (Keijser & Iizuka, 2018). In addition, to develop their innovation systems, developing countries need to tackle existing systemic gaps, constraints, and barriers that hinder or stifle innovation and upgrading of enterprises (Chunhavuthiyanon & Intarakumnerd, 2014; Lema, Rabellotti, et al., 2018; Partners, 2007).

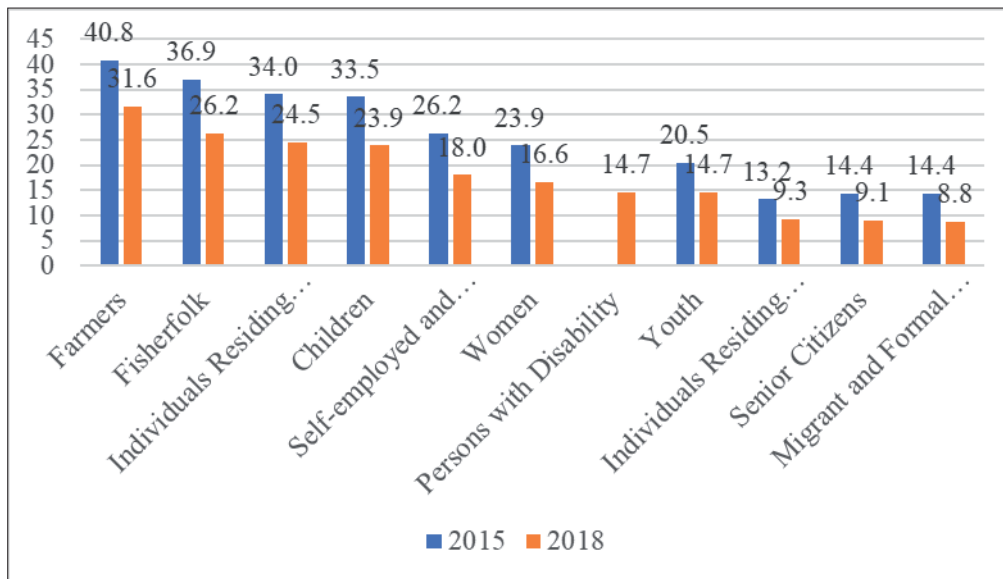
An innovation system actor often associated with supporting the innovation process is innovation intermediaries (van Lente et al., 2003). Howells (2006, p. 720) describes innovation intermediaries as “*an organization or body that acts [as] an agent or broker in any aspect of the innovation process between two or more parties.*” Moreover, these organizations have also been found effective in addressing innovation gaps (Partners, 2007). However, what constitutes the actions of innovation intermediaries is challenging to determine as their roles often evolve and grow in number in time (Howells, 2006). Nevertheless, Partners (2007) provides a simplified and encompassing description of the roles of innovation intermediaries as brokers, consultants, mediators, and resource providers. As to which organizations perform these roles, the list grows over time too. Still, several researchers (Asha Vijay & Raju, 2019; Klerkx & Leeuwis, 2009; Ramirez et al., 2018; van Lente et al., 2003) have found the following organizations performing these roles: knowledge-intensive business service providers, research and training institutes, industry associations, chambers of commerce, innovation centers, university-liaison offices, innovation consultants, network brokers, internet portals, education providers, social media groups, and, rarely, private companies.

An additional positive outcome for developing countries in improving their innovation systems and having local industries integrate further into GVCs is poverty reduction, especially

in the rural areas (Humphrey & Memedovic, 2006). Across all industries, studies show that developments in agri-food business (AFB) value chains exhibit greater poverty-reducing effects (Fernandez-Stark et al., 2012; Humphrey & Memedovic, 2006; Kissoly et al., 2017; Lee et al., 2011; Nadvi & Barrientos, n.d.; Narrod et al., 2009; Otsuka, 2000; Oyejide et al., 2019; Ponte et al., 2014; United Nations Industrial Development Organization, 2011). AFB value chains do not only pertain to agricultural production but cover the wider food industry. According to de Backer and Miroudot (2013), AFB value chains link the upstream agriculture processes and downstream activities (e.g., food processing, marketing, global trade). Moreover, they describe AFB value chains as GVCs that exhibit mostly buyer-driven chains led by food processors and retailers. Nonetheless, even if AFB value chains cover a broader set of GVC functions, the upstream agriculture segments of these chains remain relevant and essential. Therefore, it will be beneficial for developing countries with a large rural poor population, like the Philippines, to deepen participation and enhance competitiveness in these AFB value chains.

According to the Philippines’ National Economic Development Authority (2017), three-fourths of the Filipino poor live in rural areas. As shown in Figure 1, farmers, fisher folk, and individuals residing in rural areas exhibit the highest poverty incidence among the primary sectors. One AFB industry that may aid in poverty reduction and direly needs to enhance its competitiveness is the Philippine rice industry. Recently, the industry encountered a tremendous challenge in the lifting of quantitative restrictions for rice imported into the country.

The Philippines needs its rice industry to innovate and upgrade its functions to compete with cheaper imported rice. To support this endeavor, the industry will need to maximize various innovation intermediaries’ support. Thus, this study attempts to understand how innovation intermediaries perform the roles that aid in the innovation and participation of various players in the Philippine rice industry and learn how these organizations build the necessary key capabilities to do their work more successfully.



Data source: (Philippine Statistics Authority [PSA], 2020)

**Figure 1.** Poverty incidence among the basic sectors of the Philippines, 2015 and 2018.

In conducting this study, the researcher hopes to add to the growing literature on the interaction of GVCs and innovation systems by integrating innovation intermediaries into the discussion. Moreover, this paper seeks to address gaps in the lack of comparative work on the roles of intermediaries in different parts of the same value chain and add to our understanding of necessary key capabilities by observing intermediaries in an AFB industry, which represents resource-based industries. Finally, by centering on the domestic market-oriented development of the Philippine rice industry, this study tries to partially address a critique of the lack of attention to demand conditions in Malerba's (2002) sectoral innovation concept.

The succeeding Section II provides a more in-depth overview of the Philippine rice industry and the issues surrounding the industry. Section III briefly discusses this paper's analytical framework. Next, Section IV then discusses the methodology employed. Following this, Section V presents the roles and key capabilities of intermediary organizations in this study as they differ by organization type, the value chain segment they support, and the rice industry's domestic market-oriented development perspective. Finally, Section VI provides the implications and conclusion for this study.

