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Preface

The Journal of Public Affairs and Development (JPAD), a double-blind peer-reviewed journal, publishes original articles on public affairs and development issues. These include rural and agricultural policy analysis, institutional innovations and development, local governance, community development and community education, and agrarian reform, among others. Papers that advance the understanding on how transdisciplinary social science research can support agriculture and community development or provide analysis on the relationship between various development policy and governance issues are especially welcome.

Preferred are papers from research and model applications at the community and organizational levels that bridge and integrate social and technical knowledge, those that underpin agriculture and community development particularly. Because of its emphasis on transdisciplinary approach to development studies, the Journal caters to readers from a wide range of disciplines, including scientists, practitioners, administrators, policymakers, and students in social sciences, natural sciences, and related fields.

The first four articles in this issue cover support services toward improving rice production. The fifth article is on alternative staples to rice while the last one is on operational policies to support organic vegetable production.

The article of NGUYEN ET AL. examined the knowledge and perception of 128 irrigators' association presidents in the Philippines using the water governance framework of Saleth and Dinar. Their study found dissimilar perceptions on irrigation water quality and quantity between the water managers of the National Irrigation System and Communal Irrigation System. Conducted in Zumalai Subdistrict, Covalima, Timor-Leste, VICENTE and DIZON analyzed the contribution of the System of Rice Intensification (SRI) project toward food security. The study found that the participants joined the program to have access to government facilities and incentives, exchange experiences, share resources and labor, and work together. Meanwhile, the study conducted by CHANTHAVONGSA, DIZON, QUIMBO, and AMIT found that adequate experience, material possessions, and positive attitude have contributed to native rice self-sufficiency in Khoune district, Xiengkhouang province, Lao PDR. The article of ILAR found that farmers participating in Farmer

Field School (FFS), Tarlac province, Philippines have more knowledge about the PalayCheck System and have shared their knowledge as compared with non-participating farmers. He further concluded that FFS can be a good avenue for building the human and social capital of farmers.

PABUAYON, PANTOJA, MANILA, and SANTOS explored the potential of *Saba* banana, sweet potato, yam and cassava as alternative staples for the local communities in Quezon province, Philippines by interviewing farmers, traders, and consumers. The study concluded that *Saba* banana, sweet potato, and cassava were the top three possible substitutes for rice for breakfast and relatively less for other meals. Moreover, despite low production levels, a greater proportion of the total production was marketed reflecting the crops' marketability and potential as additional income source.

Lastly, the article of ROLA ET AL. analyzed the production, marketing, and consumption issues surrounding the organic vegetable industry to come up with operational policies to support the implementation of the Organic Agriculture Act of 2010 (Republic Act No. 10068). Their study showed that the most critical constraint to organic production was the high cost of certification, lack of farmers' training on the technology, and access to organic inputs. Thus, the study recommended alternative certification processes, capacity building for both farmers and program implementers, and more information, education, and communication (IEC) campaigns on the benefits of organically-grown products.



Merlyne M. Paunlagui, PhD
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Comparative Analysis of the National and Communal Irrigation Systems' Water Governance: The Philippines Case

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ABSTRACT. Using Saleth and Dinar's water governance framework, the study characterized irrigators' associations and examined how they operate and how they are managed. A total of 128 association presidents were surveyed in ten provinces in the Philippines and were asked about their knowledge and perception on the organization, natural resource policies, and water status in the locality.

The National Irrigation Systems (NIS) still has a formal structure as influenced by the National Irrigation Administration (NIA), but it is assuming the characteristics of the Communal Irrigation Systems (CIS) management because of the paradigm shift to participatory irrigation management. The CIS, on the other hand, may remain to be an informal organization that is mimicking the character of the NIS, or it may become more formal in operation.

The irrigators' associations were guided by institutional processes in water pricing. They differed on the basis and the average amount charged, and on modes of collection. Pricing did not reflect the

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true value of water with amounts set arbitrarily, and collections aimed at partial or full cost recovery.

Water administration is concerned with governance of water organization, policy and decision making, functional capacity, and government's level of influence on the water organization.

Water managers of NIS and CIS had dissimilar perceptions on irrigation water quality and quantity. Water laws (surface water, forest, and land use) were viewed to have moderate to very strong linkage. Water rights were perceived to be common or shared equally by community members. Arising mainly from water scheduling/distribution, conflicts were resolved within the association or at the *barangay* (village) government.

Keywords: *irrigation, water governance, communal irrigation system, national irrigation system, Philippines*

INTRODUCTION

In most developing countries, irrigation accounts for at least 70 percent of all water that is consumed (Frederick, 2006). With increasing scarcity of water due to environmental degradation coupled with rising demand for water in various sectors, use of water as an input to agricultural production becomes limiting.

Water, as an input to production, has many issues. First is the economic return of irrigation water per unit of production that reveals the inefficient use of water in this sector (Schneekloth, Bauder, Hansen, n.d.; Schneekloth, Norton, Clark, & Klocke, 2001). Second is the focus of agricultural research, which is to make irrigation water use more efficient for technological innovations to minimize wastage (Levidow et al., 2014). And third, which is the focus of this paper, is irrigation water governance that can improve efficiency in water use (Huppert, 2000).

Water governance refers to a “range of political, social, economic, and administrative systems that are in place to develop and manage water resources, and the delivery of water services at different levels of society” (Global Water Partnership, 2003 in Bucknall, Damania, & Rao, 2006). Two core values of governance that surfaced in literature are inclusiveness (members of a group receive equal treatment) and accountability (if things go wrong, those in authority must answer for the group and must be credited if things go well) (Bucknall et al., 2006).

Water governance covers understanding the structure of institutional arrangement under which it operates, and determines who makes decisions and who benefits from these decisions. Globally, there are different models of irrigation water governance, e.g., collaborative management, decentralized and user-centered participatory management, and participatory irrigation management and development, among others.

Franks, Cleaver, Manganga, and Hall (2013) analyzed irrigation water governance in Tanzania by looking at the system of resources, arrangements for access, and outcomes for people and ecosystems. They concluded that development of water resources had been successful because of assured water supply, improved livelihoods, and increased landholdings. In Nepal, water governance was done through cooperation and collaborative management shifting towards decentralized and user-centered participatory management (Sijapati & Prasad, 2014). Similarly, Cambodia adopted the principle of participatory irrigation management and development as well as integrated water resources management. However, discrepancies in the actual governance practices and recommended principles were observed. The participatory approach was utilized when management was delegated to the community level, i.e., the Farmer Water User Community. However, the Khmer Rouge’s hydraulic mission was used to manage infrastructure projects for large-scale irrigation (Chea, Nang, Whitehead, Hirsch, & Thompson, 2011).

In the Philippines, agricultural demand for water is estimated to be 80 percent of total water demand (Dayrit, n.d.). However, it remains to have lower priority than domestic water. In fact, only 47 percent of potentially irrigable areas (3.16 M ha) are irrigated. Worse, shortage of water supply impedes all efforts to augment irrigated areas.

Currently, the irrigation sector is faced with low water-use efficiency attributed to technical and institutional deficiencies. According to Dayrit (n.d.), the irrigation sector's major problems are 1) insufficient water control structures needed for equitable and timely water deliveries in the system; 2) irrigation systems not designed to prevent flooding during the wet season; 3) increased siltation of irrigation systems due to watershed degradation and severe erosion during typhoons; 4) irrigation facilities not properly maintained resulting to inefficient water usage; and 5) deficient water management due to weakness in institutions.

Ironically, a large chunk of government budget allocated to agriculture goes to irrigation development. Investments in irrigation development had been increasing since 2008 (Inocencio, David, & Briones, 2014). This means that the state still continuously shoulders the financial burden of the irrigation sector. Recently, this trend is being reversed by transferring the management of irrigation facilities to irrigation associations, especially among National Irrigation Systems (NIS), through the Irrigation Management Transfer (IMT) policy. Management of Communal Irrigation Systems (CIS), on the other hand, should be turned over to the local government units (LGUs) as stipulated in the Agriculture and Fisheries Modernization Act of 1997 and the Local Government Code of 1991.

Two major types of irrigation systems operate in the country: the NIS and the CIS. The NIS scheme has been established and is being maintained by the National Irrigation Administration (NIA). In this type of irrigation system, farmers have to pay an irrigation service fee (ISF) to cover operation and maintenance (O&M) expenditures. The fees collected by NIA should cover costs for O&M and investment. The CIS scheme, on the other hand, has been established either by farmers or by NIA. After project

completion, NIA will turn over the management to the irrigators' association for O&M (Lauraya & Sala, 1995; Jopillo & delos Reyes, 1998). Unless it can pay the equity (30% of investment), the CIS irrigators' association has to pay amortization to NIA for the recovery of investment for irrigation facility.

In adherence to the current trend of participatory irrigation management, NIA is now veering away from managing the NIS; thus, letting the irrigators' associations (IAs) govern by themselves. CIS, on the other hand, is using the less formal and customary rules in governing irrigation water. The primary aim of the two systems is to provide irrigation water to association members at the time it is most needed. Ensuring that water is available at the most critical times is a fundamental issue of governance mechanisms.

This paper aimed to compare the operation of NIS and CIS, and how IAs govern the systems. The NIS may have best practices that can be adopted by the CIS or vice versa. The ideal situation is for both the NIS and the CIS to have a mechanism of governance that is relevant, effective, and adequate to the needs of the members. The paper also determined the water managers' level of knowledge and perception on the organization, natural resource policies, and water status in the locality. The governance of irrigation water may be gleaned from the quality and quantity of irrigation water in the study areas.

The Irrigation Water Governance Framework

This study used the water governance framework adapted from Saleth and Dinar (2005) to describe irrigation water governance in the Philippines. The elements of the framework considered were the unbundled components of the water laws, water policies, and water administration (Table 1).

Variables of the water law component include knowledge of irrigation water managers on the legal basis of water resources; linkage between laws on water and water-related resources; and relevance of water laws to water situation. Variables on

Table 1. Summary of variables in the water governance study based on Saleth and Dinar’s (2005) framework

WATER LAW	WATER POLICY	WATER ADMINISTRATION
Knowledge of legal bases of water resources	Knowledge about water rights	Functional capacity of IAs
Linkage between laws on water and water-related resources	Conflict resolution	Level of influence of government on water organization
Relevance of water law to water situation	Pricing and cost recovery policies	Regulation and accountability
	Water fee collection mechanism	Participation of stakeholders in water planning and development/management

water policies of the organization consist of the water managers’ knowledge on water rights, conflict resolution, pricing and cost recovery policies, and water fee collection mechanisms. Finally, the variables for water administration include the functional capacities of IAs, influence of the government on water organization, regulation and accountability in water resource utilization, and participation of stakeholders in water planning and development/management.

The role of water managers is critical. They must ensure water security and availability. They should see to it that water supply is adequate for water users. For instance, the water district manager has to make sure that clean, potable, and safe water is available to clients while also making certain that the needs of other sectors are met. These sectors include the industrial,

business, and agricultural sectors. In the same manner, the IA has to make sure that irrigation water is available and distributed to farms of its members at the right time.

METHODOLOGY

Data Sources

Both primary and secondary data were used. The primary data were generated from a survey of more than 300 water managers (water districts, local government-based water system, community-based water system, private water utility organization, and irrigation systems) in ten provinces throughout the country. For this study, the responses of a subset of 128 IA presidents were examined. Comparative analysis of responses of 64 NIS and 64 CIS irrigators' association presidents or their representatives was undertaken. Secondary data were sourced from NIA and IA records, and other publications.

Sampling and Data Collection

A sampling frame was obtained by listing all the irrigators' associations, both CIS and NIS, in each of the ten provinces. The respondents representing congressional districts of each province were selected.

Primary data were gathered through surveys of the IA presidents in the different municipalities categorized by level of development as non-rural and rural¹. In the absence of the IA president, the next in rank who manages the affairs of the association was considered as respondent. A respondent was replaced when a CIS-IA of an irrigators' association was no longer operating and no officer was willing to be interviewed. Secondary data, on the other hand, were collected from NIA, IAs, and other related agencies.

Survey Sites

The municipalities surveyed from the 10 provinces covered Benguet, Mt. Province, Ilocos Sur, Bulacan, and Laguna in Luzon; Bohol, Cebu, and Iloilo in Visayas; and Bukidnon and Davao in Mindanao. The irrigation systems were categorized by type as NIS and CIS (Table 2).

Table 2. Distribution of respondents by province and type of irrigation system

PROVINCE	IRRIGATION SYSTEM					
	NIS (n=64)		CIS (n=64)		Total (n=128)	
	No.	%	No.	%	No.	%
Luzon	40	62.5	23	35.9	63	49.2
Benguet	7	10.9	4	6.3	11	8.6
Mt. Province	4	6.3	5	7.8	9	7.0
Ilocos Sur	11	17.2	2	3.1	13	10.2
Bulacan	10	15.6	5	7.8	15	11.7
Laguna	8	12.5	7	10.9	15	11.7
Visayas	9	14.1	29	45.3	38	29.7
Bohol	6	9.4	3	4.7	9	7.0
Cebu	0	0	15	23.4	15	11.7
Iloilo	3	4.7	11	17.2	14	10.9
Mindanao	15	23.4	12	18.8	27	21.1
Bukidnon	10	15.6	2	3.1	12	9.4
Davao	5	7.8	10	15.6	15	11.7

Data Analysis

Descriptive analyses such as frequencies, means, and percentages were used in the study. There were also cross-tabulations and Likert scales. Whenever applicable, Chi-square test was done to determine if there is significant difference between the two groups, NIS and CIS.

RESULTS AND DISCUSSION

The Role of the National Irrigation Administration

The National Irrigation Administration (NIA), a government-owned and controlled corporation (GOCC), is responsible for the irrigation development and management in the Philippines. By virtue of Republic Act (RA) 3601, NIA was created in June 1963. The NIA charter was later amended by a Presidential Decree (PD) 552 in September 1974 and PD 1702 in 1980, which increased its capitalization and broadened its authority.

Traditionally, NIA is the key agency that provides irrigation water. The elevation of NIA as a separate corporate body in 1963 followed the international trend of hydrocracies, with financial backing from the West, emerging in Third World countries (Molle, Mollinga, & Wester, 2009). Wrestled from the Bureau of Public Works and Irrigation Department, the NIA grew into a large bureaucracy with considerable capitalization (i.e., from PhP300 M in 1963 to PhP2 B in 1974 and to PhP10 B in 1980) under the Marcos dictatorship. With technical support from the US Bureau of Reclamation and financial infusions from international lending institutions (i.e., World Bank and Asian Development Bank) as well as aid agencies (i.e., USAID and JICA), NIA undertook big dam construction projects. Irrigation also extended the reach of the national government to remote areas; thus, further contributing to centralization (Panella, 2004).

The PD 522 in 1974 expanded NIA's scope of activities to include the management of CIS and the construction of

multipurpose drainage facilities. Consonant with an earlier state-centric focus, NIA's operations were heavily subsidized by the state, and its irrigation fees were set by the national government.

The 1980s saw significant changes in NIA's operations, such as increased water charges; reduced control over irrigators' associations, which were given water rights; divestiture of agency responsibility over irrigators' associations through graduated stage contracts; and the introduction of participatory irrigation management approaches in its field operations (Panella, 2004). Decentralization efforts after 1986 further eroded NIA's control over irrigation associations as responsibility over communal irrigation management was transferred to the LGUs. The continued reliance of LGUs on NIA for technical assistance in managing communal irrigation systems and continued channeling of foreign-funded projects through NIA ensured the agency's continuous relevance. However, populist politics under former President Joseph Estrada in 1998 resulted in the drastic cut in irrigation fee, reducing NIA's revenue base and increasing its dependence again on government subsidy to cover personnel expenses. To date, NIA is beleaguered by low irrigation fee collection and poor performance in meeting its targets (Gutierrez, 2013).

The Irrigation Systems

The Philippines has three irrigation systems, namely: national, communal, and private. This paper focuses on the large (i.e., NIS) and medium irrigation systems (i.e., CIS).

NIA has constructed NIS covering more than 1,000 ha. The construction and implementation of the operation of the NIS are responsibilities of NIA (Oprecio, 2005). The O&M of NIS are performed by both NIA and IAs. In terms of water charges, farmers pay irrigation services fee per hectare per season (Table 3). The official policy of NIS is to "recover O&M and at least partial construction costs from farmers subject to their ability to pay."

Table 3. Water origin, service area, O&M, and water charges of irrigation systems

ITEM	NIS	CIS
Water origin	Reservoir or storage; Run-of-the-river diversion pump	Run-of-the-river diversion; Small reservoirs or storage
Service area (ha)	>1,000	<1,000
Project implementation/ construction	NIA	NIA with farmers' participation
Operation and maintenance of irrigation facility	NIA and Irrigators' Association	Irrigators' Association
Water charges	Farmers pay irrigation service fee (ISF) per hectare/season/crop	Farmers pay equity or amortization
Purpose of water charges	Operation and maintenance (O&M)	Capital cost recovery
Water permits	NIA pays water permit	Irrigators' Association has to pay water permit

Covering 1,000 ha or less are the CIS that have been built by farmers over the years and more recently by NIA. Construction of CIS irrigation project is done by NIA with the participation of IA members. Upon completion of the project, the CIS is turned over to the IA for O&M. If farmers are unable to pay the equity (30%) for the investment cost of the irrigation facility, they have to pay amortization for the construction cost for a period not exceeding 50 years (Jenkins, Pastor, & Panuccio, 1994). In other words, the CIS is a self-liquidating system.

As of 2013, there were about 245 NIS with a total service area of 821,598 ha. The CIS numbered 10,651 covering 598,473 ha. Of the total irrigated area, 24.5 percent are NIS, 19.1 percent are CIS, and 6.5 percent are the private irrigation scheme (PIS)². About 1.678 M ha or only 55.59 percent of the 3.1 M ha are considered irrigable land in the Philippines (3% slope devoted to rice and corn), which have been developed for irrigation. A World Bank study reported that there are still 6.1 M ha irrigable areas, which include those that are relatively more difficult to irrigate (i.e., up to 8% slope).

The policy on water charges differs according to the irrigation technology with a bias against the CIS. Whereas the government fully subsidizes the NIS construction cost and about half of O&M, CIS farmers are required to shoulder O&M as well as contribute 10 percent of construction costs in cash or in kind, and to repay the balance without interest for a period of not more than 50 years. Such differential rate of subsidization is not only inequitable, but it also increases farmers' demand for NIS relative to the lower cost CIS (David, 1995).

As of 2012, NIA operated and maintained 217 NIS nationwide with a total service area of 793,638 ha (Castro, 2004). In the same year, NIA maintained and operated 9,651 CIS. As of December 31, 2013, there were 245 NIS and 10,651 CIS with service areas of 821,598 ha and 598,473 ha, respectively. In December 2014, irrigation development reached 56.57 percent with 1,311,546 ha of potential irrigable areas remaining to be developed. Such backdrop provided an interesting setting to study the governance of NIS and CIS.

Results of the Irrigation Systems Water Governance Survey

The next section presents the results of the survey among 128 IA presidents in selected provinces throughout the country.

Demographic profile of respondents. About 50 percent of the IA respondents are from Luzon, 30 percent are from Visayas, and 21 percent are from Mindanao (Table 2). Most of the IA presidents in both irrigation systems are male with a mean age of 55 years old for NIS and 58 years for CIS. In terms of educational attainment, Table 4 shows that more than 70 percent of the respondents have reached secondary (33%) and tertiary education (41%).

Table 4. Sex, mean age, and education of respondents by type of irrigation system

CHARACTERISTICS	IRRIGATION SYSTEM	
	NIS	CIS
Male respondents (percent)	92.2	92.2
Mean age (in years)	55.1	57.8
Education (percent)		
Elementary	18.8	21.9
High school	40.6	32.8
College	35.9	40.6
Others	4.7	4.7

Water managers' perception on water quality and quantity. Water quality measures the condition of water, such as chemical, physical, and biological characteristics relative to the requirements of its intended use. These uses include drinking, farming, fish production, industry, recreation, and agriculture. More frequently, there are quality standards for compliance.

Islam and Shamsad (2009) cited that quality of irrigation water may affect plant growth directly through toxicity or deficiency, and indirectly through altering plant availability of

nutrients. For Frenkel (1979), good water quality potentially allows maximum yield under good soil and water management practices. Poor quality of irrigation water often leads to problems on increased salinity, low soil permeability, deterioration of soil structure, and contamination of soil with potentially toxic substances.