## II. THE PHILIPPINE RICE INDUSTRY AND ITS CURRENT CHALLENGES

The main challenge the Philippine rice industry faces is the lifting of quantitative restrictions on imported rice. The policy shift came into light in 2019 with the enactment of Republic Act No. 11203, otherwise known as the Rice Tariffication Law (RTL). With its passing, the law removed quantitative restrictions on imported rice. Instead, it imposed tariffs on these. Regarding tariff rates, the Philippine government imposes 35% and 50% tariffs on ASEAN and non-ASEAN countries, respectively (Department of Agriculture [DA], 2018; Ranada, 2019). Although the rates seem high, imported rice from ASEAN countries, like Vietnam and Thailand, exhibits lower prices than those domestically produced. Historically, the Philippines imports 10% of its gross rice supply on average (PSA, 2021). If local producers cannot compete with rice exporting countries, the Philippines may soon be flooded with imported rice, effectively nearly eliminating the domestic rice industry.

Why the Philippine government passed such a law is not without context. Briones and de la Peña (2015) and Briones (2019) aptly summarized why the law had to come. In 1995, the

Philippines opened agricultural trade, following agreements with the World Trade Organization (WTO). With its opening, the government passed the Agricultural Tariffication Act (Republic Act No. 8178, 1996). Like the RTL, the Agricultural Tariffication Act imposed tariffs on agricultural products and allowed an annual minimum import quantity at a lower tariff rate. However, a clearly stated product exempted in the law was rice, as the country's National Food Authority (NFA) still held the power to authorize and allocate licenses for imported rice.

Nonetheless, the Philippine government accepted a ten-year agreement with the WTO that allowed the private sector to import a set amount of rice, coupled with a higher tariff rate of 50%. In 2005, the Philippine government requested an extension on rice import restrictions. The reason given was that the local industry was still unable to compete with other rice-producing countries. The WTO approved the extension in 2012 and extended it until 2017 while conceding a growing amount of rice imported by the private sector. Upon the 2017 extension's expiration, the Philippine government did not request further extensions as WTO members demanded more import concessions and because of the plummeting popularity of the NFA in managing rice stocks and effectively allocating import licenses.

To compete with rice exporting countries, the Philippines needs to address several issues. First, the industry needs to boost its production capabilities. As shown in Table 1, although the Philippines' yield is higher than Thailand's, the harvest area is still much smaller. Compared to Vietnam, the Philippines yields roughly 1.5 times less. Dawe (2006) attributes Thailand and Vietnam's success to natural land endowments

and to the adoption of rice production technologies that significantly reduced production costs. Higher production costs are the second problem of the Philippine rice industry. As presented in Table 2, the Philippines exhibits the highest production cost compared to Thailand and Vietnam. Of the inputs, hired labor contributes the most considerable discrepancy, which may be reduced by adopting more labor-saving machinery like transplanters, threshers, and harvesters. Third, the low uptake of more modern mechanized technologies severely hampers the production capability and costs of domestic rice production and post-harvest processing (Dawe, 2006; DA, 2018). Finally, the industry faces a lack of scale economies for rice production (Mataia et al., 2019), leading to a reliance on paddy traders to consolidate supply in the value chain.

The Philippine government institutionalized two central policies, mainly through the Department of Agriculture (DA) in response to these challenges. The first is the Rice Industry Roadmap 2030 (DA, 2018), which sets goals for developing the industry in three phases. Phase one (2017 to 2030) hopes to increase yield, reduce production and marketing costs, reduce post-production losses, and assist in transitioning farmers to other lines of work. The subsequent phase (2023 to 2026) expands crop insurance, hopes for the diffusion and adoption of more climate-resilient technologies, and further seed provisions for disaster-stricken areas. Finally, phase three will promote more resilient rice buffer stock management, expand value-added rice product opportunities, and encourage more responsible rice utilization.

Along with the RTL, the government created the Rice Competitiveness Enhancement

**Table 1.**

Rice Paddy Production Capacity of the Philippines, Thailand, and Vietnam, 2019

	Philippines	Thailand	Vietnam
Paddy Produced	18,814.83	28,356.87	43,488.50
Harvested Area	4,651.49	9,715.36	7,469.89
Yield	4.04	2.92	5.82

Note. Units: Thousand tons, thousand hectares, and tons per hectare. Data source: (Food and Agriculture Organization of the United Nations, 2021).

**Table 2.**

Average costs of rice production in the Philippines, Thailand, and Vietnam, the crop year 2013–2014 (in Philippines Pesos per kilogram)

	Philippines	Thailand	Vietnam
Seed	0.58	1.12	0.44
Fertilizer	1.94	1.56	1.36
Pesticide	0.36	0.90	0.87
Hired labor	3.76	0.66	0.46
Operator, family, and exchange labor	0.66	0.65	0.81
Animal, machine, fuel, and oil	1.73	1.66	0.81
Irrigation	0.45	0.14	0.08
Land rent	2.11	1.85	1.49
Interest on capital	0.43	0.07	0.08
Others	0.40	0.20	0.13
Total Cost	12.41	8.85	6.53

Note. Data source: Moya et al. (2016).

Fund (RCEF). Through this policy, the national government appropriates several rice-related public organizations with an additional budget amounting to 10-billion Philippine Pesos annually (approximately 197-million US dollars). This fund has four main components and is divided as follows: 50% for its mechanization program, 30% for its high-yielding seed distribution program, 10% for credit, and 10% for extension services.

Given the issues and response presented, the Philippine rice industry requires a domestic market-oriented development approach, with its primary goal as competing with the imported rice. Furthermore, maximizing participation within rice GVC would mean lowering costs, decreasing segment to segment losses, and increasing overall yield (DA, 2018). Thus, a deeper understanding of the interaction between the Philippine rice innovation system and GVC is required. Figure 2 presents this study's consolidated view of their interaction.

### III. ANALYTICAL FRAMEWORK

This study adopts two frameworks to assess the roles performed and key capabilities built by innovation intermediaries. The first is Partners' (2007) intermediary roles, and the second is an integration of Sutthijakra and Intarakumnerd's (2015) and Go's (2019) intermediary key-capabilities frameworks.

In their study on innovation intermediaries in Australia, Partners (2007) identified four primary

intermediary roles: *broker*, *consultant*, *mediator*, and *resource provider*. Partners describe the roles as follows:

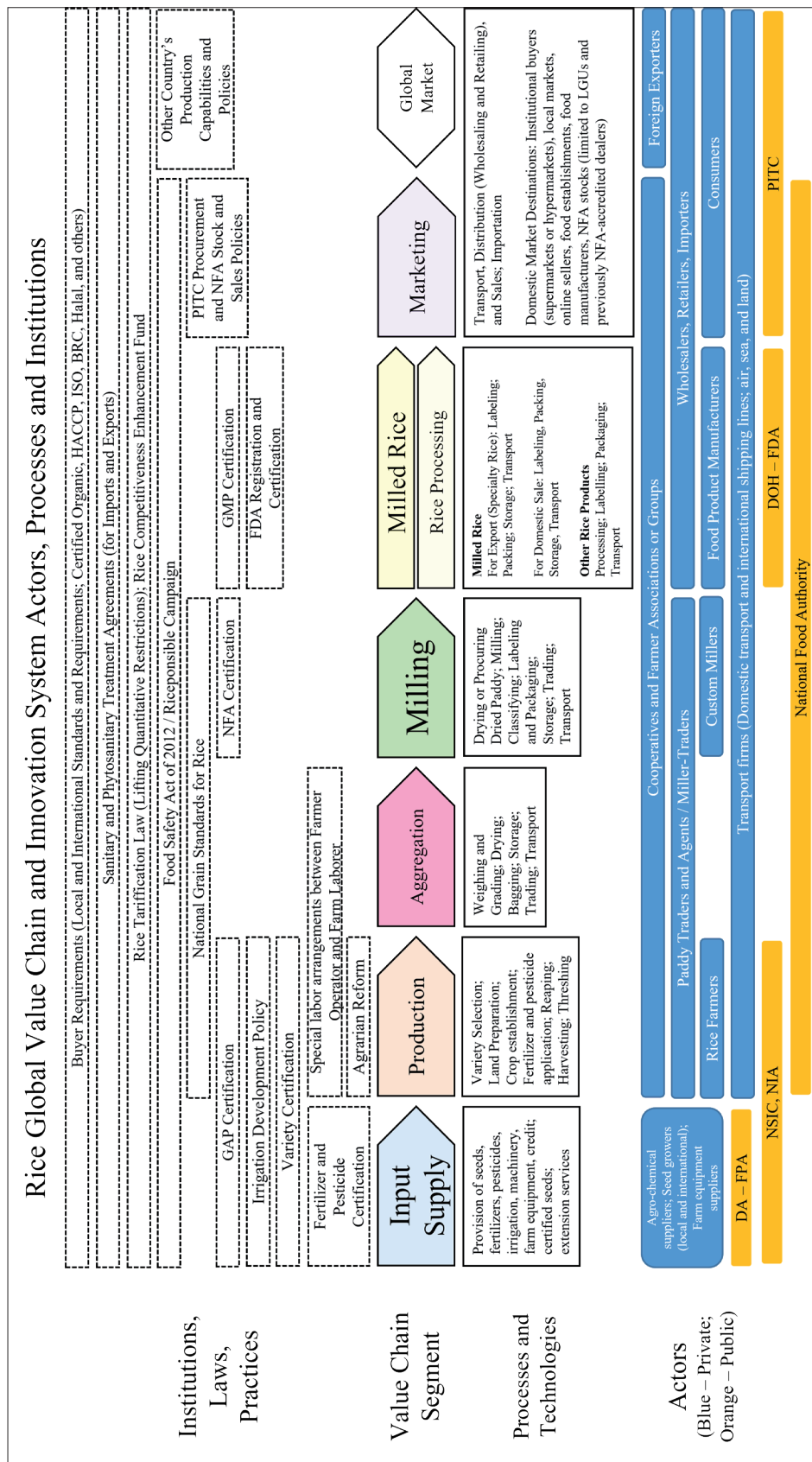
*Broker* – aiding in the successful *negotiation and transaction* of information, technology, or collaborations for two or more parties.

*Consultant* – provision of *expert knowledge and advice* on technology or linkage information, acquisition, or requirements.

*Mediator* – the creation of *relationship-building* or *conflict mediation or resolution* opportunities between parties.

*Resource Provider* – providing *owned resources* for partners or stakeholders. These resources may be financing, training, physical resources, human resources, production inputs, machinery, and others.

Sutthijakra and Intarakumnerd (2015) first developed the initial key capabilities to enhance networks and enrich their resource framework. Their original work identifies four key capabilities: *network capabilities*, *coordination capabilities*, *knowledge-building capabilities*, and *management capabilities*. Adapting their framework, Go (2019) found that the networking and coordination capabilities described often experienced overlaps in determining the actions and experiences that built these two capabilities. Thus, he opted to delineate these two as *external networking capabilities* and *internal communication capabilities*.



Note. With additional input from field interviews, the researcher adapted this figure from Senanyake and Premaratne (2016) and Mataia et al. (2019).

Figure 2. The Philippines' innovation system relationship with and participation in the rice global value chain.

As mentioned, this study integrates the two frameworks on intermediary key capabilities by adapting Go's (2019) external networking and internal communication capabilities and Sutthijakra and Intarakumnerd's (2015) knowledge-building and management capabilities. Therefore, we describe key capabilities adapted for this study as follows:

*External Networking Capabilities* – establishing and sustaining the creation of new relationships and linkages with others *outside* of its current network.

*Internal Communication Capabilities* – sustaining and deepening relationships *within* its current network.

*Knowledge-building Capabilities* – gaining new and applying current sector- or organization-specific knowledge required by its partners and the expansion of its services.

*Management Capabilities* – managing, implementing, monitoring, and evaluating its services, projects, and programs, or those tasked by its network partners.

This study adapts these two frameworks as they offer broad but well-differentiated concepts. Moreover, the two studies on intermediary key capabilities employed Partners' framework to assess the key capabilities necessary for the successful performance of its roles. Although the three original works derived their theories mostly from manufacturing and service industries, these will still be applicable in AFB industries since these value chains exhibit forms of manufacturing and services, like food processing and marketing. Nonetheless, it is still crucial to understand how innovation intermediaries perform their roles and build their key capabilities in AFB industry value chains.