In this study, water quality was rated using indicators of total suspended solids (TSS), *Escherichia coli* (*E. coli*), biochemical oxygen demand (BOD), dissolved oxygen (DO), and nutrient level.

Respondents were asked to rate the absence or presence of human or animal feces in water, with a scale of 1-5 with 5 as serious problem. They were also asked to rate TSS, with a scale of 1-5 with 5 as being a high TSS. BOD was indicated by the presence of biodegradable materials as food or fecal matter, with a rating of 1-5 with 5 as high. On the other hand, the indicator for DO was the absence or presence of aquatic animals in the water, with a rating of 1-5 with 5 for none or less aquatic animals. Lastly, the presence of water hyacinths was the indicator for nutrients in the water, with a scale of 1-5 with 5 for more water hyacinths. Meanwhile, scarcity and seasonality of water supply were used as indicators for water quantity.

Though water quality is not so much a concern for irrigation water unlike domestic water supply, it is interesting to determine the perceptions of respondents on the quality of irrigation water. The overall rating for water quality is 2.4, interpreted as moderately good. The IA presidents had no significant difference on the water quality ratings of NIS (2.6) and CIS (2.2) as seen in Table 5.

In terms of water quantity, water scarcity, which is the insufficiency of available water resource in a locality, may be caused by the increasing demand for water and depletion of water resources. Seasonality of water, on the other hand, pertains to the fluctuation in the flow and volume of water in the area within the year. Respondents were asked to rate the supply and the seasonality of water in the area for the past five years.

Table 5. Ratings of irrigation association presidents on water quality, quantity, and strength of legal linkages between surface water and the environment

INDICATOR	IRRIGATION SYSTEM		OVERALL MEAN RATINGS	PEARSON CHI- SQUARE (X ²)
	NIS	CIS		
Water quality	2.60	2.20	2.40	0.040
Water quantity	3.75	4.04	3.90	0.011
Legal linkage between surface water and land use	3.70	3.80	3.75	0.030
Legal linkage between surface water and forest	4.00	3.80	3.91	0.000

Note: Chi-square figures are not significant

Interpretation:	Water Quality	Water Quantity	Legal Linkage
2.00 & below	Very good	Very poor	Very weak
2.01 - 2.60	Moderately good	Poor	Weak
2.61 - 3.20	Slightly good	Slightly good	Strong
3.21 - 3.80	Poor	Moderately good	Moderately strong
3.81 & over	Very poor	Very good	Very strong

Notably, water quantity ratings were higher for CIS (4.04, very good) as compared with the NIS rating (3.75, moderately good). Overall rating for water quantity in the study areas was 3.9, interpreted as very good (Table 5).

Knowledge and perception about water laws.

There are water rules and ordinances at the local level, which have implications on the roles of water managers, specifically irrigators' association presidents. These are rules on maintaining clean water; measures on mitigating water pollution and actions against water pollution; rules on setting water use rates; rules

on establishing water organizations; and rules on protecting and managing watersheds. Meanwhile, rules on water usage in the locality are mostly on the provision of irrigation water, surface water, and public water use, among others.

Linkages exist between laws on water and water-related resources such as surface water, forest, and land use. The water managers were asked about this linkage. Rules and ordinances on surface water are related to certain rules and ordinances on land use that are affecting the irrigation system. Ordinances on land use such as those pertaining to agriculture or specific to the production of sugarcane, banana, rice, or corn have implications on the irrigation system as these will determine the extent of irrigation water requirement or demand. Some of those mentioned by the respondents include mining, *kaingin* (slash-and-burn farming), and quarrying, agriculture, and water for irrigation purposes only.

Respondents had an over-all mean rating of 3.75 (moderately strong) on the linkage between surface water and land use. On the other hand, respondents perceived that the legal linkage between the surface water and forest was very strong (3.91). However, the Chi-square statistic to test whether there was a difference in the rankings of the NIS and the CIS showed insignificant coefficients (Table 5).

Knowledge and perception about water rights and conflict resolution practices. Water right is the right of a person or group to use water from a water source. It emanates from a person's ownership of a land within which a water form is located or his/her land is situated along the bank of a nearby water body. Water rights are given to a group or an individual to regulate the use and enjoyment of surface or ground water.

IAs have exclusive water rights as provided in the locality's water law. However, majority of the respondents (62%) said that they did not have exclusive rights. These water rights were either individual (35%) or group/collective (65%).

More than half (27% of NIS and 25% of CIS) of the IA managers perceived that water rights are based on the belief

that water is a common property and should be collectively administered by the community. However, more CIS respondents (23%) believed that water rights should be shared equally by community members as contrasted with 19 percent of the NIS. In fact, more NIS respondents (23%) viewed water as a resource to be shared even to non-members of the community as compared with the 22 percent of the CIS respondents who believed so. About one-third (31%) of the NIS respondents as compared with the 30 percent of CIS perceived that water is a state property, and thus, should be allocated by the local government; and that water right is based on the riparian system or through legal arrangement with the government like the issuance of permit or license (Table 6).

Table 6. Knowledge and perception of respondents on the basis of general water rights

BASIS	IRRIGATION SYSTEM			
	NIS (n=64)		CIS (n=64)	
	No.	%	No.	%
Common property collectively administered by the community	17	26.6	16	25.0
Shared equally by community members	12	18.8	15	23.4
Shared equally with non-community members	15	23.4	14	21.9
Others (State property allocated by the local government, riparian system, or proximity to surface water source; by permit, license, or legal arrangement between governments)	20	31.2	19	29.7

Meanwhile, conflicts may arise among members of an IA or between an IA member and non-IA member. Among the major causes of conflicts among IA members were the non-payment or late payment of water dues and scheduling of water delivery/distribution. These conflicts were usually resolved within the IA or in the *barangay* (village) local government. A number of NIS respondents resolved conflicts with the help of the NIA.

Conflicts at the association level (21%) or at the *barangay* LGU level (55%) were usually resolved through amicable settlement, e.g., meetings and dialogues (34%), negotiation (15%), and agreements on the rotation of water delivery (9%). When indigenous peoples (IPs) were involved in the conflict, the council of elders of the ancestral tribe was engaged in conflict resolution.

There were customary or traditional practices (9%) of resolving conflicts in the community. Dialogues/meetings were conducted with the *lupon* or council of elders and community where agreements are made. General assembly meetings may be called towards resolution of conflicts. Conflicts emanating from water scheduling or distribution were resolved by assigning water use schedule. Majority (52%) of the respondents found these practices very effective in resolving conflicts.

In case of inter-municipality or trans-boundary conflicts, dialogues between elders in the community and the LGU officials were conducted. Meetings within groups of *barangays* and dialogues between zones were also carried out, whenever necessary. These results suggest that while conflicts arose, these were solved by informal means. The State was not a key player in the resolution of conflicts.

Water pricing. Survey respondents were also asked about water pricing and cost recovery and mechanisms for water fee collection. Below are the results of the survey.

Pricing and cost recovery. Fees collected by NIA from IAs should cover costs for operation, maintenance, and investment within a reasonable time, but in practice, fees just cover capital cost recovery confined to the communal sector. These fees are usually expressed in kilograms of *palay* (unmilled rice). The rates are estimated per season and depend on the origin or source of water (e.g., river diversion, pumps, or reservoir).

**Table 7. Irrigation fees based on cropping season by type
of irrigation system, per hectare**

CROPPING SEASON	IRRIGATION SYSTEM		MODE OF PAYMENT
	NIS	CIS	
Wet season (Mean price in PhP)	1,035.75 - 1,328.70	676.31 - 955.00	Palay or cash
Dry season (Mean price in PhP)	1,192.85 - 1,875.00	766.38 - 1,257.00	

Water rates set by water organizations were generally based on cost and a margin of profit for future activities or expansion of services. Both NIS and CIS had higher rates during the dry season. It was higher when water was sourced from a reservoir and highest when a water pump was used. Results from the survey show that charges for water ranged from 0 to PhP3,000/unit. Water rate in this paper also includes charges for the water system since a number of IAs manages community-based water system. This is true to 22 percent of NIS and 23 percent of CIS IAs. In general, bases of the irrigation water charges include partial or full cost recovery of IS investment or depending on NIA, where rates now become arbitrary.

Mechanisms for water fee collection. Based on the results in Table 8, many of the respondents cited diverse collection mechanisms. Most members of the CIS paid after every cropping (36%). In some IAs, the treasurer of the organization collected the fees (19% of NIS and 20% of CIS), while some NIS managers (12%) said that the bills were distributed house-to-house by no less than the IA president himself.

Water organization and administration. The survey also covered water administration, functional capacity of IA managers, level of influence of the government and other bodies on the water organization, and regulation and accountability. Results of the survey are shown below.

Table 8. Mechanisms for water fee collection

MECHANISM	IRRIGATION SYSTEM			
	NIS (n=64)		CIS (n=64)	
	No.	%	No.	%
Calendar collection; every month collected in meetings; collection after every cropping	11	17.2	23	35.9
Treasurer collects fees from association; members pay to treasurer/secretary	12	18.7	13	20.3
Bills distributed to farmers or house-to-house by the IA president	8	12.5	2	3.1
Others (during general assembly meetings, <i>purok</i> president collects the payment, pays the <i>barangay</i> treasurer monthly, IA collects, remits to NIA - gets 40% collection after deducting O&M costs and amortization/ staggered basis)	33	51.6	26	40.6

Water administration. The board of directors (BODs) was mentioned as the highest policy making body of the associations for both irrigation systems. The chair of the BODs was usually elected (Table 9). However, there were instances when the chair was appointed or the *barangay* captain assumed the position. More respondents from the CIS mentioned the chair as being appointed by other authority. There were times when the council of elders automatically became the policy-making body, especially in the CIS. Appointment authority was a privilege of the IA president and the general assembly members. The term of office of the policy-making body of the water organization ranged from one to six years, but mostly for one to three years.

While more than half (52%) of the respondents said that these policy-making body members worked for free, some IAs were able to compensate them in the form of honorarium (Table 10). The NIS manager had a higher monthly pay than the CIS manager, however, the CIS manager had more meetings as compared with the NIS manager.

**Table 9. Highest policy-making body and appointing authority
for administration of the policy-making body**

RESPONSE	IRRIGATION SYSTEM (%)	
	NIS (n=64)	CIS (n=64)
Highest policy-making body		
Board of directors	64.1	54.7
President/Chairman (farmer's organization)	12.5	18.8
Officers of the association	15.6	6.3
General Assembly	4.7	10.9
Others (e.g., elders, <i>sangguniang barangay</i> , and <i>barangay</i> captain)	3.2	9.4
Total	100.0	100.0
Appointing authority	57.8	68.8
General Assembly (members of the organization)	34.4	18.8
Election, elected by members, GA election	4.7	0.0
IA President		
Others (e.g., <i>barangay</i> captain, <i>barangay</i> council, farmers, members per sector and sectoral leaders)	3.1	12.5

The IAs conducted regular monthly meetings or when there was a need. The frequency of board meetings ranged from 1 to 24 times a year. NIS-IAs were observed to have held more meetings, while more CIS-IAs held meetings once a month. During meetings, issues that had to be addressed and decided upon by the policy-making body of the IA were discussed. Table 11 presents the major issues cited by both the NIS and the CIS, which included the following: repair, O&M, and cleaning of water source; collection of irrigation fees; water allocation and availability; association policies/management issues; and others (cropping calendar/pattern, seed subsidy, drought).

Table 10. Forms of compensation and average amount paid

FORM	IRRIGATION SYSTEM			
	NIS		CIS	
	No.	%	No.	%
Forms of compensation				
Voluntary (no compensation)	38	73.1	31	54.4
Honorarium per meeting (PD198)	9	17.3	23	40.4
Per diem	3	5.8	3	5.3
Others (taxes, depends on LWD category, per cropping, and salary)	2	3.8	0	0.0
Average amount paid per month (in PhP)	497.9		359.0	
Average amount paid per meeting (in PhP)	192.9		329.4	

Table 11. Major issues discussed during IA meetings

ISSUE	IRRIGATION SYSTEM			
	NIS (n=64)		CIS (n=64)	
	No.	%	No.	%
Water allocation, water availability/ water shortage/water distribution	17	26.5	16	25.0
Repair, operations and maintenance/ cleaning of the source	16	25.0	12	18.8
Management policy/water management issue	9	14.1	9	10.9
Others (e.g., irrigation fee collection, conflict settlement, financial management, funding, illegal connection/theft, membership/ management, project proposal/ program, sanitation, amortization, water taxes, cropping calendar pattern, reporting, seed subsidy, drought, and privately owned source of water)	22	34.4	29	45.3

The members of the policy-making body of the IAs were able to attend trainings (Table 12). Most CIS attended technical trainings. Trainings on technical matters included pest management, early cropping system, water management, and use of drought-resistant varieties. On the other hand, most of the NIS respondents have attended basic leadership development course; some have attended trainings on financial management/computing for payments; while others have undergone training on IA management/administration and bookkeeping. In general, most members of the policy-making body of the IAs attended these trainings.

Table 12. Major trainings attended by the respondents

TRAINING	IRRIGATION SYSTEM			
	NIS (n=64)		CIS (n=64)	
	No.	%	No.	%
Basic leadership development course	10	15.6	7	10.9
Technical (production technologies, water management, etc.)	15	23.4	26	40.6
IA /cooperative management/ administration/bookkeeping	11	17.2	8	12.5
Financial management/computing for payments	8	12.5	8	12.5
Strategic management	5	7.8	1	1.6
Policy making	1	1.6	3	4.7
Others (no response, not applicable)	14	21.9	11	17.2

Functional capacity. Functional capacity of IA managers may be gauged by their performance of their major functions such as planning and design; implementation of plans; financial management; O&M; environmental monitoring; research, training, and/or extension activities; inter-agency relationships; and public

relations. These were rated by the respondents in terms of the level of strength or weakness (Table 13). Mean rating of the NIS respondents ranged from 3.06 (moderately strong for research, training, and extension) to 3.98 (very strong for planning and design). For the CIS respondents, mean ratings ranged from 3.07 (moderately strong for research, training, and extension) to 4.06 (very strong for environmental monitoring). Looking at the overall rating of the IAs for functional capacity, the NIS had lower rating of 3.59 as compared with the CIS at 3.76.

Table 13. Respondents’ rating on the functional capacity of IAs

FUNCTION	MEAN RATING	
	NIS	CIS
Planning and design	3.98 (VS)	3.99 (VS)
Implementation	3.87 (VS)	3.93 (VS)
Financial management	3.45 (S)	3.66 (S)
Operation and maintenance	3.62 (S)	4.06 (VS)
Environmental monitoring	3.51 (S)	3.70 (S)
Research, training, and extension	3.06 (MS)	3.07 (MS)
Interagency relationships	3.57 (S)	3.83 (VS)
Public relations accountability	3.63 (S)	3.84 (VS)
Overall Rating	3.59 (S)	3.76 (S)

Interpretation:
2.00 & below Very weak (VW) 3.21 - 3.80 Strong (S)
2.01 - 2.60 Weak (W) 3.81 & over Very strong (VS)
2.61 - 3.20 Moderately strong (MS)

Level of influence of the government and other bodies on the water organization. National and regional offices of the National Water Resources Board (NWRB), NIA, Department of Environment and Natural Resources (DENR), Department of Agriculture (DA), Department of the Interior and Local Government (DILG), Laguna Lake Development Authority (LLDA), and others had influence on the associations. Similarly, local institutions such as the LGU and the council of elders had influence on the associations. This

Table 14. Respondents' ratings on the level of influence of government institutions on IAs

INSTITUTION/BODY	IRRIGATION SYSTEM	
	NIS	CIS
National government e.g., NWRB, NIA, DA, DENR, DILG, LLDA	4.20 (VHI)	4.30 (VHI)
Regional offices of national government	3.50 (HI)	3.60 (HI)
Municipal government	3.80 (HI)	3.50 (HI)
<i>Barangay</i> council	3.50 (HI)	3.60 (HI)
Statutory bodies	2.90 (MI)	2.10 (LI)
IP/Council of elders	3.10 (MI)	2.20 (LI)
Interpretation:		
2.00 & below	No influence (NI)	3.21 - 3.80 High influence (HI)
2.01 - 2.60	Least influence (LI)	3.81 & over Very high influence (VHI)
2.61 - 3.20	Moderate influence (MI)	

influence may be in the O&M of the organization or on the use and protection of water resource (Table 14).

Respondents rated this level of influence with the following: (1) national government agencies were rated to have “very high influence” by both the non-rural and rural respondents in both NIS and CIS; (2) regional offices were rated to have “high influence on the associations;” (3) local government units (municipal and *barangay*) were rated to have “high influence;” (4) statutory bodies were rated to have “moderate influence” by the NIS and to have “no influence” or have “low influence” by the CIS respondents; (5) IP council of elders were rated to have “moderate influence” by the NIS and to have “low influence” by the CIS. Hence, for the respondents, national government agencies had the highest influence in the IAs, although the LGUs had high level of influence on them.

Regulation and accountability. Table 15 shows the respondents' rating on the effectiveness of regulatory mechanisms at the implementation stage. Overall, the regulatory

Table 15. Respondents’ rating on the effectiveness of the regulatory mechanisms at the implementation stage

FUNCTION	MEAN RATING	
	NIS	CIS
Legal regulations (both national and local regulations)	3.66 (E)	3.71 (E)
Administrative directions	3.96 (VE)	4.03 (VE)
Pollution control agencies	3.49 (E)	3.58 (E)
River boards/river councils	3.43 (E)	2.78 (ME)
Basin/watershed organizations	3.53 (E)	2.32 (LE)
Withdrawal restrictions (water rights, quota)	3.02 (ME)	3.16 (ME)
Limits on moving water across regions (surface water)	3.35 (E)	2.87 (VE)
Overall Rating	3.49 (E)	3.21 (E)

Interpretation:
2.00 & below Not effective (NE) 3.21 - 3.80 Effective (E)
2.01 - 2.60 Less effective (LE) 3.81 & over Very effective (VE)
2.61 - 3.20 Moderately effective (ME)

mechanisms were perceived to be effective by both NIS and CIS respondents. From the regulatory mechanisms, legal regulations and administrative directions were helpful to the NIS and CIS managers in the implementation stage.

In terms of administrative directions, regulatory mechanisms were recognized by both NIS (3.96) and CIS (4.03) managers as very effective. Regulation mechanisms of pollution control agencies were rated to be effective by both types of managers. Regulatory mechanisms of river boards/councils were rated effective by the NIS and moderately effective by the CIS respondents. The regulatory mechanism of the basin/watershed

organization was also rated effective by the NIS and less effective by the CIS. Withdrawal restriction mechanisms were rated as moderately effective by the respondents of both systems. The mechanism on moving water across areas was perceived to be effective by the NIS and very effective by the CIS.

As revealed in Table 16, the overall effectiveness of legal provisions of accountability in administrative operations was rated as effective by both NIS and CIS. Administrative supervision was perceived to be very effective by both types of irrigation systems. Most accountability provisions were rated higher by the CIS relative to the ratings of the NIS. It can be deduced; therefore, that from the legal provisions of accountability, the administrative supervision was appreciated the most in water organizations, especially by the CIS. Legal provision in financial auditing was appreciated, but not as much compared with administrative supervision. Also, NIS farmers may find work auditing to be less necessary in their organization compared with the CIS farmers. This was perhaps because the latter needed to work to pay NIA with the required maintenance fees even without some legal provisions. The very effective rating given to a grievance council by CIS farmers in both non-rural and rural provinces suggest that this body had been serving its function and/or it was needed by their organization. The very effective rating on monitoring procedure for water allocation by the CIS can have the same explanation. Legal provision on having meetings attended by heads of water organizations was perceived to be effective mostly by CIS managers. This may also suggest the need to have more of such meetings within their organization.

Summary Measures of Irrigation Water Governance

Three other items were asked from the respondents to summarize the water governance in their organizations. These were 1) the relevance of the existing water laws to the current water situation faced by the managers; 2) the linkage between water policy of the organization and the water law set by the

Table 16. Respondents' rating on effectiveness of legal provisions of accountability as translated administratively

ACCOUNTABILITY PROVISION	MEAN RATING	
	NIS	CIS
Administrative supervision	4.01 (VE)	3.98 (VE)
Financial auditing (public accounts committee)	3.72 (E)	3.66 (E)
Work auditing	3.63 (E)	3.91 (VE)
Grievance council	3.41 (E)	3.88 (VE)
Monitoring procedures for sectoral and regional water allocation	3.68 (E)	3.83 (VE)
Inter-ministerial committees (joint meeting of heads of different units within the water organization)	3.17 (ME)	3.51 (E)
Overall rating	3.60 (E)	3.80 (E)

Interpretation:

2.00 & below	Not effective (NE)	3.21 - 3.80	Effective (E)
2.01 - 2.60	Less effective (LE)	3.81 & over	Very effective (VE)
2.61 - 3.20	Moderately effective (ME)		

LGUs, if any; and 3) the adequacy of the administrative set-up to operationalize the water policy and water law. Water policy was limited to water pricing, while the water law was about water rights.

Results in Table 17 show that respondents in the CIS rated the relevance of the existing water laws to the current water situation in the locality higher than those in the NIS. However, respondents in the NIS rated the reflective nature of water policy regarding water law higher than the respondents in the CIS. They had similar ratings in the adequacy of the administrative set-up of the organization to operationalize the water law and water policy.

Table 17. Irrigation managers' rating on relevance of the existing laws to the current water situation, linkage between water policy and water law, and adequacy of administrative set-up to operationalize water policy and water law

INDICATOR	IRRIGATION SYSTEM		OVERALL MEAN RATINGS	PEARSON CHI- SQUARE (X ²)
	NIS	CIS		
Relevance of the existing water laws to the current water situation in the locality	3.70	4.00	3.90	0.021
Linkage between water policy of the organization and water law set by the LGU	3.90	3.76	3.83	0.005
Administrative set-up to operationalize water policy and water law	3.86	3.84	3.85	0.091

Note: Chi-square figures are not significant

Interpretation:	Relevance	Linkage	Administrative set-up
2.00 & below	Not relevant	Not reflective	Not adequate
2.01 - 2.60	Less relevant	Less reflective	Less adequate
2.61 - 3.20	Moderately relevant	Moderately reflective	Moderately adequate
3.21 - 3.80	Relevant	Reflective	Adequate
3.81 & over	Very relevant	Very reflective	Very adequate

This implies that the NIS still had the formal structure as an influence of the NIA. On the other hand, the CIS may be informal, but it was becoming more formal in operation, mimicking the character of the NIS. With the paradigm shift to participatory management of irrigation water, the NIS was also assuming the characteristics of informal management of the CIS.

CONCLUSIONS AND RECOMMENDATIONS

Irrigation water organizations were guided by various institutional processes in the pricing of water. They differed in the average amount charged (higher among NIS), in the bases of charging, and in the modes of collection. Pricing did not reflect the true value of water as shown by amounts that were set arbitrarily, and collections aimed at partial cost recovery or full cost recovery. Thus, it is recommended that NIA should revisit its water pricing policy.

Conflicts that occurred among water organization members were usually resolved at the organization level. These were mostly on the non-payment of dues, water scheduling, and water distribution. Collection of irrigation fees and organization dues remains to be a challenge to some IAs, which calls for designing mechanism to improve collection efficiency.

Water administration is concerned with the governance of the water organization. In this study, governance included its policy making body, how the members were compensated, their decisions and actions, trainings attended, functional capacity, and the level of influence of the government and other bodies. It also entailed the effectiveness of the regulatory mechanisms at the implementation stage; the effectiveness of legal provisions of accountability as translated administratively; the relevance of existing water laws to the current situation faced by the managers; the linkage between water policy of the organization and the water law set by LGUs; and adequacy of administrative set-up to operationalize the water policy on water pricing and water law (water rights).

The BODs of the organization, elected through the general assembly, was the highest policy making body in most of the national and communal irrigation systems. Their term of office was mostly from one to three years. On both NIS and CIS, more than half of the BODs served without compensation, while those with compensation were paid per month or per meeting. The average compensation per month of the NIS BODs was higher

(PhP497.00) than that of CIS (PhP359.00). Likewise, the average honorarium per meeting of the CIS and NIS were PhP329.41 and PhP192.86, respectively.

The issues discussed during BOD meetings were similar for both NIS and CIS such as management policy and operation and maintenance. Majority of the BODs of the NIS and CIS have attended trainings on leadership, production technologies, water management, cooperative management, bookkeeping, and financial management with a few training on strategic management and policy-making. The overall rating on the functional capacity of NIS and CIS managers was strong. Meanwhile, their research, training, and extension capability was moderately strong.

The level of influence of the national government such as NWRB, NIA, DA, DENR, and DILG was noted by both NIS and CIS managers as very high, while the influence of regional offices of the national government and local government units was high.

Overall, the regulatory mechanisms at the implementation stage were perceived to be effective by both NIS and CIS managers. Specifically, they rated administrative directions as very effective and withdrawal restrictions such as water rights and quota as moderately effective. Notably, regulatory mechanism on basin/watershed organizations was perceived as less effective by CIS managers.

The NIS and CIS managers noted that the overall legal provisions of accountability in administrative operations was effective. Particularly, they rated administrative supervision as very effective. In addition, for CIS-IA managers, work auditing, grievance cells and monitoring procedures for sectoral and regional water allocation were very effective legal provisions of accountability in administrative operations. On the other hand, the NIS managers perceived inter-ministerial committees as moderately effective.

For the water governance situation in irrigation systems, the IA managers perceived that the existing water laws were

very relevant to the current situation in their locality, the linkage between their organization's water policy and the water law set by the LGUs was very reflective, and the administrative set-up to operationalize water policy and water law was very adequate.

Although the overall rating on the functional capacity of IA managers in both NIS and CIS was strong, a significant number of the BODs have not undertaken any training courses. All members of the Board should undergo relevant training courses to capacitate them, particularly in research, training, and extension.

The effectiveness of regulatory mechanisms on water rights needs to be improved. Therefore, seminars or fora on water rights should be continuously conducted for the IA managers of both NIS and CIS.

Finally, the managers of the CIS rated the relevance of existing laws to the current water situation higher than the NIS managers. However, the NIS managers rated the reflective nature of water policy regarding water law higher than the CIS managers. They rated similarly the adequacy of the organization's administrative set-up to operationalize the water law and water policy. This implies that the NIS still has a formal structure as influenced by NIA, but it is assuming the characteristics of CIS management because of the paradigm shift to participatory irrigation management. The CIS, on the other hand, may remain to be an informal organization that is mimicking the character of the NIS, or may become more formal in operation.

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LITERATURE CITED

- Bucknall, J., Damania, R., & Rao, H. (2006). Good governance for good water management. Environment Matters. Washington, D.C.: The World Bank Group.
- Castro, V. (2004). Analysis of the water pricing policy in selected irrigator's associations of four provinces, Philippines. MS Field Study, University of the Philippines Los Baños, Laguna, Philippines.
- Chea, C., Nang, P., Whitehead, I., Hirsch, P., & Thompson, A. (2011). Decentralized governance of irrigation water in Cambodia: Matching principles to local realities. Working Paper Series No. 62. Phnom Penh, Cambodia: Cambodia's Leading Independent Development Policy Research Institute (CDRI).
- David, C. (1995). Philippine irrigation development: Overview, determinants, and policy issues. Discussion Paper Series No. 95-26. Manila, Philippines: Philippine Institute of Development Studies.
- Dayrit, H. (n.d.). The Philippines: Formulation of a National Water Vision. FAO publication. Retrieved from www.fao.org/docrep on April 30, 2015.
- Franks, T., Cleaver, F., Manganga, F., & Hall, K. (2013). Evolving outcomes of water governance arrangements: Smallholder irrigation on the Usangu Plains, Tanzania. Environment, Politics and Development Working Paper Series, Paper No. 62. Department of Geography, King's College, London.
- Frederick, K. D. (2006). Irrigation efficiency, a key issue: More crops per drop. In P. P. Rogers, M. Ramom Llamas, and L. Martinez-Cortina (Eds.). *Water Crisis: Myth or Reality?* London/Leiden/New York/Philadelphia/Singapore: Taylor and Francis.
- Frenkel, H. (1979). Assessment of water quality for irrigation. *ACTA Hort.* 89: 29-30.
- Gutierrez, N. (2013). Disappointed Aquino scolds NIA for poor performance. Retrieved from www.rappler.com/nation/32200-disappointed-aquino-scolds-nia-for-poor-performance on October 2, 2013.

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- Huppert, W. (2000). Governing irrigation service delivery in water scarce situations. *ICID Journal*, 49(1): 55-60.
- Inocencio, A., David, C., & Briones, R. (2014). A rapid appraisal of the irrigation program of the Philippine government. Manila, Philippines: Philippine Institute of Development Studies.
- Islam, M. S. & Shamsad, S. Z. K. M. (2009). Assessment of irrigation water quality of Bogra District in Bangladesh. *Bangladesh J. Agril. Res.* 34(4): 597-608.
- Jenkins, G. P., Pastor, Jr., L., Panuccio, T. (1994). Farmer participation, a key input to success: The Visayas Communal Irrigation Project. Development Discussion Paper No. 1994-07. Harvard Institute for International Development, Program on Investment Appraisal and Management.
- Jopillo, S. M. G. & de los Reyes, R.P. (1998). Partnership in irrigation: Farmers and government in agency-managed systems. Quezon City, Philippines: Institute of Philippine Culture, Ateneo de Manila University.
- Lauraya, F. M. & Sala, A. L. R. (1995). Performance determinants of irrigators associations in national irrigation systems in Bicol, The Philippines: Analysis. IIMI Country Paper, The Philippines No.4. Colombo, Sri Lanka: IIMI.
- Levidow, L., Zaccaria, D., Maia, R., Vivas, E., Todorovic, M., & Scardigno, A. (2014). Improving water-efficient irrigation: Prospects and difficulties of innovative practices. *Agricultural Water Management*. 146: 84-94.
- Molle, F., Mollinga, P. P., & Wester, P. (2009). Hydraulic bureaucracies and the hydraulic mission: Flows of water, flows of power. *Water Alternatives*, 2(3): 328-349.
- Oprecio, B. P. (2005). Participatory development and management: A cornerstone of Philippine irrigation program. Paper presented at the Tsukuba Asian Seminar on Agricultural Education, University of Tsukuba, Ibaraki Prefecture, Japan, November 8-14, 2005.
- Panella, T. (2004). Irrigation development and management reforms in the Philippines: Stakeholder interests and implementation. In P. P. Mollinga & A. Bolding (Eds.). *The Politics of Irrigation Reform: Contested Policy Formulation and Implementation in Asia, Africa and Latin America*. England: Ashgate Publishing Limited.

- Saleth, R. M. & Dinar, A. (2005). Water institutional reforms: Theory and practice. *Water Policy*, 7(2005): 1-19.
- Schneekloth, J.P., Bauder, A.T., & Hansen, N. (n.d.). Limited irrigation management: Principles and practices. Colorado State University Extension. Retrieved from <http://www.ext.colostate.edu/pubs/crops/04720.html> on December 7, 2014.
- Schneekloth, J. P., Norton, N. A., Clark, R. T., & Klocke, N. L. (2001). Irrigating for maximum economic return with limited water. NebGuide. Nebraska: University of Nebraska-Lincoln Extension, Institute of Agriculture and Natural Resources.
- Sijapati, S. & Prasad, K. C. (2014). Improving Governance in Nepal's Water Resources Sector Through Institutional Changes. Retrieved from publications.iwmi.org/pdf/H036480.pdf on October 4, 2014.

NOTES

¹The National Statistics Office of the Philippines has defined *barangay* as urban if “it (a) has a population size of 5,000 or more; (b) it has at least one establishment with a minimum of 100 employees; and (c) it has five or more establishments with a minimum of ten employees and five or more facilities within the 2-kilometer radius from the *barangay* hall”. Otherwise it is rural. However, the project devised an urbanizing community based on the urban classification scale. Thus, non-rural implies both urban and urbanizing.

²A third system is called private irrigation scheme (PIS), which was developed by private individuals. The PIS supplies water by pumping water along rivers. The scheme can serve up to 20 hectares of land. This scheme was not analyzed because of scarce data; only two respondents were PIS managers. Other small scale irrigation systems (SSIS), such as pumps are also used in the country as complement to the large irrigation systems.

Community Development Methods Toward Food Security: The System of Rice Intensification in Zumalai Subdistrict, Covalima, Timor-Leste

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ABSTRACT. The study was conducted in Zumalai subdistrict, Covalima in Timor-Leste to analyze the contribution of the System of Rice Intensification (SRI) program. The program was implemented through community development methods, namely: community education, community organizing, and community resource management to achieve rice security. Using the Slovin's formula, 24 farmer-groups from Raimea village and 17 from Tashilin village were selected through draw lot sampling. From each farmer-group, five members were randomly chosen to comprise 205 respondents to participate in the household survey. Data were analyzed through descriptive and inferential statistics.

The findings revealed that majority of the respondents attended various components of the SRI training. The purposes for joining the SRI group included having access to government facilities and incentives, exchanging experiences, sharing resources and labor among members, and working together. The SRI practices were able to secure the communities' environment and maximize the utilization of local resources. The program, which could be sustained with the existing resources in the study sites, could increase rice production. With the increase in rice production, most farmer-respondents did not experience rice shortage after their involvement in the SRI program. Rice production had been sufficient to feed their families all year round.

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The correlation analysis using the Pearson Chi-square test showed that rice security, measured in terms of indicators of rice availability, rice accessibility, and rice utilization, was significantly correlated with some indicators of the community development methods. Some mechanisms to sustain SRI as a community development strategy are recommended.

Keywords: *community development methods, food security, System of Rice Intensification (SRI)*

INTRODUCTION

Timor-Leste is mainly an agriculture-based economy with more than 80 percent of the population engaged in agriculture as their primary occupation. Despite this, the share of agricultural sector accounts for about 25 percent only of the country's gross domestic product (GDP). This is largely because agriculture in Timor-Leste is primarily traditional and based on subsistence cropping. Farming mostly involves shifting cultivation in shallow soils, which is usually the characteristic of the country's terrain (UNWFP, 2005).

The negative impact of harmful practices and ways of thinking, coupled with external factors, such as droughts and floods, poor market access and increasing prices, and lack of agricultural inputs, greatly influence household incomes. The result is that harvests only meet household consumption needs for around 7–8 months each year (Viegas, 2001).

The traditional farming system in Timor-Leste has resulted to food security problems. This includes a history of crisis and dislocation, environmental degradation, disrupted land tenure and farm practices, severe seasonal weather fluctuations, and a pattern of food import dependence. The most critical period of food availability and normal period of hunger is usually 2–4 months within a year in an average farming household. The macro-deficit in production reflects that the household's produce

sustains its food needs only for eight months a year. Productivity is low as a result of subsistence farming. Natural disasters are recurrent in most parts of the country, thereby affecting the three dimensions of food security (UNWFP, 2005).

The above mentioned food security problems led the Timor-Leste government to set goals geared towards achieving food security. The government is enhancing the production of diverse staple foods and restoring household and village crop storage facilities. In addition, the government is improving the production of niche crops and animals, promoting internal markets and alternative income generation, providing cash income for subsistence communities, and improving swidden farming system in the uplands to improve livelihoods and reduce environmental degradation (Viegas, 2001).

Rice is the preferred staple food of the East-Timorese. The local demand is at 90 kg per capita, which amounts to 77,200 tons annually (MAFF, 2008). The local production was estimated to be 27,000 tons of milled rice (FAO, 2003), equivalent to 45,000 tons of paddy at 60 percent milling efficiency. The shortage of about 50,000 tons plus the estimated need for cross-substitution for other staple food is being filled with rice imports, with government spending of US \$58.5 M annually (MAFF, 2008).

To increase rice production and address food security problems, the Ministry of Agriculture, Fisheries and Forestry (MAFF) endorsed the Gesellschaft für Technische Zusammenarbeit (GTZ)-funded system of rice intensification (SRI) in 2007. The SRI is one of the strategies to attain sustainable growth in agriculture through intensive and extensive cropping in Timor-Leste's Covalima and Bobonaro districts.

Within two years, the number of farmers practicing elements of the SRI increased from around 50 to almost 1,300. The average yield increased from about 3 tons/ha to around 5 tons/ha (around 60%). In 2008, the total rice production area covered 5,004 ha in the Bobonaro district and 4,015 ha in the Covalima district (MAFF, 2008). In terms of percentage to national rice production, the Bobonaro and Covalima districts are the first

and fifth most important districts of all 13 districts of Timor-Leste with about 21 percent (5.67 tons) and 10 percent (2.70 tons) of the harvest, respectively (MAFF, 2008).

Thus, it is believed that one of the effective means to address food security problem and to increase rice production in Timor-Leste is to introduce new agriculture innovations through community development approach. Community development (CD) as an approach highlights community education, community organizing, and community resource management methods in addressing problems in the community such as poverty and low agriculture productivity (Luna, Ferrer, Tan, & Bawagan, 2004). The primary outcome of community development is improved quality of life. Effective community development results in mutual benefit and shared responsibility among the community members. It recognizes the connection between the social, cultural, environmental and economic matters, the diversity of interest within a community and its relationship to building capacity (Frank and Smith, 1999).

Low production in the country is attributed to subsistence agriculture, thereby affecting food security, household income, and environmental degradation. In this context, community development methods are urgently needed to address the pressing issue on food security.

Objectives of the Study

The general objective of this study was to analyze the contribution of the SRI program through community development methods to achieve rice security in the Zumalai subdistrict. Specifically, it aimed to:

1. Describe the SRI implementation in the Zumalai subdistrict;
2. Describe the socio-demographic characteristics of the SRI program participants;
3. Discuss the community development methods of the SRI;

4. Determine the rice security situation in the Zumalai subdistrict;
5. Analyze the effects of SRI community development methods on rice security in the Zumalai subdistrict; and
6. Recommend sustainability mechanisms for SRI as a community development strategy.

Conceptual Framework of the Study

Community development methods include, among others, community education, community organizing, and community resource management (Luna et al., 2004).

Community education is concerned with the enhancement of people's potentials and capability. It enables them to translate their consciousness into operational and effective actions. They have to be equipped with the necessary skills for community work such as community organizing, education and mobilization, human relations and communication, conflict resolution, planning, and management of community resources. Under the SRI program, community education was implemented by the GTZ, Department of Agriculture-Ministry of Agriculture, Fisheries and Forestry (DA-MAFF), and program partners. The implementers conducted various intensive trainings, plot demonstration, formal education of extension workers, and cross-site visits to familiarize and enhance farmers' capacity. The indicators that were measured included attendance to SRI training before and after program involvement, participation in cross-site visits, and sharing of knowledge and skills.

Meanwhile, community organizing refers to the activities aimed at grouping people to struggle for their common needs and aspirations in a given locality. In the context of SRI, community organizing involves mobilization of farmers into groups brought about by their individual interest on the new and alternative technology initiated by the GTZ and MAFF. The establishment of the farmers' organization enables individual households to accommodate one another's needs. It also increases their

access to and sharing of the service systems or incentives of the Department of Agriculture and program partners. Some of the variables included the following: purpose in joining the SRI group, advantages in joining the SRI group, awareness of the group's weaknesses and needs, stability of the group, accommodation of ideas and suggestions, and active participation of the farmers.

Community resource management includes the acquisition, generation, production, development and conservation, protection, and rehabilitation of community resources (Luna, 2009). In the context of the SRI, this was done by GTZ and MAFF to identify possible local resources, which the community can utilize, access, and share in order to develop SRI projects. The indicators for this variable included the following: maximization of forest resources, organization of SRI program, sustainability of SRI methods, conflict resolution, and awareness of issues on resource utilization.

With regard to the financial aspect, the SRI program received package grants from the GTZ and the Second Rural Development Project (RDP II) during its five years (2007–2012) of implementation. Institutionally, it is being implemented by the DA-MAFF and program partners. Meanwhile, its technical implementation is being adjusted according to resource availability and on the farmers' capacity and capability.

Based on the conceptual framework (Figure 1), this study was a step towards conceptualization of community development methods used in the implementation of the SRI as an innovative strategy to contribute to rice security in the study areas. These three CD methods work together to bring about the following: organized groupings of farmer-participants, capacity development among the SRI participants, and management of local resources as inputs into the SRI program.

On the other hand, institutions, organizations, and technical and financial support are considered components of the support system. These contribute to the adoption and implementation of the SRI through community development strategies.