#### IV. METHODOLOGY

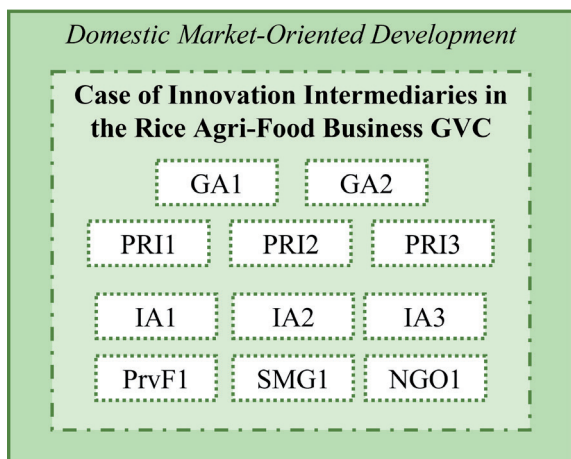
This study employs a case-study method, guided by the works of Yin (2003, 2018), Creswell (2014), and Creswell and Creswell (2015). We deem the case study the most appropriate approach as it allows the researcher to examine cases containing rich contextual conditions that exhibit several variables and data sources (Yin,

2003). Specifically, this study uses a descriptive case-study design that utilizes theories to guide the scope, depth, and in describing the findings (Yin, 2003). Moreover, similar research on innovation intermediaries often employs this methodology (Go, 2019; Lindberg et al., 2014; Ramirez et al., 2018; Sutthijakra & Intarakumnerd, 2015).

For its unit of analysis, this study examines phenomena on an organizational level. However, we do not treat each organization included in this study as a single case. Instead, each organization is considered as an embedded unit of analysis, building the findings for innovation intermediaries in the Philippine rice industry in general. The organizations included at the time of writing are Government Agencies (GA), Public Research Institutes (PRI), Industry Associations (IA), a Private Firm (PrvF), a Social Media Group, and a Non-Government Organization (NGO). In total, this study includes 11 organizations: two GAs, three PRIs, three IAs, one NGO, one PrvF, and one SMG. Invitations for participation were sent to numerous organizations, however, only the 11 mentioned agreed to participate. Thus, the chosen organizations are more purposively chosen. Future studies may include more samples of less represented organizations. Moreover, to protect the identities of the participating organizations, we chose to code by providing each an identifying number based on their organization type.

The researcher produced a case-study design (Yin, 2018) to aid in visualizing and contextualizing the study, as shown in Figure 3. The outer box represents the overarching contextual condition of the case, while the inner broken-lined box characterizes the case. Each dotted box within the case signifies each of the intermediary organizations participating in this research.

To select the organizations for this study, the researcher first conducted pilot interviews with experts from the rice industry. We interviewed five experts from the government and academe between November 2019 to January 2020. Furthermore, by presenting the four roles of Partners (2007), the researcher asked the experts about organizations that perform any or several of these roles. Moreover, he also presented a list of innovation intermediaries based on previous studies



*Note.* This design was formed using Yin's (2018) case-study design guide.

**Figure 3.** The research's case-study design.

(Kivimaa et al., 2019; Klerkx & Leeuwis, 2009; van Lente et al., 2003) to help guide experts in describing innovation intermediaries in the rice industry. Although the researcher attempted to interview private sector experts, he was unsuccessful as they would either be unavailable or not respond. Nevertheless, when interviewing intermediary representatives, particularly industry associations, the research would also weave questions regarding the industry and other critical innovation intermediaries.

The research employed a purposive approach to collect data as it ensured that chosen persons agreed to the interviews and possessed the necessary information. The data for this study were collected primarily through semi-structured interviews and a focus group discussion. The researcher conducted 23 interviews and one focus group discussion between March 2020 to November 2021. Of the 23 interviews, 12 were with rice value chain actors. By interviewing value chain actors and conducting secondary desk research, the researcher triangulated several of the claims made by intermediary representatives. All of these were conducted over online video conferencing applications or through cellular phone calls due to the physical restrictive effects caused by COVID-19. In addition to interviews, the researcher conducted secondary desk research to validate and add to the interview data.

Data analysis of the findings was examined in three areas under the guidance of the frameworks described in the previous section. The three areas are organization type, value chain segment participation, and a predominantly domestic market-oriented industry.

## V. THE ROLES AND KEY CAPABILITIES OF INNOVATION INTERMEDIARIES IN THE PHILIPPINE RICE INDUSTRY

### A. Organization Types

Data gathered on the 11 organizations reveals that different types appear to specialize in certain roles. Table 3 presents roles emphasized by interview participants and validated by several other data sources. In the table, more stars (\*) means that representatives emphasized a role much more than other roles for the same organization. However, it does not mean that each organization may only specialize in one role. On the contrary, most of the participating intermediaries emphasized two or more roles.

Government agencies emphasized their mediating and resource provision roles the most. Their mediation role is not surprising as these public organizations have often been known as network orchestrators (van Lente et al., 2003). The resource provision role is managed and overseen by the central offices and distributed or implemented by their provincial or local counterparts. These resources may take the form of training, farm inputs, farm machinery, or the setting up of facilities. For GA2, they also brokered inter-sectoral opportunities in mushroom farming using rice waste as compost.

The other public organization that performed an unsurprising significant amount of brokerage was the PRIs. These organizations conduct R&D and broker their technologies to rice farmers, machinery manufacturers, and product processors. In addition, the PRIs perform as a consultant by providing information for new technologies or practices that an adopter may use. For example, PRI2 provides rice farming smartphone applications and rice seeds as a resource provider,



**Table 3.**  
Innovation Intermediary Roles Emphasized by Organization Type

		Brokerage	Consultancy	Mediation	Resource Provision
Public	GA1	**	**	***	***
	GA2	***	*	***	***
	PRI1	***	**	*	**
	PRI2	***	**	**	***
	PRI3	***	**	**	**
Private	IA1	***	*	***	**
	IA2	***	**	***	**
	IA3	***	**	*	**
	SMG	**	***	*	**
	PrvF	***	***	***	***
	NGO	***	**	***	**

Note. Criteria for judging emphasis are based on focused roles during interviews and an FGD with respective organization representatives and triangulated through other data sources.

while the others have provided business planning services. However, the resource provision role of PRIs is somewhat an unexpected result, as PRIs often take more technology generation and brokering roles (Intarakumnerd & Goto, 2018; van Lente et al., 2003) and do not necessarily provide resources at little to no cost.

The six private-sector organizations highlighted their brokerage roles, albeit the SMG focused on the group as a platform. Similarly, the IAs and the NGO broker financing opportunities, sales or trades between members and stakeholders, community organizing, use of farm machinery, or other development-related opportunities. Most private intermediaries also provide consultancy services on a variety of topics and not solely for rice-related matters. Examples of non-rice-related topics are organizational development consultancy for agricultural cooperatives and farmer associations, value chain and business analysis, and legal advice that the NGO and IA2 offer.