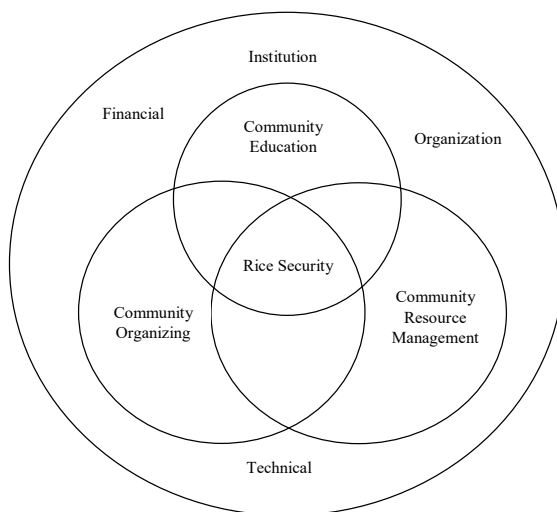


Figure 1. Conceptual framework of the study

Rice security, which is at the center of the interacting circles, was measured in terms of rice availability. The indicators of the latter were occurrence of rice shortage before joining the SRI program, sufficiency of rice production since their involvement with SRI, experience of rice shortage with SRI, and sufficiency of rice stock.

Another component of rice security is rice accessibility, which refers to the respondents' access to rice. This was measured in terms of concurrence with price of rice, whether the respondents considered the price of rice either high, low, or just enough; access to rice; and rice shortage remedy.

Lastly, rice utilization refers to the respondents' use of rice as a primary food staple, sale of rice as a source of family income, number of meals taken per day, and sufficiency of rice for family consumption.

METHODOLOGY

The study was conducted in Zumalai subdistrict consisting of two villages, namely: Raimea and Tashilin. The two study villages were chosen based on the following characteristics: 1) they are located in lowland agricultural areas, 2) rice production is their primary source of income, and 3) they were selected by MAFF and GTZ as SRI pilot sites since 2007 when the SRI was first implemented. The program ran from 2007 to 2012.

The study used multi-stage sampling wherein the two villages were chosen based on the aforementioned criteria. The sample groups from the Raimea village and Tashilin village, which were composed of 32 and 20 groups, respectively, were determined using the Slovin's formula. From each farmer-group, five members were randomly selected to serve as the respondents of the study. Based on the calculation, there were 120 respondents from the Raimea village and 85 from the Tashilin village, or a total of 205 respondents from the two villages.

Primary and secondary data were collected. Primary data were gathered through interview of farmers involved in the SRI program using a structured research instrument. The research instrument for the individual farmer-survey was pre-tested and revised accordingly to generate accurate data for the study. The research instrument was translated into Tetum, which is the local language in the villages to facilitate the interview process.

The study also used key informant interviews (KIIs) and focus group discussions (FGD) to validate the household data. KIIs were done with community leaders, extension workers, and key officials of the Department of Agriculture, program partners, and donors. On the other hand, an FGD was conducted among 8–10 farmer-leaders in each village as well as some members who did not serve as respondents in the individual survey.

Secondary data were gathered from institutions such as the donor agencies, program partners, and MAFF. These secondary sources included annual reports, program evaluation reports, official records, research papers, among others.

The results were analyzed using descriptive and inferential statistics. Descriptive statistics included frequency counts, percentages, mean, and range of data obtained. The effect of the SRI program on rice security was determined using non-parametric Pearson Chi-square test (test of independence) given that variables observed were categorical. The community development methods and other SRI selected variables that might have effect on rice security (dependent variable) served as the independent variables. The alpha of 0.05 was employed for reliability of statistical test.

RESULTS AND DISCUSSION

SRI Implementation in the Zumalai Subdistrict

Technical practices and rice production. Of the 205 respondents, 84 (41%) have been involved in the SRI program for three years and 30 (15%) have been involved for six years. Nevertheless, only 21 percent have applied the complete SRI package in their farms. The majority (79%) who only adopted the basic or main components of SRI cited the difficulty in applying the full technology. They said that they needed to focus and devote much time to adopt all the components.

Despite the constraints mentioned, majority (98%) of the respondents were willing to adopt all the SRI components (Appendix 1). Almost all (99%) believed that the SRI methods could increase rice yields. Based on the given estimates, applying SRI methods could increase rice production up to 3 percent as compared with traditional practices or any other methods. With the use of SRI methods, majority (78%) believed that yield could fall within the range of 2–4 tons/ha or at an average of 3.31 tons/ha, ranging from 1.5 to 5.5 tons/ha. In fact, two respondents estimated that yield could go up to 7 tons/ha. The traditional practices could only yield an average yield of 0.83 ton/ha ranging from 0.50 to 1.00 ton/ha. More than half (55%) of the respondents estimated having yield above the average from traditional rice production. Timor-Leste's average yield is about 3 tons/ha as reported by MAFF in 2009 (Deichert, 2007).

Components of SRI Implementation. The MAFF recommended seven components to be introduced to the farmer-participants. These included seed selection, nursery management, transplanting age, distance of transplanting, water management, weed control, and soil nutrient.

Findings show that majority of the farmers did not practice all the recommended components. As they were shifting from traditional practices to a new and unfamiliar system, they decided on what components to adopt only based on their own practices and experiences. However, more farmers are expected to adopt the complete technology package. The technology assures them of rice supply so that they will not experience shortages just like before the introduction of SRI in their village.

Community response to the SRI Program. The introduction of SRI methods in Zumalai subdistrict is transforming the farmers' knowledge, skills, attitude, and practices. They are undergoing the four phases of change and adoption mentioned by Mchombu (2004), namely: awareness, interest, examination and testing, and adoption/rejection.

As an innovation, farmers assumed that the SRI program would always provide them free access to the facilities even if they were not seriously involved in the activities. But only a few farmers agreed that there were times when the government had to look into their problems and respond positively to their practices. The farmers also needed more information to raise their awareness about the SRI technologies and to compare the benefits over their traditional practices.

Perceptions about the SRI practices compared with other methods. Two practices in Timor-Leste can be compared with the SRI methods, namely: the traditional practices and the integrated crop management (ICM), which was introduced lately at the eastern part of Timor-Leste.

The use of traditional practices such as the use of cow or carabao for land preparation and seed sowing yielded low produce of about 0.4–1 ton/ha. In contrast, ICM requires more

inputs such as chemical fertilizer to maximize production. On the other hand, the SRI technology uses organic fertilizer, which is readily available and can be produced by the farmers.

Difficulties encountered with program implementation. The program's concern was more on its sustainability. Many of the farmers did not really perceive it as assistance to address their needs and problems. Rather, its components were perceived as 'freebies' from the government and program partners; hence, they did not really participate fully in the activities.

Another difficulty was the farmers' attitudes and behavior. The farmers did not develop a sense of ownership of the SRI program. This was because most of the decisions have been made by the funding agency and MAFF. The farmers were mainly asked to fulfill project requirements, accept, and adjust themselves to be part of the program whether they needed the specific projects or not. Engendering a sense of ownership and sustainability was addressed through community development methods.

Profile of the Respondents

Socio-demographic characteristics of the respondents.

Majority (60%) of the respondents were from 40 to 59 years old, male, and married with an average number of four children. One-fourth (25%) of the respondents were elementary undergraduate. Almost half (46%) of them have lived in the area for more than 20 years. They have been involved with the SRI program from three to six years with an average of four years. Majority (72%) of the respondents were members of the SRI group, while the rest (28%) were officers who held positions as chief of the group, vice-chief, secretary, and treasurer. The total members in the group under the SRI program varies. Majority (66%) said that they had 10 members, while the rest (34%) said there were more than 10 members.

Natural resources of the study sites. Two rainfall peaks in the study areas appear between December and March and between May and July. Almost all (99%) of the respondents

answered that there are rivers near their village. The two main rivers in between the two villages are Lo'omea and Mota Mola. These rivers serve as the main source of irrigation water supporting the rice fields in the study area. About 89 percent of the respondents said that the irrigation system was built by the government, while 11 percent said that NGOs built the irrigation system to support the SRI program. Before the presence of the SRI program in both study sites, there was no irrigation system available although the locality has two rivers. Meanwhile, majority (79%) of the respondents regarded the soil condition as fertile.

Agriculture-related information. Appendix 2 shows that majority (78%) of the respondents had their own land for rice cultivation, and only 22 percent were landless. Accordingly, majority (94%) of the landless used their family land, 4 percent were into shared income through public land/tribe, and only 2 percent cited renting land to cultivate rice.

For the SRI participants, almost all (99%) of them devoted 0.01–1.0 ha of land to the SRI program, while only one percent planted on 1.01–2.0 ha. Majority of the SRI participants planted rice twice a year. Likewise, majority (65%) of the non-SRI participants planted also on 0.01–1.0 ha (Appendix 2). Data show that although the SRI was already introduced to the farmers, they still practiced their traditional way of planting rice. They used the small area planted to rice under the SRI program for practice and to gain more experience and familiarity with the new model and technology.

All the lands were used, according to majority (72%) of the respondents (Table 1). However, 28 percent of them said that they did not use all of their land for the program for different reasons. Half of them (50%) pointed out that their present area was already enough to produce rice for their family's consumption. About 15 percent said that they shared the land with their relatives for the planting of rice. The rest (35%) revealed that they did not have sufficient time and labor to cultivate all their lands.

Table 1. Agriculture-related information of Tashilin and Raimea villages

AGRICULTURE-RELATED INFORMATION	TASHILIN (n=85)		RAIMEA (n=120)		TOTAL (n=205)	
	No.	%	No.	%	No.	%
Have used all land for rice farming						
Yes	68	33.2	79	38.5	147	71.7
No	17	8.3	41	20.0	58	28.3
Reason for unused land for rice farming						
Enough area for rice	6	10.3	23	39.7	29	50.0
Shared with relatives	6	10.3	3	5.2	9	15.5
Labor is insufficient	2	3.4	8	10.3	10	17.2
Not enough labor to use and share to relatives	3	5.2	5	8.6	8	13.8
Not enough manpower and time	0	0.0	2	3.4	2	3.4
Planted other crop aside from rice						
Yes	11	5.4	17	8.3	28	13.7
No	74	36.1	103	50.2	177	86.3
Raised livestock						
Yes	15	7.3	27	13.2	42	20.5
No	70	34.2	93	45.4	163	79.5

Aside from rice, only about 14 percent of the respondents planted other crops such as corn, vegetables, and cassava. Majority (86%) of them planted rice only for home consumption. A few (20%) of them raised livestock such as swine, cow, and buffalos to augment household savings (Table 1).

Community Development Methods

Community organizing. The community organizing approach was top-down, but by enhancing farmers' participation, the latter's awareness and sense of ownership of the SRI program increased. Under the SRI, the formation of farmers' groups enabled the extension workers to monitor farmers' activities, to help them share facilities provided by the Department of Agriculture, and to assist them in influencing and learning from each other (i.e., aside from labor sharing). The farmers became empowered; hence, enabling the sustainability of the program with minimal assistance from the government.

The process of community organizing mentioned above was quite different from what Luna (2009) calls community organizing. Luna refers to activities aimed at grouping people to struggle for their common needs and aspirations in a given locality. Community organizing involves the following activities: integration with the community, social investigation, problem/issue spotting, ground work, meeting, role playing, mobilization, evaluation, reflection, and setting up of the organization.

The major reason for joining the SRI group was to have access to government facilities and incentives. Table 2 shows that of the 549 responses, 44 percent cited "sharing of experiences, resources, and labor among members, and working together" as an advantage of joining the SRI group. About 27 percent cited "access to government incentives and the sharing of government facilities, materials, or equipment," while, 18 percent cited "increased rice production and land use." Furthermore, 7 percent cited "improved skills and knowledge, learned new model, technology, system, skills, knowledge, or innovation."

Majority (81%) of the farmers were aware of their group's future needs, i.e., to achieve group development or be self-organized and learn more about the SRI components. They also cited that their group could be sustained in the future based on the identified advantages of the SRI technology and their needs.

Table 2. Respondents' perceived advantages of joining SRI group

PERCEIVED ADVANTAGE OF JOINING SRI GROUP	TASHILIN (n = 85)		RAIMEA (n = 120)		TOTAL (n = 205)	
	No.	%	No.	%	No.	%
Awareness of the advantages of joining SRI						
Yes	85	41.5	119	58.0	204	99.5
No	0	0.0	1	0.5	1	0.5
Advantages of joining SRI group						
Sharing experiences/ resources/labor/skills/ knowledge among members; working together	115	21.0	135	24.6	250	44.5
Increased rice production; increased land use	39	7.1	60	10.9	99	18.0
Incentives; sharing/free access to government facilities, materials, incentives, equipment; government support	52	9.5	97	17.7	149	27.1
Improved skills and knowledge; learning new model/technology/system/ skills/knowledge/ innovation	14	2.6	22	4.0	36	6.6
Maximized use of local resources	5	0.9	0	0.0	5	0.9
Increased/improved capacity	9	1.6	1	0.2	10	1.8

Community education. Community education methods were applied to introduce SRI techniques to the farmers after they have formed into groups. There were three main components of community education, namely: training on SRI elements, cross-site visits, and plot demonstrations.

Training activities focused on the seven SRI components as recommended by the MAFF. These components were divided into two parts, namely; 1) basic components, which involved seed selection, nursery management, age of seedlings, and distance of transplanting; and 2) water control, weed control, and soil nutrients.

Following the training activities, the farmers were allowed to practice directly in a communal demonstration farm assisted by an extension worker. Furthermore, farmers were encouraged to have their own plots measuring 0.5 ha so that they could be familiarized with SRI techniques, generate data, and compare among treatments.

Cross-site visits were conducted so that farmers could learn from different SRI groups that were more advanced in adoption. Most of the cross-site visits happened in the Bobonaro district. These were intended to groups that were not well-developed so that it would stimulate their practices and gain more experiences.

Table 3 shows that almost all (99%) of the respondents attended various components of the SRI training. However, majority (64%) of them still needed trainings related to SRI components. As part of community education, some of the respondents attended cross-site visits to the Bobonaro district for one (27%) to two (60%) weeks.

Majority (92%) preferred skills and knowledge on all components of the SRI that may be useful in improving their rice production in the future. Majority (92%) of them also shared these skills and knowledge among the members and non-members of SRI groups. Nevertheless, they felt that they still needed outside trainers as it was rather difficult to generate local trainers. Almost a third (34%) of them said that they needed a trainer to improve

Table 3. Trainings attended of the respondents since involvement in SRI

TRAINING	NO. OF TIMES ATTENDED			CROSS-SITE VISIT			LEVEL		SPONSOR	
	1	2	6	1 week	2 weeks	Basic	Advanced	GO	NGO	Both
Full package (seed selection, nursery management, transplanting, distance of transplant, water control, weed control, soil nutrient)	115			13	106	119	2	104	0	22
Basic package (seed selection, nursery management, transplanting, distance)	27			21	5	27		26	0	1
Combination of any of the components	35	3		18	8	36	2	26	2	7
Any of the individual components	34	8		4	4	36	6	32	2	11
Total	211	17		56	123	218	10	188	4	41

Note: Multiple responses

their skills and knowledge, and assist group needs; enhance their ability; and to learn more. A total of 18 percent said that they needed more trainings on SRI and other related topics; 16 percent wanted to assist/facilitate group needs; and 15 percent wanted to be familiar with all SRI components and other relevant trainings.

Community resource management. The SRI sites were identified by MAFF based on the area’s local resources and socio-economic conditions. These resources included abandoned lands that could be suitable for planting rice even without irrigation systems. These had many local materials for composting to maintain land fertility as well as plants that could produce herbal pesticides for pest control.

The respondents cited that the SRI program could maximize the utilization of local resources (98%) (Appendix 3); that it was well organized to secure the communities’ environment (98%); and that it could be sustained with the existing resources (99%) (Table 4).

Table 4. Respondents’ perception on SRI program’s capacity to secure environmental sustainability

PERCEPTION ON SRI PROGRAM	TASHILIN (n=85)		RAIMEA (n=120)		TOTAL (n=205)	
	No.	%	No.	%	No.	%
SRI project organized?						
Yes	83	40.5	119	58.0	202	98.5
No	2	0.9	1	0.5	3	1.5
SRI method sustainable with existing resources?						
Yes	84	41.0	120	58.5	204	99.5
No	1	0.5	0	0.0	1	0.5

Since all local resources were available to supply the farmers' needs, they no longer need to invest much to achieve rice security. In this case, the SRI methods were considered locally-based innovations that could enhance the utilization of local resources. The methods required low inputs and were environment-friendly to ensure sustainability and attain maximum outputs. Hence, the technology enabled farmers to survive and empowered them in many ways.

Rice Security in Zumalai Subdistrict

Main issues of rice security in Timor-Leste. The national rice demand in Timor-Leste is increasing as rice is the primary staple food in the country. Domestic production is not sufficient and natural disaster, such as drought and floods, cause harvest failure. Other factors of rice insecurity include the practice of traditional farming that leads to low outputs. In the absence of alternative technology to intensify production, traditional farming had been considered to be the best strategy. Also lacking were agricultural facilities and infrastructure to support rice farming that limit the maximum utilization of local resources as well as potential lands for planting of rice.

To address the issues on rice security, MAFF adopted in 2002 two strategies (short-term and long-term) in cooperation with the Ministry of Tourism, Commerce and Industry (MTCI). First, the MTCI was responsible for food aid through rice import to meet the gap of domestic demands. The MTCI provided rice to the villages at the lowest price at US \$13.00 per sack (0.34 USD/kg). Second, MAFF was responsible for seeking new innovations to be introduced and for building infrastructure to support long-term planning to improve domestic rice production and to achieve sustainable agricultural growth.

The MAFF, in cooperation with GTZ, introduced ICM at the eastern part of Timor-Leste in 2002-2007 as one of their strategies. Later, the SRI was endorsed in the western part in 2007

up to the present. With the SRI program, there was a comparative model with ICM. The SRI model included innovative technologies to increase paddy production area as well as rice productivity in order to limit rice importation.

Rice availability. More than half (52%) of the respondents professed that they have experienced hunger or rice shortage before joining the SRI program. With the introduction of SRI in both villages, majority (73%) stressed that rice production had been sufficient since their involvement with the program. As a result of the increased rice production, majority (71%) did not experience rice shortage after their involvement in the SRI program, although about a third (29%) still experienced it one to three times a year. Among the reasons cited for insufficiency of rice were many members of the family to feed (44%) and low volume of production (26%). Other reasons included not enough land to plant rice, occurrence of diseases, effect of climate change on production, and insufficient labor.

Majority (87%) of the rice farmers estimated that their current stock of rice would last for a year, and only some (13%) estimated otherwise. They expected their stock to last for an average of 9.92 months ranging from 9.00 to 10.50 months. Meanwhile, more than half (56%) of the respondents presumed that their stocks would last for 10 months.

Rice accessibility. In the Zumalai subdistrict, the average price of rice was US \$0.25 per kilogram. Whenever there was a shortage, almost half (49%) of the respondents would buy rice in the market and/or borrow from their relatives. According to the majority (88%), rice was their staple food. In the absence of rice, the respondents preferred corn as an alternate staple food.

Despite the rice shortage being experienced by some, all the respondents had access to rice during shortage. Those who experienced rice shortage bought rice from the market and borrowed from relatives (49%), or they simply borrowed from their relatives (44%). Majority (65%) of those who bought

rice in the market during shortage borrowed money from their relatives and co-group members. Others (15%) resorted to selling of livestock and availing of credit, while some (5%) well-to-do farmers used their savings.

Rice utilization. In both Tashilin and Raimea, majority (88%) of the households ate two meals per day. Almost all (99%) of the respondents considered that rice was enough for their family's consumption, with an average of 0.76 kg/day. Two-thirds (69%) fell within the low consumption of 0.01–0.76 kg/day, while the remaining one-third (31%) fell within the high consumption range of 0.77–3.00 kg/day.

Contribution of SRI Program to Rice Security

Generally, the project sites achieved rice security when the SRI program was introduced. One of the indicators was the increase in yield, which averaged 3 percent as compared with the yield obtained using traditional farming practices. Many farmers no longer experience rice shortage. However, there were still some farmers who did because of poor stock rice management. Rice shortage was somehow unavoidable because many ceremonies were held during the summer season requiring more finances and food. Rice was the main source of household income. The farmers had to sell their rice to get cash for these ceremonies and for other needs, such as school fees, school uniforms, and others.

Increase in rice production can make rice more available and accessible to farmers. However, it is not enough to say that farmers are free from hunger because of the issue on food management. Ironically, some farmers sold their rice before harvest time at a low price based on their estimate that production would last more than enough for their home consumption. The estimate can be wrong if there are changes in the weather or occurrence of diseases. To avoid rice shortage at the household level, the farmers should be able to manage rice stock based on their daily calculation of household consumption.

Effects of SRI Program on Rice Security in Zumalai Subdistrict

Relationship between CD methods and rice availability.

The community development strategies for community education included attendance to SRI trainings before involvement in the program, attendance to SRI trainings after involvement in the program, attendance to SRI formal education, participation in cross-site visit, and sharing of knowledge and skills. For community organizing, the indicators included awareness on the following: purpose of joining the SRI group, advantages of joining the SRI group, group's weaknesses, and group needs. On the other hand, group sustainability indicators included accommodation of ideas/suggestions and active participation. The community resource management cut across maximization of local resources, organization of SRI program, sustainability of SRI methods, conflict management, and awareness of issues on resource utilization.

Meanwhile, the rice security variables, particularly for rice availability, included rice shortage before involvement in SRI, sufficiency of rice production since involvement in the SRI, sufficiency level of rice production, rice shortage during SRI involvement, and sufficiency of rice stock. In terms of rice accessibility, factors included concurrence with the price of rice, access to rice during shortage, rice shortage remedy, and source of money to purchase rice. For rice utilization, the indicators included whether rice was a primary staple food, selling of rice, number of meals taken per day, and sufficiency of rice for family consumption.

This study found no significant correlation between community development methods and sufficiency level of rice production (SLRP) and sufficiency of rice stock (SSR). It can be argued that many farmers avoided rice shortage through their own efforts. Second, having experienced hunger before their involvement in the SRI program, farmers responded by getting involved in the SRI program, which provided free incentives to increase rice production.

Table 5. Relationship between community development methods and rice availability

COMMUNITY DEVELOPMENT METHOD VARIABLE	RICE AVAILABILITY (p-value)		
	RSB	SRP	SR
Community education			
Attendance in cross-site visit	0.032*	ns	ns
Community organizing			
Group sustainability	0.004**	ns	ns
Community resource management			
Awareness of issues on resource utilization	ns	0.049*	0.025*

Legend: RSB: Rice shortage before joining SRI, SRP: Sufficiency of rice production since involvement in SRI, SR: Rice shortage with SRI, ns: not significant

*Moderately significant at $P<0.05$, ** Strongly significant at $P<0.001$

All p-values above 0.05 level are not significant and these are not included in the table.

Meanwhile, four variables were found to be significantly correlated with some community development method indicators. Experience of rice shortage before joining the SRI program (RSB) was moderately correlated with participation in cross-site visit ($p=0.032$) under community education, and highly correlated with group sustainability ($p=0.004$) under community organizing (Table 5). Members who did not experience rice shortage were more likely not to participate in cross-site visits as compared with those who experienced rice shortage. In like manner, members who did not experience rice shortage were more resolute in believing that their group could be sustainable by applying SRI methods in the future to avoid rice shortage.

The other rice availability variables, which were moderately correlated with community resource management indicator, specifically awareness of issues on resource utilization, were sufficiency of rice production since involvement with the

SRI program ($p=0.049$) and rice shortage with SRI ($p=0.025$). The respondents who were aware of the issues on resource utilization were more likely to have sufficient rice production since their involvement in the SRI program and will not experience rice shortage.

The findings are consistent with what was mentioned by Luna et al. (2004) — that exposure or field visit is one of the community education methods considered as more appropriate as compared with lectures and theoretical discussions. Field visits serve as avenues for participants to observe first-hand experiences of other organizations and to discuss with them about their observations.

As for the sustainability of the group, it can be argued that experiencing hunger/food shortage and the advantages of belonging to a group can have positive impact in addressing immediate needs. It takes into account future group sustainability and self-organization. The finding corroborates the results of Jones and Yogo's study (Sharma, 2000) that self-organizing capability of communities is crucial when utilizing the support from external sources. It is sometimes referred to as social resource, the community's self-organizing capability as the product of accumulated experiences in society over time. These experiences are reproduced in the community in the form of self-organization that may provide, for instance, the mechanism for receiving government assistance. Such organizing gives people the experience of working together towards a common goal. Effects of collective experiences accumulated over time provide the base for future organized activities.

Relationship between CD methods and rice accessibility. Access to rice (AR) and source of money to buy during shortage (SM) were not correlated with any of the indicators of the CD methods. This implies that access to rice during rice shortage depended upon the capacity of the farmers to substitute rice with other foods or to reduce the quantity of household consumption.

Table 6. Relationship between community development methods and rice access

COMMUNITY DEVELOPMENT METHOD VARIABLE	RICE ACCESS (p-value)	
	CPR	RSR
Community education		
Attendance to SRI training since involvement in the project	ns	0.039*
Attendance to cross-site visit	0.002**	ns
Sharing of knowledge and skills	ns	0.010*
Community organizing		
Awareness of group's weaknesses	ns	0.024*
Accommodation of ideas/ suggestions	ns	0.010*
Active participation	ns	0.015*

Legend: CPR: Concurrence with price of rice, RSR: Rice shortage remedy,
ns: not significant

*Moderately significant at $P < 0.05$, ** Strongly significant at $P < 0.001$

All p-values above 0.05 level are not significant and these are not included in the table.

Meanwhile, the respondents' concurrence with the prevailing price of rice in the market was highly correlated with the attendance in cross-site visit as a community education indicator ($p=0.002$) (Table 6). Members who were able to join the cross-site visits were more likely to consider that the current price of rice in the market was just enough, while those who were not able to join either considered the price as low or just enough. During the cross-site visit, farmers were able to know and compare the price of rice to be accessed especially during rice shortage.

The other rice access indicator which was correlated with CD methods was rice shortage remedy (RSR). This was found to be moderately correlated with various CD variables such as attendance to SRI training ($p=0.039$), sharing of knowledge and skills ($p=0.010$), awareness of group's weaknesses ($p=0.024$),

accommodation of ideas and suggestions ($p=0.010$), and active participation in group activities ($p=0.015$) (Table 6). Those who attended the SRI training were willing to share their knowledge and skills to non-members, knew their group's weaknesses, and were actively involved in every group activity.

The community resource management method, as measured by the different indicators, was not correlated with rice access. While community resource management did not directly influence access to rice, the proper use and management of local resources enhanced the increase in rice production.

Relationship between CD methods and rice utilization.

Among the rice utilization variables, sufficiency of rice for family consumption (SRC) was not correlated with any of the indicators of CD methods. This implies that farmers' experiences and knowledge on rice utilization were already sufficient. Only rice as primary food ($p=0.040$), selling of rice ($p=0.046$), and number of meals per day ($p=0.037$) were moderately correlated with accommodation of ideas and suggestions. In addition, number of meals per day was also moderately correlated with awareness of purpose in joining SRI group ($p=0.041$) and conflict resolution ($p = 0.027$) (Table 7). This implies that the management of rice was essential in enhancing the utilization of rice by the family.

The result of the correlation analysis using the Chi-Square test of independence revealed that the three variables of rice availability were correlated with indicators of CD methods, i.e., rice shortage before joining the SRI program with attendance to cross-site visit and awareness of issues on resource utilization; and sufficiency of rice production since involvement in SRI and rice shortage with awareness of issues on resource utilization.

Among the rice access variables, concurrence with prevailing price of rice in the market was correlated with attendance to cross-site visit. Meanwhile, remedy during shortage was correlated with SRI training since involvement in the program, sharing of knowledge and skills, awareness of group's weaknesses, accommodation of idea/s and suggestions, and

**Table 7. Relationship between community development methods
and rice utilization**

COMMUNITY DEVELOPMENT METHOD VARIABLE	RICE AVAILABILITY (p-value)		
	PF	SR	NM
Community organizing			
Awareness of purpose in joining SRI group	ns	ns	0.041*
Accommodation of ideas/ suggestions	0.040*	0.046*	0.037*
Community resource management			
Conflict resolution	ns	ns	0.027*

Legend: PF: Rice as a primary food, SR: Sell rice, NM: Number of meals per day,
ns: not significant

*Moderately significant at $P < 0.05$

All p-values above 0.05 level are not significant and these are not included in the
table.

active participation. As regards to the relationship between the CD methods and rice utilization, correlation was found between community organizing and community resource management variables such as primary food staple, selling of rice, and number of meals taken per day.

Sustainability Mechanism for SRI as a CD Approach

There have been significant achievements in rice production since the SRI was introduced in the Bobonaro and Zumalai districts. Based on the achievement, SRI methods should be expanded to other districts in Timor-Leste to increase rice production in order to satisfy domestic rice demands. The SRI is an alternative innovation that can provide low input rice production techniques suitable to the climate, limit utilization of high input technology, and address the lack of agricultural facilities. In order for SRI to be well-adopted and expanded, program implementers

should consider farmers' participation, enhance farmers' capacity (community education), organize farmers into groups (community organizing), enhance utilization of local resources (community resource management), and provide infrastructure support to address the farmers' needs.

CONCLUSIONS

The SRI program catered to farmers with different socio-demographic characteristics but involved more adult males, with low educational attainment, and with small size of land devoted for the said program. Since the SRI program was initiated in 2007 until the present time, most of the farmers have already attended trainings related to SRI practices, which would enhance their capacity in adopting the SRI components. Still, farmers did not practice all the components as recommended due to the difficulty in the application of the whole SRI package. The practice of several SRI components could increase rice yield as compared with traditional practices.

The formation of farmers' groups was the initial accomplishment of the program. Other accomplishments included group organization as well as the sharing of program facilities and other resources such as labor, land, skills, knowledge, and experiences among farmers. Future intervention and sustainability of community organizing could be acquired through capacity building, working together, building trust, adherence to the group's rules and regulations, self-organization and management, and ownership of the program. Sustainability of community organizing can be guaranteed from the group outputs, thereby resulting to positive impact in addressing the immediate needs of the community.

The SRI can enhance utilization of local resources, secure the communities' environment, and ensure sustainability with existing local resources because it does not require more inputs to increase rice production. Through the SRI program, rice production in both villages had been sufficient to feed the farmers' families at all times.

The correlation analysis revealed that the three variables of rice availability were correlated with CD methods, i.e., rice shortage before joining the SRI program with attendance to cross-site visit and awareness of issues on resource utilization; and sufficiency of rice production since involvement in SRI and rice shortage with awareness of issues on resource utilization.

Among the rice accessibility variables, concurrence with prevailing price of rice in the market was correlated with attendance to cross-site visit. Meanwhile, remedy during rice shortage was correlated with SRI training since involvement in the program, sharing of knowledge and skills, awareness of group's weaknesses, accommodation of idea/s and suggestions, and active participation.

As regards to the relationship between the CD methods and rice utilization, correlation was found between community organizing and community resource management variables with primary food staple, selling of rice, and number of meals taken per day.

RECOMMENDATIONS

Significant achievements in rice production have been observed, which can pave way to expansion, since the SRI was introduced in the Zumalai subdistrict. Based on the achievement, SRI methods should be expanded to other farmers in Timor-Leste.

In the future expansion of SRI, community development methods can be adopted to achieve effectiveness in the implementation and adoption of the innovation. Adoption of the SRI is a shift from traditional practices, which requires behavioral and attitudinal changes.

Likewise, in expanding the SRI methods, it would be better to involve the farmers from the beginning of the program. Through this, farmers could better appreciate their contribution, develop a sense of ownership, and enhance their belongingness in order to

be self-organized. Basic infrastructure such as irrigation systems and basic machinery (e.g., hand tractor or tractor) should be provided to support the SRI.

Moreover, expansion of the SRI methods through the adoption of community development strategy, MAFF should initiate and create a policy that can secure initiatives for future practices and adoption. The policy should also be able to encourage participation of relevant stakeholders to support and promote the adoption of the strategies. Technically, policy recommendations should be based on farmers' self-organization with support from MAFF.

Lastly, community development is an accepted approach and has been proven effective in technology transfer and in overall development work. Studies like these, which address specific programs, should be encouraged. However, caution must be exercised not to expect community development to bring about miracles in the march towards development.

LITERATURE CITED

- Deichert, G. (2007). Introducing system of rice intensification in Timor-Leste – experiences and prospects. Timor- Leste: EU-GTZ Second Rural Development Program Timor Leste.
- Food and Agriculture Organization (FAO). (2003). Special report: FAO/WFP crop and food supply assessment mission to Timor-Leste. Rome: FAO.
- Frank, F. & Smith, A. (1999). The community development handbook. Canada: Ministry of Public Works and Government Services.
- Luna, E. M. (2009). Community development as an approach to reducing risks among flashflood-affected families in Albay, Philippines. Disaster Studies Working Paper 24, Aon Benfield UCL Hazard Research Centre. London: University College London.

- Luna, E. M., Ferrer, O. P., Tan, M. J., & Bawagan, A. B. (2004). Introduction to community development. Quezon City, Philippines: University of Philippines Diliman. College of Social Work and Community Development.
- Ministry of Agriculture, Fisheries and Forestry (MAFF). (2008). Rice. Commodity Profile Series, No 1. Version 3. Directorate of Agribusiness. Timor-Leste: Ministry of Agriculture, Fisheries and Forestry.
- Mchombu, K. J. (2004). Sharing knowledge for community development and transformation: A Handbook. Canada: DLR International.
- Sharma, P. N. (2000). Local community and the market. National Academy of Administration-Mussoorie. Lucknow, India: Uttar Pradesh Development System Corporation.
- United Nations World Food Programme (UNWFP). (2005). Food insecurity and vulnerability analysis in Timor-Leste (pp. 44-45). Dili: Vulnerability Assessment and Mapping Unit, United Nations World Food Program.
- Viegas, E. (2001). Agricultural mechanization for a sustainable development of East Timor. Unpublished Working Paper. Rede agrícola e biblioteca virtual de Timor-Leste. Retrieved from <http://gov.east-timor.org/MAFF/ta000/TA042.PDF> on December 18, 2012.

APPENDICES

Appendix 1. Respondents' application and adoption of SRI elements

APPLICATION & ADOPTION OF SRI ELEMENTS	TASHILIN (n=85)		RAIMEA (n=120)		TOTAL (n=205)	
	No.	%	No.	%	No.	%
Application of all SRI elements						
Yes	36	17.6	7	3.4	43	21.0
No	49	23.9	113	55.1	162	79.0
If no, farmers' practices						
Seed selection	15	3.2	51	11.0	66	14.2
Days and distance to transplant	18	3.9	79	17.0	97	20.9
Plowing	4	0.9	4	0.9	8	1.7
Nursery	44	9.5	96	20.7	140	30.2
Distance of transplanting	29	6.3	27	5.8	56	12.1
Water control/ management	15	3.2	22	4.7	37	8.0
Weed control	31	6.7	20	4.3	51	11.0
Days to transplant	2	0.4	3	0.7	5	1.1
Pest control	0	0.0	4	0.9	4	0.9
Reasons for non-practice						
Not introduced yet; do not know yet; not yet familiar	15	8.6	18	10.3	33	18.9
Basic key/main components of SRI; step by step in adopting all components	8	4.6	39	22.3	47	26.9
Labor constraint	7	4.0	6	3.4	13	7.4

Appendix 1. Respondents' application...(Continued)

APPLICATION & ADOPTION OF SRI ELEMENTS	TASHILIN (n=85)		RAIMEA (n=120)		TOTAL (n=205)	
	No.	%	No.	%	No.	%
Takes time to adopt all components; need more focus and time	24	13.7	40	22.9	64	36.6
Need to learn from experiences; still in the process of learning; more practice	11	6.3	7	4.0	18	10.3
Willingness to adopt all SRI components						
Yes	84	41.0	118	57.6	202	98.5
No	1	0.5	2	1.0	3	1.5
If no, reasons						
Labor constraint	1	33.3	0	0.0	1	33.3
Step by step process	0	0.0	1	33.3	1	33.3
No answer	0	0.0	1	33.3	1	33.3

Appendix 2. Size of land devoted to rice farming and frequency of planting

RICE FARMING	TASHILIN (n=85)		RAIMEA (n=120)		TOTAL (n=205)	
	No.	%	No.	%	No.	%
Land for rice farming						
With land	63	30.7	96	46.8	159	77.6
Without land	22	10.7	24	11.7	46	22.4
If none, land used in rice farming						
Hired land	0	0.0	1	2.2	1	2.2
Shared income	1	2.2	1	2.2	2	4.4
Public land/tribe land/family land	21	45.6	22	47.8	43	93.5
Total	22	47.8	24	52.2	46	100
Size of land devoted to rice farming (ha)						
0.01 - 2.00	49	30.8	65	40.9	114	71.7
2.01 - 4.00	10	6.3	15	9.4	25	15.7
4.01 - 6.00	4	2.5	12	7.6	16	10.1
> 6.00	0	0.0	4	2.5	4	2.5
Mean	1.98		2.48		2.28	
Range	0.50-6.00		0.50-7.00		0.50-7.00	

Appendix 2. Size of land...(Continued)

RICE FARMING	TASHILIN (n=85)		RAIMEA (n=120)		TOTAL (n=205)	
	No.	%	No.	%	No.	%
Size of land devoted to SRI (ha)						
0.01 - 1.00	63	39.6	94	59.1	157	98.7
1.01 - 2.00	0	0.0	2	1.3	2	1.3
Mean	1.00		1.02		1.01	
Range	1.00 -1.00		1.00 – 2.00		1.00-2.00	
Size of land devoted to non-SRI (ha)						
0.01 - 1.00	34	21.4	70	44.0	104	65.4
1.01 - 2.00	19	11.9	14	8.9	33	20.8
No answer	10	6.3	12	7.5	22	13.8
Mean	1.36		1.17		1.24	
Range	1.00 – 2.00		1.00 – 2.00		1.00-2.00	
Frequency of planting rice						
Once	5	2.4	22	10.7	27	13.2
Twice	76	37.1	94	45.8	170	82.9
Once or twice (depends on climate, water)	4	2.0	4	2.0	8	3.9

**Appendix 3. Respondents' perception on the effects of SRI program
on local resources utilization**

PERCEIVED EFFECTS OF SRI PROGRAM	TASHILIN (n=85)		RAIMEA (n=120)		TOTAL (n=205)	
	No.	%	No.	%	No.	%
SRI project maximized utilization of local resources						
Yes	85	41.5	115	56.1	200	97.6
No answer	0	0.0	5	2.4	5	2.4
Local resources						
River/irrigation/ water	87	15.0	97	16.8	184	31.8
Land (unused, family labor)	72	12.4	68	11.7	140	24.2
Local materials/ resources	54	9.3	61	10.5	115	19.9
Local knowledge and skills/ experience	22	3.8	41	7.1	63	10.9
Local seeds	24	4.2	32	5.5	56	9.7
Community labor	17	2.9	0	0.0	17	2.9
Others (all we have contributed to the program, group facilities) land/family land	1	0.2	3	0.5	4	0.7
Purpose of utilization						
Irrigation	27	6.8	63	15.9	90	22.7
Compost/ fertilizer, pesticide/herbal pesticide	26	6.6	26	6.6	52	13.1

Appendix 3. Respondents' perception...(Continued)

PERCEIVED EFFECTS OF SRI PROGRAM	TASHILIN (n=85)		RAIMEA (n=120)		TOTAL (n=205)	
	No.	%	No.	%	No.	%
Improved/ maximized/ increased rice production; maximized land use; plant more rice	94	23.7	71	17.9	165	41.7
Support SRI program & group needs	0	0.0	10	2.5	10	2.5
Sharing among community; minimized dependency; sufficient labors; maximized work	20	5.0	2	0.5	22	5.6
Community experiences/ knowledge/skills complementary to adoption of SRI model	5	1.3	20	5.1	25	6.3
Using local seeds	14	3.5	12	3.0	26	6.6
Others (to support the needs, enhance utilization of local resources, supplement)	5	1.3	1	0.3	6	1.5

Note: Multiple responses

Household Resources and Practices Toward Native Rice Sufficiency in Khoune District, Xiengkhouang Province, Lao PDR

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ABSTRACT. A case study was conducted in Na-Ou and Xang villages in Khoune district, Xiengkhouang province, Lao PDR to discuss the households' resources and practices in attaining native rice sufficiency. Data were gathered through a combination of methods that included a survey of 91 households, focus group discussions, key informant interviews, actual field observations, and secondary data analysis. The study villages are largely rural, popular nationwide for their native sticky rice varieties, and regarded as models in native sticky rice production. There are also areas of wetland for rice cultivation that are suited to grow the age-old native sticky rice varieties.

The native rice farmers in these villages are rice self-sufficient because of their household resources and practices. In their households, they possess adequate farming experiences, land parcels, household technology, farm tools, basic farm machinery, organic fertilizers, rice storage system, and positive attitude and unwavering intent to crop their age-old sticky rice varieties. Their household level practices that contribute to their native rice sufficiency are use of technology that is fundamentally traditional and suitable to the place; engaging in husband-wife enterprise; familial and communal rice farming; and seed variety preservation.