An interesting finding not discussed in previous literature is the lobbying role that innovation intermediaries may take. IA1 and IA2 emphasized the lobbying and policy work that they continue to do. IA1 even ran for a congressional party-list position in the past. It is currently placed under the mediation role as lobbying allows intermedi-

aries to act as representatives on behalf of their constituents and others in the industry. Further research is necessary to know whether lobbying is a separate role from mediation.

Of note is the private firm that emphasized performing all roles. The data collection process revealed that they conduct their business to alleviate the challenges for rice farmers. They perform a mediating role by cooperating with farmers through a partnership program. In it, the firm provides farmers with high-yielding seeds and zero to low-interest loans for imported fertilizer. For its brokerage role, the firm offers machinery and other farm equipment for partner farmers to use. As a consultant, the firm has agriculturists and field technicians that support and monitor the progress of their partners and provide advice when necessary. The firm also ensures purchasing the paddy produced by its partners, then mills, processes, and markets the rice under their brand. By controlling its value chain, the firm can provide more upgrading and innovation opportunities for its partner farmers.

The participating innovation intermediaries exhibit variations in what they emphasized as most critical and focused on building for their key capabilities. Like the previous table, Table 4 expresses emphasis in the same manner. A lack of emphasis does not mean that the organization

does not possess the key capability. Instead, it may mean that the intermediaries prioritized other key capabilities.

One may notice that most organizations build all key capabilities almost evenly, with some giving less priority than others. Because of its network orchestration role, stakeholders and partners are the ones that usually approach GA1. IA3, on the other hand, reported that they would like to focus on maximizing the support they can give each other first and not think about partnering with others outside of their association or area yet. In addition, owing to its open membership, the SMG does not actively promote its group to gain more members. Instead, the SMG focused on building its management capabilities to operate more effectively.

Of the four key capabilities, knowledge-building is the most emphasized by almost all intermediaries. Building this capability allows them to learn their stakeholders' needs and understand and apply rice-specific knowledge. Particularly for PRIs, this key capability is of utmost importance to conduct R&D. For other organizations, building this capability also means accumulating information about applicable technologies and practices that they may diffuse to their stakeholders and partners.

External networking is seen as vital for PRIs, particularly in looking for adopters, and

most especially, for R&D collaboration with other organizations nationally and abroad. IA2, the PrvF, and the NGO also highlighted building and utilizing key-capability because it allowed them to access global opportunities. IA2 and the NGO gain funding and projects that they provide to their stakeholders. PrvF built its facility as the owners maximized their international contacts to learn about the most advanced rice production processes and technologies worldwide. Moreover, common to all these organizations is their heavy online presence, where they share updates of their work either through their respective websites or social media accounts.

For internal communication, government agencies find this vital to ensure that they can pass on the information necessary to their local implementers. As the representative from GA2 highlighted, staff under their office need to be sociable to relay and collect information effectively. IA1 and the NGO also emphasized this capability. Without a physical office, IA1 built its internal communication mechanisms together with its management capabilities by creating a system where its members lead and support each other on a municipal, provincial, and national level. For the NGO, it highlighted this capability because of the restrictive effects of COVID-19. As it only started operating in 2018, the NGO still needs to build trust with its partners. The

**Table 4.**  
Innovation Intermediary Key-Capabilities Emphasized by Organization Type

		External Networking	Internal Communication	Knowledge-Building	Management
Public	GA1	*	***	***	**
	GA2	**	***	**	**
	PRI1	***	**	***	**
	PRI2	***	**	***	**
	PRI3	***	**	***	**
	IA1	**	***	***	**
Private	IA2	***	**	**	***
	IA3	*	**	***	*
	SMG	*	**	**	***
	PrvF	***	**	***	***
	NGO	***	***	**	**

Note. Criteria for judging emphasis are based on focused key capabilities during interviews and an FGD with respective organization representatives and triangulated through other data sources.

pandemic hampered their program implementation, but the NGO quickly realized the need to move their operations online and began helping their partners shift to this model.

For management capabilities, the organizations mainly discussed systems that they have built, conducting evaluations, and properly managing funds. However, the public organization representatives relayed that certain institutions hinder their management capabilities. An example of this is the public procurement process which takes too long and requires similar documents, regardless of how little or large the amount procured. According to their representatives, it disincentivizes participation for many possible suppliers because of the tedious work required to join the bidding process.

A shared aspect of the key capabilities that the intermediaries often highlighted was their human resources. Except for IA1, IA3, and the SMG, all other intermediaries emphasized the need to develop their staff to ensure that they were always competent to handle the tasks required. For the public organizations, all mentioned staff development programs allow their staff to pursue further studies or undergo specialized skills or management training. However, more than staff development, the organizations also mention hiring the right people or professionals. For example, IA2, the PRvF, and the NGO emphasized hiring lawyers, engineers, community organizers, business consultants, and specialized staff. With such attention given to human resource management, we propose that we treat this aspect as a separate key capability on its own.

## B. Value Chain Segment Support

Table 5 showcases the roles performed by the participating organizations in each segment of the rice value chain. As shown in the table, most intermediaries perform roles in the input supply, production, milling, and milled rice/rice processing segments of the value chain. Following these segments, several intermediaries perform roles under the marketing portion, and vastly fewer support the aggregation and import or interaction with the global market.

Brokerage roles are performed mainly in the input supply, milling, milled rice/rice processing, and marketing portions. The three segments mentioned require more technologies, equipment, facilities, and training. Thus, it does not come as a surprise that intermediaries perform brokerage in these segments. In the marketing portion, the role is performed more to broker sales or markets for their partners.

Similarly, resource provision roles are also most performed in the input supply, milling, and milled rice/rice processing portions. Public intermediaries mandated to provide resources to farmers, millers, and firms involved in rice processing primarily perform this role. These resources may take the form of seeds, capital as loans or grants, farm equipment, training, fertilizer, and other production inputs, and use of public facilities.

On the other hand, consultancy is performed in almost all segments of the value chain. In the upstream portions of the value chain, the intermediaries practice consultation by addressing production and technology inquiries and providing advice on input sourcing information and some buyer information. From the milling segments onwards, the consultancy provided is quite similar, but it also includes business consultancy, especially for the value-added product processing and marketing. Several of the intermediaries that provide business and market consultancy are PRI1, PRI3, and the NGO.