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A SWOT analysis of the existing native rice production system reveals a number of strengths as well as weaknesses. However, there are also a lot of opportunities, which the farmers can exploit, to address the weaknesses and the threats confronting native rice production.

Keywords: *native rice sufficiency, household resources, household practices, Lao PDR*

INTRODUCTION

Sticky or waxy rice (*Oryza sativa var. glutinosa*), also known as glutinous rice, is the main staple food of the Lao PDR people as it is more preferred than plain or ordinary rice (Gorsuch, 2006). Consequently, sticky rice production is considerably important in the country.

Xiengkhouang, a province in the northern part of Lao PDR, is a producer of glutinous rice. Being mountainous and having a considerably high elevation of 1,200 meters above the sea surface level [Provincial Agriculture and Forestry Office (PAFO), 2012], the paddies in this province are rainfed and the farmers practice single cropping per year.

The study villages, Na-Ou and Xang, belong to the Khoune district, Xiengkhouang province. Held as model villages in native rice production, rice is sufficient in the study areas at the household and community levels as compared with the provincial production level. At the household level, the average annual rice yield is 5,047 kg/ha, a figure that is twice higher than the provincial average (2,454 kg/ha). At the community level, the two villages' computed average annual rice production of 2,622 kg/ha during the 2012 cropping season is slightly higher than the provincial average.

However, comparing the community and provincial annual rice yields with the national level of 3,084 kg/ha (Lao PDR Ministry of Agriculture and Forestry Agricultural Master Plan

2011-2012) shows that there is rice insufficiency. This national rice yield corresponds to a per capita value of 336 kg, which is 14 kg short of the 2015 target of 350 kg, which is considered the sufficient per capita value to achieve food security (PAFO, 2012). Considering this national target, rice sufficiency is reflected at the household level.

The native rice farmers' household resources and practices were identified to be some of the contributing factors for their attainment of native rice sufficiency. The study therefore aimed to:

1. Describe the household resources for native rice sufficiency;
2. Discuss the household level practices that bring about native rice sufficiency; and
3. Explain the strengths, weaknesses, opportunities, and threats of the native rice production in the study areas.

Conceptual Framework

Figure 1 illustrates the interrelationship of socio-demographic and economic characteristics, household and community level practices on native rice production, native rice sufficiency at the household and community levels, and household and community resources that support native rice production. All the elements play important parts in attaining rice self-sufficiency.

Selected socio-demographic and economic characteristics of the respondents are hypothesized to determine the household and community level practices, attainment of native rice sufficiency, and resources that support native rice production. In like manner, all those three components (i.e., household and community level practices, native rice sufficiency, and resources related to native rice production) are interrelated with each other. Specifically, the household and community level practices determine the household and community resources to be utilized in native rice production and also define the native rice sufficiency at the household and community levels. The native rice sufficiency at the household and community levels determines the farmers' household and community level practices and resources. Correspondingly,

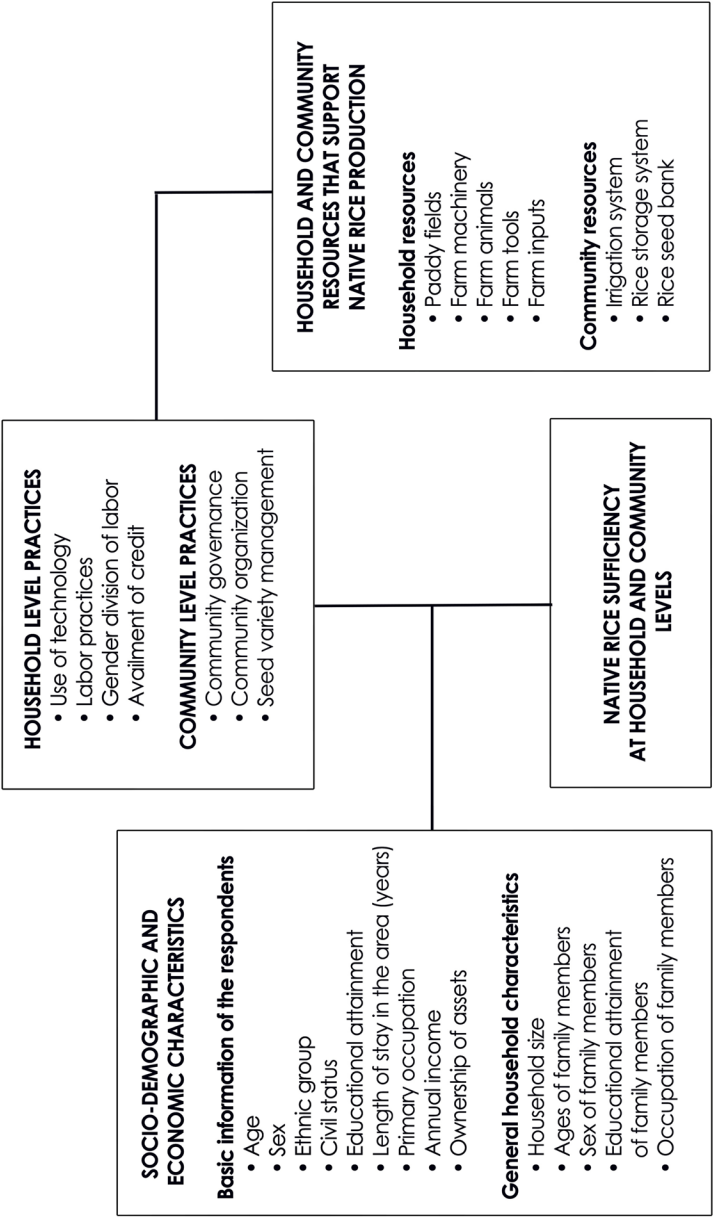


Figure 1. Conceptual framework of the study

the farmers' household and community resources shape and affect native rice sufficiency and practices at the household and community levels. These assumed relationships were analyzed in this study.

METHODOLOGY

The case study was conducted in Na-Ou and Xang villages, Khoune district, Xiengkhouang province, Lao PDR. These villages were chosen as study sites on the bases of their being largely rural, their practice of wetland rice cultivation to grow the age-old native sticky rice varieties, their being popular nationwide for their native sticky rice varieties that have distinct aroma and taste, and their standing as models in native sticky rice production.

From the total of 119 households in the two villages, a sample of 91 household respondents was determined using the formula:

$$n = \frac{N}{1 + Ne^2}$$

where n=the number of respondents, N=total households in the village, and e=desired margin of error set at 5 percent. The sampled respondents were chosen to answer the structured individual survey.

Data were gathered from October to November 2013. The results of the survey were analyzed using descriptive statistics such as frequency, percentage, mean, and range.

Key informant interviews (KIIs) and focus group discussions (FGDs) using guide questions and direct observation were also conducted to validate information and to ensure reliability of results. Direct observation and gathering of first-hand impressions on the biophysical and socioeconomic conditions of the villages were done by the principal researcher after the conduct of the KIIs and the FGDs through a village walk.

The key informants were composed of seven individuals who were aged 29 to 64 years old, which reflected the variability in the ages of the KIs. Five of them were males and two were females. They were model farmers, village heads, Small Chicken Rice Farmers' Organization officers, and technical staff members of Khoune District Agriculture and Forestry Office (DAFO) Crop Sections. They were community members, heads of local community organization, and representatives of the local Agriculture and Forestry Office who were able to provide information on the topics of concern based on their knowledge, skills and experience.

The FGD participants were composed of eight males and three females whose ages ranged from 23 to 60 years old. They were model farmers (those who were successful in native rice production), deputy heads of the study villages, and technical staff of Xieng cluster Agricultural Office, Khoune District Development Office, Xiengkhouang Provincial Development Office, and Provincial Agriculture and Forestry Extension Section.

Secondary data were obtained from local stakeholders involved in rural development, Khoune DAFO, Xiengkhouang PAFO, and libraries. Other reference materials included published and unpublished documents related to the subject matter, such as official reports, articles, seminar papers, and internet materials.

RESULTS AND DISCUSSIONS

The study discussed the Na-Ou and Xang rice farmers' household resources and practices in support to native rice production. Their household resources included paddy fields, farm machinery, farm animals, farm tools, and farm inputs. Their household practices included using technology, labor practices, gender division of labor, and seed preservation. But before these sections, the socio-demographic and economic attributes of the respondents will be described.

Respondents' Socio-Demographic and Economic Characteristics

The respondents were mostly 20-60 years old, male, married, have attained secondary level of education (6-8 years in school), and residents in the study villages for an average of 32 years. They were all Lao Loum by ethnicity. Farming was their primary occupation and livestock-raising was their secondary occupation. Most of the respondents had 1-5 household members, 1-2 children, and 1-2 family members who helped in native rice farming (Appendix 1).

The average household annual income from rice production was 5,858,947 Kip (US\$732) that ranged from 600,000 Kip (US\$75) to 4,000,000 Kip (US\$5,000). Most of them derived their annual income from livestock production at an average of 4,925,942 Kip (US\$616) and ranged from 400,000 Kip (US\$50) to 27,000,000 Kip (US\$3,357). Their non-farm income was very minimal.

The average total income of the households annually was 35,195,195 Kip (US\$4,373), which ranged from 200,000 Kip (US\$25) to 176,000,000 Kip (US\$21,869). This came from farm and non-farm sources. When compared with the poverty threshold of the country based on the 2013 data of the World Bank Group, their economic status was below the poverty line.

Most (57%) of the respondents had one parcel of agricultural land, which usually measures 1 ha. All of them owned the house where they reside. They also possessed home appliances, namely: television sets, satellite discs, radios/cassette recorders, refrigerators, mobile phones, and vehicles (mostly motorcycles).

Household Resources in Support to Native Rice Production

Paddy fields. While the Food and Agriculture Organization (2010) reported that the average size of farm parcels in

Xiengkhouang province is 0.5 ha, the present study found that the farmers in the area had an average of 1.27 ha of paddy fields ranging from less than 1 ha to more than 3 ha. More than half (53%) of them had less than 1 ha, while more than one-third (36%) possessed 1-2 ha of paddy fields. However, the study did not look into the different implications of land size on household practices. In terms of land tenure status, majority (90%) of them owned the land parcels they were using for native rice farming, and only a few (10%) utilized the land parcels either as tenants or as renters.

They were experienced native rice growers as majority (88%) of them have been farming native rice for more than 30 years now. They had an average farming experience of 31 years that ranged from 4 to 67 years.

They were farming on sandy loam soil that was aptly described by agriculturists in the province as moderately fertile; hence, the farmers used fertilizers. The key informants and participants during the FGD affirmed that most of the farmers used organic fertilizers although a few farmers still applied chemical fertilizers.

The size of the respondents' paddy fields, with an average of 1.27 ha, was relatively small to yield high production of native rice. Even so, the maximum volume of production could be attained by capitalizing on the farmers' long experience in farming.

Farm machinery. The farmer-respondents owned farm machinery. All of them used tractors, but not all of them owned these units. All of the respondents used two-wheel tractors during land preparation. Their paddy fields were normally located in hilly areas where it would be very difficult to transport and use four-wheel tractors because most of their terraced paddies were located in sloping land.

Aside from two-wheel tractors, a few of the farmers owned a thresher. Farmers who did not own these kinds of machinery resorted to borrowing from relatives, renting, or doing

the corresponding tasks manually. It is along this aspect of rice production that both the government and the NGOs can provide support to the farmers through granting of financial support or loans for farm machinery. Availability of necessary machinery can minimize production cost and increase volume of production and income.

Farm tools. All of the respondents owned farm tools, specifically hoes, shovels, sickles, spades, bolo knives, knapsack sprayers, and winnowing baskets.

For rice harvesting, the respondents used sickle, a half moon-shaped hand-held knife used for manual cutting of rice stalks just below the panicle. The native rice farmers' practice of manual harvesting is justified in the International Rice Research Institute (2009) article stating that this system best suits lodged crop conditions. Findings in the present study showed that all of the respondents owned sickles. Its importance became evident as the survey showed that majority (75%) of the farmers had five or more sickles.

Majority (87%) of them also owned one to two spades. They used this in composting and digging paddy canals and gardens. Machete or bolo knife, a multi-purpose tool for cutting, was also an essential tool of the farmers. All of them owned two units but some had as many as 25 pieces of bolos. More than half (61%) of them had five and more bolo knives.

Unlike sickle and bolo knives, a knapsack sprayer was not considered as a necessity for most (98%) of the respondents who did not have this kind of farm tool. Only two farmers (2%) had a knapsack sprayer because 39 percent of them practiced organic farming. They manufactured their own fertilizer from the manure of their livestock. Many households had a composting facility made of a roofed and cemented box that normally measures 2 by 3 m. However, some (17%) of them preferred inorganic fertilizers because they are readily available.

Premature grains in threshed grains needed to be separated from massy grains through winnowing. In the past, the native rice farmers used winnowing baskets, a fan-shaped tool, to wind-winnow the threshed grains. The farmers, usually women, stood on a mat, held the winnowing basket filled with threshed grains, raised that basket overhead, and slowly dropped the grains to the mat such that chaffs would be blown away and good grains would drop to the mat just by their feet. However, at present, the farmers no longer practice manual winnowing. They now use threshing machines that also winnow premature grains, stalks, and leaves. The winnowing baskets of the respondents were used to soak rice to be grown into seedlings in the nursery or seedbeds. In their kitchens, the winnowing basket was a useful container as well when preparing vegetables and other ingredients. Majority (89%) of them had one winnowing basket.

Farm animals. Livestock served as source of additional income and food, provided manure for fertilizer, and aided in transportation and mobility. The farmers owned livestock such as cow, buffalo, pig, and horse. Majority (92%) of them owned cows, pigs, and poultry only. They did not own buffaloes and horses because they used tractors in ploughing and hauling the fields. Neither did they own goats as these animals sometimes destroy the plants of their neighbors, which caused conflicts.

None of the respondents owned grazing lands as these were natural areas and were considered communal. Commonly, farmers grazed their farm animals in grasslands, while others practiced the cut and carry system of feeding their farm animals. The KII and FGD participants provided the same information but supplemented that farmers grazed cattle only in communal grasslands because they had pigsty for their pigs and coops for their poultry.

Aside from poultry, some farmers also owned fishponds. Ownership of fishpond in the study sites reflected the owner's proximity to a stream because of the availability of water. Moreover, rain water was just enough to water their paddies. Fishponds in these villages were usually small-sized, which were just enough

to raise fish for family consumption. This upland rice fishing was practiced during rainy season only when the water level in streams was relatively high. The pond dried up during the dry season and there was no irrigation system available that would provide and sustain water into it just like in lowland paddies. After the farmers had finished planting rice and while they were tending (weeding and applying fertilizers) the rice field, they would start preparing their pond by digging and raising its wall to catch water. Afterwards, they would spawn the pond. Fingerlings were either bought or solicited from owners of adjoining fishponds. They spawned and grew common carp, bighead carp, catfish, and tilapia in rice paddies. Harvest period of upland rice fish was from December to March.

Among the respondents, only 38 percent owned a fishpond. In the 2006 Comprehensive Food Security and Vulnerability Analysis (CFSVA) Community Survey conducted by the World Food Program (WFP) Lao PDR, it was reported that among the food insecure households were the 72 percent farmers who did not fish nor hunt. This underscored the significant contribution of fishing or having a fish pond to the economic status of the farmers.

Farm inputs. The UN's FAO reported in 1998 that sticky rice production in Lao PDR was predominant, and it comprised 80 percent of cultivated land in the country. The Encyclopedia of Nations stated that in 2013, about 93 percent of rice production areas is devoted to sticky rice production. The farmers in the study areas were found to be predominantly producers of native rice or sticky rice. According to the respondents, they took pride in their produce that had a distinct aroma and taste. All of them used their own native rice seeds for rice production.

During the FGD, the participants recounted that in 2013, they were provided with hybrid rice seeds by the Provincial Agriculture and Forestry Office (PAFO) to grow in their area. They tried growing these seeds in some portions of their paddies alongside the native rice varieties in other parts. The result was unexpected as the hybrid seeds took a longer period to grow and did not yield much. The yield was lower than that of the native rice

variety. The FGD participants wondered why because the same hybrid rice variety was planted in Vientiane, and it yielded the expected volume and was grown in only three months as projected. Most of the FGD participants, being experts and experienced in rice farming, attributed the negative results of planting hybrid variety in Xiengkhouang to the province's elevation and insufficient water as it is an upland area and had no irrigation system.

During the 2012 native rice production season in the study sites, the respondents used varying quantities of native rice seeds because they had diverse sizes of paddy fields. Native seeds ranging from 10 to 300 kg with a mean of 90 kg were used during this season.

Bestari, Shrestha, and Mongcopa (2006) stated that aside from being the staple food of the people, rice was significant to their cultural and religious practices. They had traditions and rituals related to rice production. An example they presented was the Khamu farmers in Luang Prabang province who considered black sticky rice as the 'father' variety. They planted this variety "with special purpose and in small quantities near the hut, in memory of the dead parents and also at the edge of the rice field to indicate that the parents are still alive."

The villages of Na-Ou and Xang, being part of Xiengkhouang province, are known for organic small chicken rice. Findings show that most (40%) of them used organic fertilizers or did not fertilize at all. Only a few (18%) of them chose to use chemical fertilizer and others (16%) opted for the combination of organic and chemical fertilizers.

Rice straw was used as fodder for cows and buffaloes and was an unintentional component in composting. When the cows were fed with rice stalks, some leftovers fell on the ground. As the cows stepped on them, they were mixed with the dung and eventually served as compost material. In the study sites, majority (87%) of the farmers used rice straw as compost. Ordinarily, farmers laid the stalks directly on the rice field to dry before using these as fodder for their animals, while others mixed these with

manure and other materials to be used as organic fertilizer. Only a few (15%) did not make the most of the rice straws.

Rice storage system. Rice storage was individually owned. Almost all (99%) of the respondents had rice storages in their own backyards. In these villages, just like in the entire country, the rice storage was a small wooden structure that measured 2 m by 3 m or wider, depending on the household's volume of harvest. Its walls and floor were made of wood, and the roof was made of galvanized iron. The structure resembled a box-type hut, except that their rice storage appeared to be a little bit sturdier and had only one opening. Its floor was elevated about 1-2 m from the ground to protect the grains from the moisture of the soil, from possible flood, or from insects. The storage was built just beside the owner's residential house and had only one opening (i.e., a window that looked like a door) because it was single-framed and had a width that was almost equivalent with that of a door. Windows had different styles, but the dominant style was a window made of wooden panels/boards, which the farmers removed one at a time when getting or storing grains inside.

Household Level Practices for Native Rice Sufficiency

Use of technology. At the household level, the farmers used hand tools, two-wheel tractors, threshers, traditional seed selection technique, organic fertilizers, and organic insecticides that they considered effective and helpful. Each stage of native rice production had corresponding tools and/or machinery.

In seed selection, all of them used sickle and a winnowing basket. The winnowing basket was likewise used as they prepared for the seeds to be soaked. Hoe and shovel were used in building dikes or bunds and in watering the paddies. In building fences, they used bolo knives and hoes. When harvesting, all of them used sickles. They did not use any tool but used their bare hands when transporting manure to the field, sowing, uprooting seedlings, and weeding. Moreover, the farmers mentioned no hand tools

in plowing, harrowing, threshing, and transporting because they used simple farm machinery such as two-wheel tractors and threshers. According to the survey respondents and the KII and FGD participants, the native rice farmers have found, in their many years of farming, the effectiveness of combining these farm tools and simple machinery. Though the kinds of tools that could be used by the farmers were determined by their geographical location, work was made easier and faster because of these tools and equipment. According to them, using the two-wheel tractor and the thresher was enough and very helpful.

The farmers in these villages, like most of the farmers in Lao PDR, used a traditional technique of seed selection. This was described during the KII and FGD. According to the participants, the farmers would put water in a bowl and then mix it with salt. They would test the adequacy of salt by dropping an egg into the solution. If the egg sunk, they needed to add salt; if the egg floated, salt was enough. Then seeds were soaked in the salty solution. Seeds that floated were not used and were thrown away, while seeds that sank were used as seeds. This technique was further facilitated by the PAFO under the System of Rice Intensification (SRI) program.

The farmers indeed used organic fertilizers. It was a traditional practice handed over from generation to generation. However, this practice intensified and improved through the facilitation of the PAFO in the SRI program. Through this program, the farmers were given formal and informal trainings on making compost.