Performing mediation roles in the value chain involves creating relationships between suppliers and buyers. It may also involve sharing rice stocks between areas, such as what IA1 does, where they help members source milled rice from members in other regions and funnel rice supply to disaster-struck areas.

A note on the marketing of milled rice: public intermediaries do not appear to be very much involved in this segment because of the existence of the NFA. Even if the RTL removed several powers from the NFA, the institution is still tasked with the public authority to purchase rice from farmers and manage the nation's buffer stocks. Conversely, private intermediaries are more active in supporting the marketing of

**Table 5.** Roles Performed by Participating Intermediaries in the Rice Value Chain

	Input Supply	Production	Aggregation	Milling	Milled Rice / Rice Processing	Marketing	Global Market / Import
Public	GA1	B, C, RP	C, RP	C, RP	B, C, RP	M	
	GA2	B, C, M, RP	C, M	B, C, M, RP	B, M, RP		
	PRI1	B, C, M, RP	C	B, C, M, RP	B, C, M, RP	M	
	PRI2	B, C, M, RP	C, RP	B, C, M, RP	B, C, M, RP		
	PRI3				B, C, M, RP	C, M	
	IA1			C, M	B, C, M	B, C, M, RP	B, C, M
	IA2	B, C, M	C, RP			B, C, M	
	IA3	B, C, M, RP	C			C	
	SMG	C, M, RP	C, M		C, M		
Private	PrvF	B, C, M, RP	C, RP	B, C, RP	B, C, RP	B, RP	
	NGO	B, C, M	C, M	C	C, M	B, C, M, RP	

*Note.* B stands for brokerage, C for consultancy, M for mediation, and RP for resource provision. The researcher based the assignment of roles in the value chain on the actions and services done by the organizations vis-à-vis the processes involved in each segment of the value chain. The data for this table is drawn from the interviews and an FGD with respective organization representatives and triangulated through other data sources.

their partners' milled and processed rice products. Besides providing buyer information and introductions, several broker transactions for their stakeholders, as IA1, IA2, and the NGO do.

A lesson from laying out intermediary roles in the value chain is that one may not see all activities listed under a performed role in the value chain. For example, because a value chain focuses on the production to final delivery processes, activities such as R&D conducted and diffused by the PRIs are not considered. The same goes for the lobbying role done by IA1 and IA2. Moreover, the community organizing and organizational development services that several intermediaries provide will not be immediately evident in the value chain. Thus, when studying the role performance of intermediaries in a value chain, non-production process activities must be considered. One way to aid in this endeavor is by examining the different institutions, laws, and practices surrounding a value chain and assessing how innovation intermediaries incorporate these into their roles.

For intermediary key capabilities, it appears that differences in value chain segment support

and participation do not matter significantly. This is especially true for knowledge-building, and management capabilities as these remain essential regardless of which segments intermediaries support. These two key capabilities also support one another. Intermediaries must understand the entire value chain and the current state of their stakeholders or partners in the chain. By learning their current state, intermediaries may also discover the hindrances to participation, innovation, and upgrading. By applying this knowledge, the intermediaries exercise their management capabilities by implementing programs and services that target specific segments or the entire value chain. Public intermediaries seem to perform more segment-specific roles like providing inputs and training or consultancy regarding specific processes or technologies in a segment. The PrvF and the NGO provide examples of a whole-chain approach. The PrvF ensures that their business targets the entire chain and that their actions in a segment build upon the next part. On the other hand, the NGO focuses on organizational development training and business development. According to the NGO representatives, these

types of training and development programs are more chain-encompassing.

Similarly, the intermediaries' external networking and internal communication capabilities are built and utilized in a more whole-chain approach. The differences between them vary with their services and by organization type. Table 6 presents a summary of these findings. The public sector intermediaries expand their network to deliver their work to more recipients. Moreover, PRIs rely on it for continuous R&D collaboration. They utilize their internal communication to orchestrate their respective networks and monitor the progress of their programs or R&D. The IAs, SMG, and NGOs build their external networking to gain more members and widen their partnership opportunities. These intermediaries do these to further their respective causes and opportunities (e.g., lobbying work, finding more rice machinery suppliers and repairers, training programs, and grants for members). Like the public intermediaries, the IAs and the NGOs depend on their internal communication capabilities to relay information to members and manage ongoing projects or programs. Conversely, the SMG relies on its established internal communication capabilities to ensure adequate consultation within the group.

However, the PrvF is an outlier in that it uses its capabilities to enter and maintain its position in the value chain.

Given these findings, it seems more plausible to argue that, except for private firms, value chain segment support and participation do not directly build intermediary key capabilities. Instead, this study further supports Sutthijakra and Intarakumnerd's (2015) claim that key capabilities are built depending on what roles intermediaries perform.

### C. Domestic Market-Oriented Development

Building on how innovation intermediaries performed their roles based on their organization type and support in the value chain, we find that specific intermediaries better fit certain roles. To map these differences, we follow Intarakumnerd and Charoenporn (2013) who delineate roles based on the more general typology of public or private organizations. Table 7 presents this paper's findings on which roles public and private organizations performed and may focus on to stimulate domestic market-oriented development.

Generally, this paper finds an almost similar assessment as Intarakumnerd and Charoenporn

**Table 6.**

The External Networking and Internal Communication Capabilities Exhibited and Built by Participating Innovation Intermediaries in the Rice Value Chain

	External Networking	Internal Communication
GA	For the diffusion of programs and resources	For network orchestration and monitoring
PRI	For R&D collaboration For technology consultation, diffusion, and adoption	Building trust with scientists R&D coordination and updates Sharing adopter stories
IA	Finding new members and keeping their network open to others To further their causes	To relay information and opportunities to members across the country
SMG	Getting new members Creating local rice machinery suppliers and repair networks	Individual consultation Sharing of information
PrvF	To start their business and learn best practices and issues	To control all processes of their value chain Maintaining standards Sustaining relationships
NGO	Finding and tapping more partners To further their causes	To relay information and opportunities to members across the country

Note. The data for this table is drawn from the interviews and an FGD with respective organization representatives and triangulated through other data sources.

Table 7.  
The Roles Performed by Innovation Intermediaries and Suggested Services and Requirements for the Organizations and the Industry

	<b>Roles</b>	<b>Suggested Services</b>	<b>Requirements to Work Properly</b>	<b>Requirements for Industry</b>
Public	<i>Broker</i>	<i>Standards and certification monitoring,</i>	Consistent public funding	
	<i>Consultant</i>	<i>promotion and acquisition support</i>	Clear government mandate	
	<i>Mediator</i>	<i>Technology generation (for PRIs)</i>	Recipients of machinery need to	
	<i>Resource</i>	<i>Facility, inputs, and machinery funding</i>	manage these properly	
	<i>Provider</i>	<i>Industrial and support policies</i>		
		Technology adoption advice and training		Professionalized organization management and development
		<i>Extension service provision</i>		
		<i>Network orchestration (for GAs)</i>		
		Clustering promotion and development		Extension services shift towards clustered organization development
		Price mediation		
Private	<i>Broker</i>	<i>Standards and technology promotion and acquisition</i>	Professional organizational management	Willingness to invest
	<i>Consultant</i>	<i>Technology diffusion and advice</i>	A consistent source of funding	
	<i>Mediator</i>	<i>Extension service provision</i>	Adequate human resources	
		<i>Market network linkage</i>		
		<i>Demand articulation and sourcing</i>		
		Financial management support		
		<i>Organizational development support</i>		

Note. The researcher based the format of this table on Intarakumnerd and Chaoroenporn's (2013) delineation of roles performed by public and private sector intermediaries. Italicized and the bolded text indicate suggested focus for intermediaries. The data for this table is drawn from the interviews and an FGD with respective organization representatives and triangulated through other data sources.

(2013), except that one role each from either organization type differs. For public sector intermediaries, it appears that they focus more on performing brokerage, consultancy, and resource provision roles. With the PRIs and GAs leading the generation and diffusion of technology in the Philippine rice industry, it is not surprising that they have focused on brokerage. Although we do not emphasize the mediator role, it does not mean that public intermediaries do not need to perform this role. Between the two public organization types, we find that GAs will fit better for mediation-related roles.

The other role this paper finds a better fit for public intermediaries is the resource provision role. Among the participating intermediaries, public sector organizations have reported and highlighted this role more than private-sector ones. Since the law mandates a budget and the delivery of many resources, public intermediaries may ensure the provision of these resources. However, the proper use, maintenance, or man-

agement of resources provided by the public sector is not solely their responsibility. Therefore, private sector intermediaries will need to support the resource provision of public intermediaries to ensure that recipients utilize these efficiently and effectively.

Compared to Intarakumnerd and Chaoroenporn (2013), this study finds that private sector intermediaries have also focused on providing consultancy roles, like public intermediaries. However, compared to their public sector counterparts, it seems that private intermediaries are better suited for mediation roles, especially organizations with large membership bases like IA1, IA2, and the NGO, or those that interact with several other value chains actors, like the PrvF. Moreover, private intermediaries can assist their members in their transactions or gain market opportunities by performing a mixture of brokerage and mediation roles.

Regarding suggested services, Table 7 also provides recommended ones for both public and

private sector intermediaries. Shared between both would be standards, certifications, and technology promotion and acquisition, which requires awareness building and convincing farmers and other actors that these benefits outweigh the costs in the long run. With more consistent funding, public intermediaries may focus on technology generation and investments in setting up communal processing facilities (e.g., milling stations or product processing machinery) and providing farm inputs. On the other hand, private sector intermediaries may focus on diffusing available technologies and building their knowledge on which technologies are most adaptable.

Moreover, they may support the public sector intermediaries by supporting the business or organizational development of farmers, agricultural cooperatives, associations, or other consolidated groups. A key finding from the interviews with private intermediaries and several farmers is that resources provided by the government (e.g., farm machinery and equipment, milling facilities) are, at times, wasted because recipients are unable to manage these resources or do not understand how to use them properly. Several private intermediaries argue that professionalization may be the key to addressing this issue, as evidenced by the experiences of several billionaire cooperative members of the NGO. Thus, private intermediaries in the rice industry may focus on providing services that help develop value chain actors' management and business skills. A shift towards the professional development of rice-producing or agricultural organizations will coincide nicely with the government's 'no cluster, no assistance' policy.

The public and private intermediaries in this study have built and continue to develop their key capabilities. Table 8 provides a summary of the innovation intermediary key capabilities built and suggested for a domestic market-oriented development approach. Based on the roles that the two generalized intermediary types focused on, certain similarities and differences in each key capability are present. For example, for external networking, both organization types need to remain and promote their networks to gather more members and stakeholders for whom the intermediaries may deliver their services. Another common as-

pect of this capability is adopting and using social media for communication and publicity. Although not all organizations in the study are consistent in their use of these new lines of communication, those that do like the NGO, the PrvF, the GAs, IA2, and the PRIs have gained more opportunities for organizational collaboration, funding support, and additional users or customers. On the other hand, private intermediaries may exercise their external networking more by maximizing their national and global network memberships. By being part of these networks, they gain access to other organizations that may support their work or new stakeholders that they may serve.

Public intermediaries may develop their internal communication capabilities by harmonizing their policies, programs, and directives with their local counterparts or implementers and other relevant agencies. Doing so will aid in creating a better institutional environment for the value chain actors in the value chain. In addition, as public intermediaries take the role of technology generation and provision of resources, private intermediaries can build their ability to inform and communicate these opportunities to grow technology diffusion and adoption. Therefore, it appears best for private sector intermediaries to encourage the replication of best practices and technology adoption mechanisms across their membership bases. Moreover, they may share their successful cases with other intermediaries within their current network for further adaptation and replication.