The farmers did not use chemical insecticides but used the traditional organic insecticide handed to them by their forefathers. The basic ingredients are 1 mg tobacco, 1 L Lao traditional rice wine (distilled spirit from rice wine and locally called *Lhao Lao*), and 1 L water. These are mixed and boiled until half is left. When cooled, they mix 1 spoon of this solution to 5 liters of water and spray this directly to the rice plants that are affected by aphids or other kinds of insects.

Labor practices. Worner (1997, as cited in Appa Rao, Bounphanousay, Shiller, & Jackson, 2000), reported that in Lao PDR, family labor remains to be a distinct input in rice cultivation. In the stages of native rice production, the family was still the primary source of labor for majority of the respondents, followed by exchange labor with other farmers in the community, and hiring of laborers.

The family shared labor in all stages of native rice production including land preparation, transplanting, harvesting, and hauling. Exchange labor with other farmers in the community was practiced during transplanting, harvesting, and threshing. Labor exchanges on land preparation and hauling were less common among the farmers. In terms of paid labor, workers were hired during transplanting and harvesting stages only. Meanwhile, land preparation and hauling, which required less manpower, were performed by family members.

Gender division of labor. In a household in Lao PDR, both men and women are involved in agriculture. The FAO's (1998) Fact Sheet of Lao PDR: Women in Agriculture, Environment, and Rural Production reported that women held dual responsibility for farm and household management. Women also had substantial and enlarging roles in agriculture. The report also presented the gender division of farm labor in the country (Table 1).

Furthermore, the FAO Report (1998) stated that in agriculture production in the country, female labor force constituted 69 percent, while male labor force amounted to 55 percent. Despite this, the report stated that women's contribution as family labor was undervalued and was never included in national accounting as work.

This study acknowledged both men and women's contribution to native rice farming in the study sites. Gender division of labor in terms of native rice production is illustrated in Table 2.

Table 1. Gender division of labor in rice farming of the Lao Loum ethnic group (Schenk, 1995 as cited in FAO, 1998)

TASK	MALE ADULT	FEMALE ADULT	BOTH MEN AND WOMEN
Selecting seeds		X	
Soaking seeds			X
Making bunds	X		
Making fences			X
Transporting manure			X
Plowing	X		
Harrowing	X		
Sowing			X
Uprooting of seedlings	X	X	
Transporting	X	X	
Irrigating	X		
Guarding the field at night	X		
Weeding	X	X	
Harvesting			X
Threshing	X		
Packing hay		X	
Threshing by hand	X	X	
Transporting to storage			X
Marketing rice		X	

Table 2. Gender division of labor in native rice production

TASK	MALE		FEMALE		BOTH		PAID WORKER		NO ANSWER	
	No.	%	No.	%	No.	%	No.	%	No.	%
Seedbed preparation	18	19.8	2	2.2	71	78.0	-	-	-	-
Fencing	20	22.0	2	2.2	43	47.2	-	-	26	28.6
Land preparation	53	58.2	-	-	36	39.6	-	-	2	2.2
Fertilizer application	1	1.1	1	1.1	84	92.3	-	-	5	5.5
Transplanting	-	-	-	-	91	100.0	-	-	-	-
Weeding	1	1.1	6	6.6	84	92.3	-	-	-	-
Water controlling	16	17.6	-	-	75	82.4	-	-	-	-
Harvesting	-	-	-	-	91	100.0	-	-	-	-
Hauling	9	9.9	-	-	82	90.1	-	-	-	-
Threshing	7	7.7	-	-	84	92.3	-	-	-	-
Drying	7	7.7	-	-	84	92.3	-	-	-	-

In the paddy field, generally both husbands and wives shared equal responsibilities from preparing the seedbed, constructing the fence, applying fertilizer, transplanting, weeding, controlling water, harvesting, hauling, threshing, and drying the grains. In Lao PDR, the farmers' wives helped their husbands because they were concerned with their family's income and subsistence. Most (87%) of them participated in their husbands' farming occupations; thus, they also went to the rice fields and worked. Moreover, accomplishing native rice farming tasks became faster and easier when wives helped their husbands (Chanthavong, 2012). However, preparation of the paddy field was predominantly the job of the males as the task was strenuous and required much physical strength.

The rice field was fenced manually by members of the family. Land preparation was either done through the traditional method with the use of manual plows being pulled mechanically by a two-wheel tractor. Both seed sowing and transplanting were done manually. Farmers from neighboring rice fields, family members, and relatives congregated to transplant the seedlings; then, they moved to the next fields of participating families. Fertilizer application and weeding were commonly done manually as the farmers did not use chemical fertilizers and weedicides.

Harvesting, hauling, and threshing were festive communal activities. Farmers from neighboring rice fields, family members, and relatives flocked to work together to harvest, to bundle using bamboo strip twines, to dry, and to thresh the grains. They even brought food and drinks to be shared with everyone in the group including hired laborers.

Some families did the hauling by themselves without the help of their neighbors. Hauling was performed two days after cutting. After the ripened yields were cut, they were bundled (as they were still in the stalks) by young bamboo strip twines. The bundles were left on the rice fields for two days to dry. Some families hung the bundles in elevated poles usually made of bamboo to dry. After drying, the bundles of rice stalks were hauled to be threshed. Threshing was done by the small community of neighbors, relatives, and hired workers as well. The key informants and FGD participants reported that there were five rice threshers available in the study sites. During the 2012 native rice production in the area, the farmers paid five sacks for every 100 sacks of clean rice to the owners/operators of the threshing machines. Compared with the previous years, the threshing charge of 7 sacks per 100 sacks was considered lower.

The clean grains were immediately packed in sacks and hauled again towards the family's rice barn either through tractors or motorcycles. Some simply carried the sacks at their back one at a time if the distance from the field to their barn was less than 100 meters. Milling came after drying, and milling was done by individual families. In milling, those who did not have a rice mill or a rice polisher would go to the nearby milling stations owned by

private individuals and pay for the service. Farmers commonly did not pay in cash but in kind. They would leave the rice bran with the rice mill owners as payment for the service. Milling stations sold the rice bran as animal feed.

Availing of credit for native rice production. Only two respondents (2%) availed credit for native rice production. The two farmers loaned money from Nayobay Bank that is located in Phonesavanh village, Pek district, Xiengkhouang province. The soft loans of the two respondents were spent on native rice production and livestock breeding. They filed for 5,000,000 Kip (US \$621) loan, and it was granted. They still borrowed money from the bank to buy a tractor as they aspired to increase farm production. However, one FGD participant said that the two loan grantees found the monthly interest of 14 percent as high, and so, they paid their loans after a few months only. Majority (97%) of them did not borrow for several reasons, namely: high interest rate, unawareness of the loan grant, reluctance to process papers, apprehension for inability to pay, and distance to the bank.

Seed variety management. Almost all (98%) of the farmers declared that they did preserve traditional native rice varieties. They chose the best seeds while they were still in the field right after harvesting. Afterwards, they stored these well-chosen seeds in sacks and kept them in their rice storage together with other sacks of rice for consumption. The sacks of rice seeds to be used for planting the next season were marked for proper identification.

According to the KII and FGD participants, the farmers believed that the cycle of using native rice varieties in this area should be changed every three years. Otherwise, as grounded on their forefather's experience, rice yield would decrease. Farmers practiced seed exchange (native species only) with other farmers in the same village, and they found this effective in achieving their rice crop's expected yield.

The respondents had criteria in choosing the seed variety aside from yield. Most of them considered grain quality on taste, visual aspect, and milling characteristics as primary bases. Only

some considered high and stable productivity in low-to-medium input environment.

The farmers in the study area differed in their choice of native rice variety to be planted. Most of them planted the yellow glutinous rice variety. This was followed by those who planted the red glutinous rice, which was the variety used for making the famous Xiengkhouang rice noodles. There were a few who planted the black glutinous rice variety.

The native rice variety is synonymous to the small chicken rice. The black (dark) and red varieties have the same seed size, and the yellow variety is slightly smaller. The three varieties have the same duration of production period from germination to maturation stage. The yellow variety had the highest yield among the three varieties, while the black variety had the lowest yield. Thus, the farmers would quip: yellow > red > black. All three had the same height and were cultivated using the traditional method. They were all susceptible to certain pests and diseases compared with the hybrid varieties.

As regards to aroma, the black variety had the best aroma, while the red had better aroma than the yellow variety, and thus, black > red > yellow. All three varieties, when planted in Xiengkhouang, generated a distinct aroma that was valued to be superior over the same varieties planted elsewhere in the country.

Based on all of the respondents' experience in native rice farming, only the traditional seed variety could grow best in the area given the study sites' geographical location and climatic conditions. Private enterprise companies, government line agencies, and foreign institutions did not introduce other exotic native rice varieties in the study sites. This was because the farmers themselves did not solicit any other rice variety from outside the community. They bred only their own native rice varieties to assert the suitability of these varieties in their geographical location and farming traditions.

Their pride in their own native rice varieties was complemented by the appreciation of the people in the entire

country about the fine quality of the Xiengkhouang native rice. Its excellence was well-known nationwide. In fact, Vientiane Times (2014) reported that Lao Brewery Company (LBC), brewer of Beer Lao (famous in the country and is exported to 20 countries worldwide), chose the native rice from Xiengkhouang and Huaphan provinces to be the most important source of raw material for its new beer brew—the Beer Lao Gold. Mr. Saysavanh Boutthavong, LBC Brand Manager said:

Khao Kai Noi rice is rich in nutrients and low in sugar. It is resistant to disease, and it yields a high productivity at three tons per hectare, which farmers grow using organic methods, causing it to be in high demand (Vientiane Times, 2014, p. 1).

An agreement was signed between the LBC and the Provincial Governments of Xiengkhouang and Huaphan stipulating that LBC would purchase 800 tons of the Khao Kai Noi (small chicken rice, which is a particular variety of native rice) yearly and would increase its buying price. The LBC also pledged to assist the two provinces in establishing a research center, in establishing a farmers' organization, and in organizing a Khao Kai Noi rice festival yearly to help promote this produce. This contract would further encourage the rice farmers to improve and increase the production of native sticky rice. Na-Ou farmers were specifically mentioned in this news article. It said that Na-Ou village, together with other villages, would benefit from this deal. The Vientiane Times news article likewise mentioned that "many countries are also interested to import Khao Kai Noi rice for domestic consumption especially the European countries as well as Japan and Vietnam."

SWOT Analysis of Native Rice Production System in the Study Villages

Strengths. There were positive points for the farmers' native rice production system. As a family activity, there was availability of manpower or family labor needed for the different activities; thus, farmers very seldom resorted to hired

labor. Husband-wife partnership and collaboration with other neighboring farmers were also frequent. The strong collaboration among the farmers in the neighborhood allowed them to exchange labor, which did not only help in reducing labor cost but also in maintaining their social capital. The farmers possessed the skills and experience, which made them very knowledgeable about rice production. Their indigenous knowledge and practices on native rice production were contributory factors to attaining sufficient production levels as compared with those of the district and provincial levels. The farmers also owned the needed tools and machinery related to native rice farming. As rice growers, their preference for native rice varieties over other varieties was cultural. The presence of the farmers' organization in the villages was another factor because the people's organization could serve as conduit for government assistance. They had attitudes and traditional practices such as the use of organic fertilizers and pesticides that complemented their farming resources. All of these contributed to their sufficiency in native rice.

Further, the villages were endowed with geographical and climatic conditions, which were suitable for native rice production, namely: good soil, favorable climate, natural resources such as rivers and streams, among others.

Weaknesses. The areas needing attention were basically outside support and community level resources. Infrastructure, such as an irrigation system and a rice seed bank, were very expensive, which the farmers could not afford themselves. They needed material, financial, and technical support from the government and other institutions.

Although the presence of the farmers' organization had been pointed out as a strength, there was a concern over the low membership. The DAFO extension/community development workers should focus on motivating the farmers to join the organization. Another point was the non-availing of credit by the farmers. This could be both positive and negative. It was positive since it indicated that farmers had more than enough capital. In their traditional practice, they used minimal inputs and labor as

they made their own fertilizers and pesticides, and used their own seeds. It was negative since non-availment of credit may limit their capital; hence, the ability to engage in other livelihood activities. The last point was the non-inclusion of non-cash income in the computation of total income from crop and livestock production because the products were meant for home consumption. This translated to a low reported income.

Opportunities. Despite the weaknesses, there were also opportunities that could be exploited. The native rice that the farmers grew had a good market, and the country's number one beer manufacturer had promised them of a sure market and support. This means that they could produce more than what they needed at the household level. In other words, they should strive to produce surplus to supply the market demand. On this aspect, the presence of credit facilities becomes important. Availment, though, may become a problem due to the distance of the credit providers as well as the submission of the required documents.

In addition, the government through its district and provincial offices provided support to the rice farmers particularly on the technical aspect like the implementation of the System of Rice Intensification program. Lastly, although there was no rice seed storage facility in the villages, the presence of a cold rice seed storage at the Agricultural Research Center in Vientiane was a good opportunity for preserving the native rice varieties that they were currently planting.

Threat. The only threat that could be mentioned is the initiative of the government to introduce hybrid varieties throughout the country. Obviously this move would replace the traditional varieties that the farmers have been planting. During the FGD, the participants recounted that in 2013, they were provided with hybrid rice seeds by the PAFO to grow in their area. The result was rather negative as the hybrid took longer to grow and did not yield much as expected. Most of the FGD participants, being experts and experienced in rice farming, attributed the negative results of planting hybrid variety in Xiengkhouang to the province's high elevation and water insufficiency. Fortunately, the

Xiengkhouang province has been identified as one of the native rice production areas in northern mountainous region of Lao PDR.

CONCLUSIONS

In the light of the foregoing discussions, the following conclusions were drawn:

1. The farmers had the necessary household resources that supported native rice production. In the households, they were adequately experienced farmers, owners of small land parcels, and equipped with household technology/appliances, farm tools, and basic farm machinery. The sloping land in their villages prevented them from acquiring sizable wheeled-machinery. Land tenure was not a problem to them. Soil fertility status challenged them to produce fertilizers that they could afford, that is, from their own compost. They take pride in cropping their age-old sticky rice varieties, and this attitude was complemented by their need to use such varieties because of their geographical conditions.
2. Their practices and resources in the household level were helpful in attaining rice sufficiency. Native rice farming in the study villages was a husband-wife enterprise, and familial and communal in nature. The women had remarkable contribution in farming. Borrowing money from outside institutions was difficult for them and not part of their culture. Preserving the traditional native rice variety was an individual household-initiated endeavor.
3. Based on the SWOT analysis, the native rice farming system had positive aspects (strengths) as well as negative aspects (weaknesses). On the other hand, there were opportunities available that could help address these weaknesses or harness their strengths. However, the possible threat (e.g., hybrid rice varieties) to the sustainability of the native rice production should be addressed by the native rice farmers.

RECOMMENDATIONS

The following recommendations are put forward to the native sticky rice farmers:

1. Outside efforts should be balanced with cooperation. When meetings are called, all the native rice farmers in the study villages should positively respond to demonstrate willingness to participate in rural rice farming development efforts.
2. As with inland fishery production, cash crop production and kitchen gardening were found to potentially augment income. Hence, farmers in the study villages should re-examine their farming system and strive to be fully equipped with knowledge and skills on these farming activities. For instance, active participation in the Organic Small Chicken Rice Producers Association will be a venue for them to learn more and to hone their farming skills further.
3. Since a community radio is available to them, they could bring their radio sets to their farms so that they could listen and learn from the broadcast programs especially those related to rice farming.
4. Since farming is a husband-wife enterprise, the women should be given equal opportunity to participate actively in the rice farmers' association; they must have equal access to education and health; and they must have opportunities to be heard and decide on matters concerning native rice farming and domestic concerns.

To the Government of Lao PDR through its line ministries, the following are recommended:

1. Efforts to increase food security through crop diversification in the study villages should be prioritized. As the farmers would not allow other rice varieties, government efforts

should be directed towards improving systems of kitchen gardening, livestock breeding, fish pond maintenance, and cash crop production.

2. The Ministry of Public Works should strive hard to repair the non-functional irrigation system in the study sites. Assistance on the installation of wells and pumps should also be considered.
3. The Ministry of Agriculture and Forestry, Veterinary Division, should assist the farmers in their livestock problems. Its veterinarians should be regularly trained and fairly compensated so that they can respond to the farmers quickly and efficiently on livestock problems.
4. The Ministry of Agriculture, Forestry and Fisheries (MAFF) should assist the native rice farmers in setting up their own fish ponds as this was found to be helpful in augmenting the latter's income.

For future researches, the following are suggested:

1. That the same study should be conducted in other villages in Xiengkhouang province to determine how households and the community contribute towards attaining rice sufficiency.
2. An in-depth study on the women's contributions towards rice sufficiency should be conducted. The suggested methods are direct observation and case study because the Lao women are generally much occupied with both house and farm works.

LITERATURE CITED

Appa Rao, S., Bounphanousay, C., Shiller, J. M., & Jackson, M. T. (2000). Collection and classification of rice germplasm from the Lao PDR between 1995 and 2000. Vientiane: Ministry of Agriculture and Forestry/Lao-IRRI Project.

- Bestari, N. G., Shrestha, S., & Mongcopa, C. J. (2006). Lao PDR: An evaluation synthesis on rice. A case study from the 2005 sector assistance program evaluation for the agriculture and natural resources sector in the Lao People's Democratic Republic. Vientiane City, Lao PDR: Operations Evaluation Department, Asian Development Bank Lao PDR. Retrieved from <http://www.adb.org/sites/default/files/evaluation-synthesis-rice-lao.pdf> on August 27, 2013.
- Chanthavong, A. (2012). Household and community level practices towards attaining food security in Long district, Luangnamtha, Lao PDR. Unpublished Master's thesis, University of the Philippines Los Baños, College, Laguna, Philippines.
- Encyclopedia of Nations. (2013). Laos - agriculture. Retrieved from <http://www.nationsencyclopedia.com/economies/Asia-and-the-Pacific/Laos-AGRICULTURE.html> on September 17, 2013.
- Food and Agriculture Organization. (1998). Fact sheet Lao PDR: Women in agriculture, environment, and rural production. Bangkok, Thailand: Food and Agriculture Organization of the United Nations Regional Office for Asia and the Pacific. Retrieved from <ftp://ftp.fao.org/sd/sdw/sdww/Lao.pdf> on June 9, 2013.
- Food and Agriculture Organization. (2010). Profile of Lao People's Democratic Republic. Retrieved from www.faorap-apcas.org/lao/Lao%20Background.pdf on November 21, 2013.
- Gorsuch, J. (2006). Rice: The Fabric of Life in Laos (A Lao-IRRI Project). Vientiane, Lao PDR: Ministry of Agriculture and Forestry of Lao PDR, International Rice Research Institute, and The Swiss Agency for Development and Cooperation.
- International Rice Research Institute. (2009). Cutting. Retrieved from <http://www.knowledgebank.irri.org/rkb/cutting.html> on April 23, 2014.
- Lao PDR Ministry of Agriculture and Forestry Agricultural Master Plan 2011-2012. Laos: MAFF.
- Provincial Agriculture and Forestry Office (PAFO). (2012). Report of the Xiengkhouang Province, LAO PDR. Laos: PAFO.

- Vientiane Times. (2014). Kai Noi rice adds crispness to new Beer Lao Gold. Vietstock. Retrieved from <http://en.vietstock.vn/2014/02/kai-noi--rice-adds-crispness-to-new-beerlao-gold-117-167994.htm> on May 3, 2014.
- The World Bank. (2013). Lao PDR rice policy study. Retrieved from <http://www.worldbank.org/en/country/lao/publication/lao-pdre-rice-policy-study> on August 27, 2013.
- World Food Program-LAO PDR. (2006). Comprehensive Food Security and Vulnerability Analysis (CFSVA), Vulnerability Analysis and Mapping Branch, WFP-Lao PDR. Laos: WFF.