Both types see the value of having multiple types of experts or professionals on their teams for knowledge-building capabilities. Apart from being farmers or value chain actors, most intermediaries have personnel equipped with diverse professional skills and those versed in various rice-related fields, which is especially important for the PRIs and the PrvF. Moreover, most private intermediaries, many put forward their collective experiences in the industry are their most vital knowledge source. Nonetheless, both types of intermediaries ensure that they are in constant dialogue with value chain actors, most notably farmers, to learn about their needs. However, one application of their knowledge capabilities that the intermediaries may not always provide

**Table 8.**  
Key Capabilities Built and Exhibited by and Suggested for Innovation Intermediaries

	Public	Private
External Networking	Opening avenues for industrial consultation and contact Adoption and continued use of new lines of communicating	Openness for collaboration and membership Maximize membership in national and global networks Introduce themselves to relevant government agencies Adoption and continued use of new lines of communicating
Internal Communication	Harmonizing policies, plans, and directives with regional/local counterparts and other agencies Continued relationship with technology adopters Build communication skills of staff	Encourage replication, mentoring, and demonstration between members Build communication skills of staff Communicate services and purpose of the organization
Knowledge-Building	Experts come from various fields Existence of technology banks and libraries Learn and communicate end-market demands	Experts come from various fields Learn from national and global networks Learn and communicate end-market demands
Management	Work is law-mandated Human resource development and management are vital Encourage employment permanency Passion for service of the country	Professional/professionalize the management of the organization Create a sustainable business model, veer away from being grant-reliant Scale services to current capabilities/delivery capacity

Note. The data for this table is drawn from the interviews and an FGD with respective organization representatives and triangulated through other data sources.

is learning and sharing end-market demands. Although most intermediaries understand market demands, there seems to be a lack in sharing this information with the rice farmers. Intermediaries may influence more innovative changes in the rice production process by being more direct about what customers want.

For their management capabilities, there were several aspects that the different intermediaries emphasized. For the public intermediaries, representatives highlighted human resource development and management. It signaled that the staff are given growth opportunities even in public service. However, owing to the limitations in the law, an issue related to human resources is the lack of permanent positions in offices. Several have mentioned the loss of staff with potential because of the lack of job security. With people perceived as critical factors to the success of their work, the government will need to address this

issue to encourage more skilled persons to work under its innovation intermediaries.

Another point raised by public intermediary representatives was their passion for serving the country. According to them, many in their organizations remain because of their passion for serving the Filipino people. Moreover, this passion is respected and cultivated well by their organization's management team. It provides the staff opportunities to see the results of their work to develop themselves. As one representative from a PRI explained, it might be easy for a government scientist to develop some new technology and take it for themselves. However, their staff does not do this because they enjoy being part of the organization and desire to serve their fellow citizens. Therefore, management capabilities are about how an organization implements, monitors, and evaluates its programs and projects and maybe more about managing



its staff. Alternatively, as previously proposed, human resource development and management is likely a fifth key capability.

The experiences of the private intermediaries are somewhat similar where they claim how vital their staff is in ensuring the success of their operations. Apart from the staff, another facet of management most of the intermediaries asserted is the professionalization of their organization. Included in the vie for professionalization is creating a sustainable business model for the organization. The NGO and IA2 mentioned that they are trying to veer away from being grant-reliant and move towards charging for services or receiving commissions to keep their organizations running. Comparing the different private intermediaries, those without a similar mindset were more arbitrary when discussing their programs and services for their members and stakeholders. More success may be possible by pushing for more concrete management of the intermediary.

## VI. CONCLUSION AND IMPLICATION

Comparing public and private sector intermediaries shows that the public sector organizations seem to have a more dominant force in the development of the rice industry. Their overall key capabilities appear more developed, and these organizations seem to host a knowledge base that covers multiple aspects of the value chain. With the proper and more sustainable funding, public sector intermediaries may take the lead in providing the innovations that may aid in addressing the challenges the rice industry faces. GAs and PRIs may broker and provide labor-saving technologies like harvesters or threshers to farmer organizations. Moreover, public sector intermediaries may mediate farmers with irrigation providers.

Nonetheless, the involvement of private sector intermediaries is still necessary. Instead of just brokering and providing machinery, these organizations may focus on brokering markets and developing the organizational capacities of farmer organizations. By doing such, the intermediaries may target organizational innovations, allowing these groups to eventually

create scale economies and drive some market power in reducing input costs and by sharing farm machinery costs. In addition, the private sector will be vital in diffusing technologies further as these intermediaries have deeper connections and contact with private sector actors.

Moreover, private sector intermediaries may also perform consultancy roles. Although rice value chain actors in the Philippines still approach the government for advice, several farmers interviewed report that they seek consultancy online and from fellow farmers. In more recent years, public sector intermediaries have also moved towards a more robust online presence. However, addressing individual concerns may be overtly taxing on public time and resources. Still, public intermediaries may use the data gathered on issues raised and how others respond as a gauge to check on possible misinformation and what knowledge they may focus on diffusing.

Specifically, for interventions in the value chain, this study first finds that innovation intermediaries may perform lobbying or policy roles. Performing this role targets the institutional environment, which affects the innovation process of farmers, firms, and other enterprises. More studies may be necessary to unpack the lobbying and policy role of intermediaries. Second, we observe that very few of the participating intermediaries appear to involve themselves in the aggregation portion of the chain. As this segment acts as a bridge between the upstream and downstream portions of the rice industry, mediating and brokering intermediaries may be necessary for this segment. Third, specific roles or services of innovation intermediaries may be understated when gleaned only through the value chain approach. Since value chain analysis focuses on production processes, one may lose out on analyzing intermediary services that may indirectly affect these like community organizing, lobbying, organization development training, facets of business consultancy, or R&D. One suggested way to aid in analyzing these services is by adding the institutional context when visually analyzing intermediary roles in value chains.

Regarding key capabilities, we find and propose that human resource development and

management be a fifth necessary key capability for the success of intermediaries. Further studies that focus on understanding this proposed key-capability further may be required as the significance of their staff is a critical point raised by almost all intermediaries.

To conclude, we provide several implications. First, innovation intermediaries need to have organizational and management capability development plans. Understanding the capability development of innovation intermediaries through a dynamic capabilities approach (Tece, 2019) may further build their key capabilities for successful role performance.

Second, human resource management and development policies may need amendments in the Philippines, particularly employment permanency. Providing better job security may allow public sector intermediaries to maximize the potential of highly skilled professionals seeking careers in public service.

Third, agricultural collectives may need to prepare organizational and management capability development plans. With the government's 'no cluster, no assistance' policy, consolidated farmers and farmer organizations may need assistance in developing their organizational and management capabilities, which intermediaries may provide through business consultancy or resource provision (e.g., secondment of managerial staff or creation of management programs). Intermediaries may focus on developing or searching for professional managers or persons with organizational management skills for their stakeholders or even create a pool of professionals ready to serve in farmer organizations or groups.

Finally, on the RCEF implementation, the DA may be more explicit in describing the actions that different innovation intermediaries may provide to support its implementation. An example of this is IA2 partnering with PRI1 to provide farm machinery to IA2's member rice farmers. In addition, if the government provides more concrete approaches that different organization types offer, the implementation and diffusion of the different RCEF components may be done more quickly.

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