APPENDIX

Appendix 1. Respondents' socio-demographic and economic characteristics

SOCIO-DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS	NO. (n=91)	%
Age		
Teenager (13-19)	1	1.1
Young adult (20-39)	30	33.0
Adult (40-59)	45	49.4
Senior (>60)	15	16.5
Range	18-78	
Mean	46	
Sex		
Male	56	61.5
Female	35	38.5
Civil status		
Single	2	2.2
Married	86	94.5
Widow/Widower	2	2.2
Separated	1	1.1
Educational attainment		
No formal education	5	5.5
Primary (1-5 years in school)	28	30.8
Secondary (6-8 years in school)	46	50.5
High School (9-13 years in school)	8	8.8
College (14-18 years in school)	4	4.4

Appendix 1. Respondents' socio-demographic...(Continued)

SOCIO-DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS	NO. (n=91)	%
Length of stay in the area (years)		
≤10	10	11.0
11 to 20	12	13.2
21 to 30	18	19.8
31 to 40	26	28.6
41 to 50	18	19.8
> 50	7	7.7
Range	4 - 72	
Mean	32.32	
Primary occupation		
Farming	80	87.9
Employee	11	12.1
Secondary occupation		
Farming	7	7.7
Animal raising	55	60.4
Retail	5	5.5
Driving	2	2.2
Noodle-making	22	24.2
None	2	2.2

Note: Multiple responses for those that do not total 100

Appendix 1. Respondents' socio-demographic...(Continued)

SOCIO-DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS	NO. (n=91)	%
Rice production income (Kip)		
<5,000,000	36	39.6
5,000,001 - 10,000,000	11	12.1
10,000,001 - 15,000,000	8	8.8
15,000,001 - 20,000,000	1	1.1
> 20,000,000	1	1.1
None	34	37.4
Mean		5,858,947.37
Range		600,000-40,000,000
Total annual household income (Kip)		
<5,000,000	6	6.6
5,000,001 - 10,000,000	13	14.3
10,000,001 - 15,000,000	3	3.3
15,000,001 - 20,000,000	5	5.5
> 20,000,000	45	49.4
Mean		35,195,195.60
Range		200,000-176,000,000

Farmer Field School as an Effective Approach in Increasing Farmers' Knowledge, Skills, and Practices, and in Enhancing Diffusion of Innovations: Evidences from Selected Rice Farmers in Masalasa, Victoria, Tarlac, Philippines

GLENN Y. ILAR¹

ABSTRACT. The study assessed the effectiveness of the Farmer Field School (FFS) approach in increasing the knowledge, skills, and practices of selected rice farmers in *Barangay* Masalasa, Victoria, Tarlac in the Philippines as well as the diffusion of innovations among them. Empirical evidences were obtained from the 24 farmers who attended the FFS on PalayCheck System and 24 non-participating farmers serving as the control group. The FFS provided farmers with new knowledge and skills on the whole PalayCheck System as demonstrated by the FFS graduates having more knowledge on the PalayCheck component-technologies as compared with non-FFS farmers. All the FFS farmers shared their knowledge to their families, relatives, friends, and other farmers. Farmer-to-farmer diffusion was observed as the FFS farmers shared what they have learned to the non-FFS farmers, who in turn, shared this knowledge with other farmers. Thus, more farmers were reached because of the multiplier effect of farmer-to-farmer diffusion.

While the extent of knowledge diffusion, such as the number of farmers and the management practices shared by the participants, were not determined, this case study suggests that FFS can be a good avenue for building the human and social capital of farmers. However, social

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and technical gains can only be sustained if the appropriate local and national level-institutions, and the necessary supporting mechanisms and policies for continuous capacity development are developed and in place.

Keywords: *Farmer Field School, PalayCheck System, diffusion-adoption process, social impact*

INTRODUCTION

Globally, agricultural extension faces many challenges, one of which is how to develop a sustainable approach that empowers farmers and extends beyond technical knowledge to producers. This challenge is to help small-scale farmers play a leading role in organizing themselves for production, marketing, and advocacy (David, 2007). The Farmer Field School (FFS) approach, which promotes group learning based on the principles of adult education, had been espoused by many authors as one approach to meet this challenge (Erbaugh, Donnermeyer, & Kibwika, 2001; Erin, Sadoulet, de Janvry, Murgai, & Ortiz, 2004; David, 2007; Erbaugh, Donnermeyer, Amujal, & Kidoido, 2010; Godrick & Khisa as cited in Muhammad, Chaudhry, Khatam, & Ashraf, 2013).

The FFS was developed in Asia in the 1980s in teaching integrated pest management (IPM) techniques to groups of farmers. It was introduced in Africa in the mid-1990s, and it is currently being used in over 27 African countries, covering varied topics such as integrated production and pest management (IPPM) of annual and perennial crops, soil management, livestock production, and HIV/AIDS (Davis, 2006; Braun et al., 2006 as cited in David, 2007).

While many studies show the effectiveness of FFS as it leads to reduced pesticide use, increased productivity, and improved farmer's knowledge (Erbaugh et al., 2001; Erin et al., 2004; Feder, Murgai, & Quizon, 2004; van den Berg, 2004; David, 2007), there have also been criticisms to the approach such as high cost of FFS

in terms of time, funds, and human resources; and the difficulty of scaling up FFS in a financially sustainable way (Quizon, Feder & Murgai, 2001; Feder et al., 2004). Nearly all of the empirical evidences on the challenges and issues of FFS implementation is taken from Asian and African countries, which implemented several FFS programs.

David (2007) observed gaps in the literature and mixed results, which do not allow conclusions about the effectiveness of the FFS approach. The popularity of the approach among many countries, and the increasing number of donors and governments wanting to establish FFS programs made it necessary to have more empirical evidences on the effectiveness as well as on the strengths and weaknesses of the FFS approach. Particularly, more studies are needed on the effectiveness of the approach in imparting knowledge and in empowering farmers, both of which are strongly influenced by socio-cultural context. This study documented the impact of FFS on farmer's empowerment and provided more detailed analyses of the factors contributing to farmer's learning and diffusion behavior.

Low Rice Production of Farmers and the Need for Discovery-based Learning Training Approach

Low rice productivity has always been a problem of almost all farmers. They continually face many problems such as biotic and abiotic stresses (e.g., pests and agro-climatic conditions). Added to these, they lack the necessary knowledge and skills to deal with pest problems. Often, they resorted to calendar spraying of pesticides, which just aggravated the problems because of pest resurgence. Hence, instead of getting higher yield, they got lower yield.

Previous extension works conducted in *Barangay Masalasa, Victoria, Tarlac* in the Philippines focused on blanket technical messages without much emphasis on understanding the interactions within the rice agro-ecology and the factors contributing to diseases and pests. While demonstrations may

have been effective in teaching skills and practices to farmers, these were less appropriate in conveying knowledge about diseases and pests. Similarly, teaching farmers how to spray pesticides based on the calendar discouraged them from observing disease levels and pest infestations as well as depriving them from making their own decisions whether to spray or not, and when. As one FFS farmer said: "We never learned to think for ourselves, and make our own decisions."

To help increase the productivity of rice farmers, the Philippine Rice Research Institute (PhilRice) in close collaboration with the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) and the local government unit (LGU) of Victoria, Tarlac implemented a project entitled "Science and Technology-Based Farm (STBF) on Increasing Yield through the Utilization of Quality Rice Seeds of Recommended Varieties on Selected Irrigated and Rainfed Areas" in Tarlac.

The project's general objective was to demonstrate the advantages of using quality rice seeds of the most preferred and newly released inbred and hybrid rice varieties in increasing the productivity and income of rice farmers. It was implemented in four cropping seasons (2010 wet season to 2012 dry season). Part of the project was a weekly training of farmer beneficiaries dubbed as FFS on PalayCheck System, which followed the FFS approach. The FFS is based on adult education principles such as experiential group learning. It is used to disseminate information and technology, educate, and empower farmers. It involves an intensive, season-long training program where facilitators used experiential learning, group dynamics, and simple experimentation to 'co-learn' with farmers.

In the typical FFS, a group of about 25 farmers meet regularly with a facilitator during the cropping season. The facilitator helps the farmers learn for themselves by asking questions and encouraging discovery-based learning. Farmers are taught to diagnose and solve problems, set priorities, and perform on-farm experiments (Davis, 2006).

In the study, among the 45 farmers who enrolled during the first cropping season, only 12 of them finished and continued in the second and succeeding seasons. Other farmers enrolled in the second and third seasons, and 32 of them (including the 12 farmers from the first cropping season) graduated from the FFS after the four cropping seasons (Ilar, 2012).

Comparing with typical FFS, the PalayCheck System, on the other hand, is a dynamic rice crop management system. It presents the best key technology and management practices as Key Checks; compares farmer practices with the best practices; and promotes learning through farmers' discussion groups to sustain improvement in productivity, profitability, and environment safety. This system is simply "learning, checking, and sharing for best farming practice."

The PalayCheck System is a Rice Integrated Crop Management (RICM) System, which recognizes that rice growing is a production system consisting of a range of factors that are interdependent and interrelated in their impact on the growth, yield, rice grain quality, and environmental sustainability. It covers the principal crop management areas such as variety and seed selection, land preparation, crop establishment, nutrient management, water management, pest management, and harvest management, where the different yield-enhancing and cost-reducing rice production technologies (termed as component technologies) are recommended. It also encourages farmers to manage their rice crop according to targets by measuring crop performance and analyzing results.

The system provides standards in the form of Key Checks that guide farmers on what to achieve; how to assess the Key Checks; and how to achieve these Key Checks. Hence, through a continuous learning process, the system helps farmers learn from their experiences while improving their crop management practices (PhilRice, 2008).

Prior to the implementation of the FFS on PalayCheck System in the village, varietal trials (VTs) were established to

demonstrate the performance of the five newly-released varieties with the aim of developing location-specific variety/ies after four seasons. Aside from demonstrating their performance, these VTs also served as learning fields of the FFS farmers. Likewise, to encourage experimentation, observation, and decision-making of the participants, technology demonstration farms (TDFs) were established by dividing a 1-ha farm of the farmer-cooperator (FC) into two adjacent plots: the PalayCheck System plot, where all the PalayCheck component technologies and practices are implemented; and the farmer practice plot, where the participants carry out their normal farming practices. This is to allow comparisons between their normal practices from that of the new practices and technologies being introduced.

Aside from these, the participants also allotted 0.5 ha of their own farms wherein they may or may not apply the things they have learned in the FFS. Farmers learned from three types of activities. The discovery-based learning exercises allowed farmers to develop an understanding of the concepts and principles related to the topic as well as skills or practices. The field activities focused solely on teaching skills or practices. On the other hand, the conduct of agro-ecosystem analysis (AESAs) taught the FFS farmers how to make close observations of farm conditions and to analyze the interactions between the rice plants and other biotic and abiotic factors co-existing in the field.

The group-learning processes, specifically the group dynamic exercises, were designed to increase farmers' communication skills, boost self-confidence, and encourage team building (David, 2007). The process also involved field days where farmers from neighboring *barangays* (villages), LGU officials, and representatives from other government agencies, non-government organizations (NGOs), and people's organizations were invited and taught by the farmers. These field days served as avenues where farmers explain to the participants about their demonstration farms and the things they were doing in the FFS. Farmer participants were sometimes trained as facilitators for future field schools (Davis & Place, 2003; Davis, 2006).

This study examined the knowledge and skills acquired by the FFS farmers, the technology adoption behaviors of both the FFS and non-FFS farmers, the knowledge sharing done by the FFS farmers to the non-FFS farmers, and the socio-economic impacts of this training approach.

Farmers' Benefits from FFS

According to David (2007, p. 36), "the better internalization and retention of knowledge, attributed to the participatory and discovery learning process, coupled with social benefits of FFS training, are key justifications for the relatively high time, human, and cost investments required to implement FFS."

Several studies have shown the effectiveness of the FFS approach in increasing the level of knowledge and skills of the FFS farmers. Erbaugh et al. (2001) found that participation in FFS was effective in increasing both knowledge on IPM and the adoption of cowpea IPM strategies. Farmers' level of IPM knowledge had a very significant effect on technology adoption (Erbaugh et al., 2001; Mutandwa & Mpangwa, 2004; Erbaugh et al., 2010). Furthermore, David (2007) mentioned that FFS provided farmers with new skills and knowledge on cocoa integrated crop and pest management (ICPM), and FFS graduates generally demonstrated superior knowledge on cocoa ICPM as compared with non-FFS farmers. Thus, FFS increased the capacity of farmers to apply new technologies in their fields in order to assess the technologies' relevance to their specific circumstances, and to interact with researchers and extension workers for help when needed to solve a specific problem (Godrick & Khisa as cited in Muhammad et al., 2013). In this light, the FFS is an agricultural intervention that could boost agricultural productivity by allowing farmers, assisted by an expert, to experiment and learn from their own plots. In Cameroon, Africa, David (2007) reported that FFS provided farmers with new skills and knowledge in managing, and in increasing the income from their cocoa plantations. Same results were obtained in Peru where FFS farmers increased their average potato seed output/input ratio by approximately 52 percent of the average value

in a normal year (Erin et al., 2004). Increased knowledge from technological interventions provided opportunities for farmers to be creative in enabling them to solve farm-related issues, such as pest problems (Ooi, 1998). Improved knowledge translated to tangible benefits, such as reduced pesticide use and increased productivity (Erbaugh et al., 2001; Praneetvatakul & Waibel, 2006; van den Berg, 2004; David, 2007). Nevertheless, some studies showed mixed results regarding increased yield and productivity depending on the crop and period under investigation (IDB, 2010).

On the other hand, better communication skills (e.g., confidence in public speaking, negotiation skills) and increased social capital as means to collective action were some of the social benefits derived from the FFS. There are empirical studies showing mixed results regarding the social impacts of FFS. Greater group cohesion and leadership skills were documented in Africa (Mwagi, Onyango, Mureithi, & Mungai, 2003 as cited in David, 2007; Khisa & Heinemann, 2005 also cited in David, 2007) whereas other studies found no evidence of increased social capital (Tripp, Wijeratne & Piyadasa, 2005, as cited in David 2007). In addition, Muhammad et al. (2013) suggested that the results obtained from FFS included self-confidence and pride. Farmers were empowered in gaining greater control over their lives and realizing positive changes in their roles versus the role of professionals.

Likewise, the FFS literature has devoted attention on the challenges of scaling up. According to David (2007), the FAO team that developed the FFS approach recognized farmer-led expansion and farmer-to-farmer diffusion as instrumental in the scaling-up process and critical for making the approach more cost-effective and sustainable.

However, while the effectiveness of the diffusion process was a key factor in the success of the FFS approach, evidences have not been conclusive, partly due to data and methodological limitations of earlier studies (Feder et al., 2004). Likewise, studies on FFS diffusion showed disappointing results in terms of the effectiveness of farmer-to-farmer diffusion and the type of knowledge that FFS farmers shared (David, 2007).

Several researches conducted in West Africa (Simpson & Owens, 2002), the Philippines (Rola, Jamias, & Quizon, 2002), and Sri Lanka (Tripp, Wijeeratne, & Piyadasa, 2004) suggested that FFS farmers were more likely to share practices and skills and less likely to discuss abstract concepts and principles with other farmers. Hence, the effectiveness of farmer-to-farmer diffusion was called into question by the study conducted by Rola et al. in 2002, which showed that the knowledge of secondary recipients on key technical topics was not significantly better than that of the control group of farmers. Likewise, the study of Feder et al. (2004) showed that there was no significant diffusion of knowledge to other farmers who resided in the same villages as the trained farmers. These results implied the need for revision in the training procedures and curriculum to make the FFS approach more viable and effective.

On the other hand, it was observed in Ghana and Mali that some FFS farmers “established close, almost apprenticeship type, relations with one or two other farmers.” However, the literature provided little discussion on how the farmers shared knowledge (e.g., verbally, through apprentice arrangements, or by demonstration) and how these methods affected the knowledge retention and learning of farmers (Simpson & Owens, 2002; David, 2007).

METHODOLOGY

Survey interview was the primary method used to gather quality data in this case study. Out of the 32 FFS graduates, only 24 were interviewed because some have moved out of the area to work elsewhere, while one had died. Another group of 24 farmers served as a control or comparison group because of the unavailability of baseline data that could serve as bases to assess improvements from the FFS intervention. The control group was composed of farmers who did not attend the FFS but were assumed to have attended similar trainings conducted by PhilRice or other agencies. They were selected using systematic random sampling from a list obtained from the agricultural extension worker (AEW) assigned in the area and validated by the Committee on Agriculture

in-charge. The total sample size of 48 consisted of 24 FFS farmers and 24 non-FFS farmers.

To determine their level of knowledge on the PalayCheck System, the farmers rated 32 questions (negative and positive questions) on the PalayCheck System and its different component technologies under the seven crop management areas. A Likert scale was used with the following values: 1=strongly disagree, 2=disagree, 3=undecided, 4=agree, and 5=strongly agree. Likewise, they were asked to rate their perceived level of competencies on the different technologies using a Likert scale with the following values: 1=not competent, 2=less competent, 3=slightly competent, 4=competent, and 5=very competent. Open-ended questions were also asked to gather their perceived social impacts of the FFS.

To support the data gathered from the survey, key informant interviews (KIIs) were conducted using the guide questions. The key informants included FC and the AEWs who assisted in the FFS. Secondary data were also collected from project protocol, terminal reports, and other documents related to the STBF project.

Quantitative and qualitative data gathered from the primary and secondary sources were sorted, grouped, categorized, and analyzed. Data analysis used descriptive statistics such as frequency counts, percentages, mean, range, and standard deviation. Highlights of some farmers' testimonies were included to corroborate the findings.

RESULTS AND DISCUSSION

Socio-demographic Characteristics of the Respondents

Appendix 1 shows the socio-demographic characteristics of FFS farmers and non-FFS farmers. Non-FFS farmers were older than the FFS farmers. Majority (42%) of the FFS farmers were from 40 to 50 years old, while nine (38%) were above 50 years old, with a mean age of 48 years. Their age ranged from 23 to

65 years old. On the other hand, majority (42%) of the non-FFS farmers were above 50 years old, and only eight (33%) were 40 to 50 years old, with a mean age of 49 years. Their age ranged from 32 to 81 years old.

Majority were male and married for both groups of farmers. In terms of education, 50 percent of the FFS-participants were high school graduates as opposed to only two (8%) for the non-FFS farmers. Also, there were more college graduates (17%) among the FFS farmers, while there were more high school undergraduates (38%), college undergraduates (29%), and vocational graduates (17%) among the non-FFS farmers.

For farm size, both farmer-groups had equal number (42%) of farmers with 1.0 to 3.0 ha of land. More non-FFS farmers had farm sizes below 1 ha as compared with the FFS farmers. Further, four of the FFS farmers had above 3.0 ha farm sizes. For tenurial status, half (12) of the FFS farmers owned their farms, while only nine of the non-FFS farmers owned theirs. The rest (15) were tenants.

Farmers' Learning and Application of PalayCheck System Component Technologies

Appendix 2 shows the PalayCheck System component technologies that the FFS farmers have learned. When asked about technologies covered in the FFS, all of them recalled the use of high quality seeds of a recommended variety; planting of sufficient number of healthy seedlings; use of leaf color chart (LCC) and minus-one element technique (MOET); use of controlled irrigation (CI); identification of insect pests (IPs) and natural enemies (NEs), IPM, AESA, and the cutting and threshing of the crop at the right time. These were mostly recalled as majority of them learned new knowledge and skills on these technologies.

The other technologies recalled by more than 90 percent of the participants were plowing the field 3 to 4 weeks before transplanting; planting synchronously after a one-month fallow

period; management of golden apple snail (GAS); and management of field rats. Likewise, 79 percent of them recalled the management of weeds, while 75 percent recalled the use of muriate of potash (MOP).

The technology that only 58 percent of the farmers recalled was the use of hybrid rice (HR). This may be attributed to the complexity and applicability of the HR technology given the farmers' problems with irrigation water. The use of HR requires a good source of irrigation water because it needs more water as compared with inbred varieties.

As to their knowledge on new technologies, all of them acquired new knowledge on plowing the field 3 to 4 weeks before transplanting; planting synchronously after a fallow period of one month; planting sufficient number of healthy seedlings; using LCC, MOET, MOP, and CI; proper disease diagnosis, and AESA. More than 90 percent also mentioned that they acquired new knowledge on the use of high-quality seeds of a recommended variety, cutting and threshing of the crop at the right time, identification of IPs and NEs, and IPM. Most of them also learned new knowledge on managing field rats, GAS, and weeds. Only half of them learned new knowledge on the use of HR and in harrowing the field at least twice at a one-week interval. Farmers actually harrowed their fields twice but not at one-week interval owing to the unavailability of irrigation water in the area. They learned the science behind why a one-week interval between harrowing was recommended.

In relation with technology adoption behavior of farmers, the level of knowledge on the different technologies was compared between the FFS farmers and non-FFS farmers. The FFS farmers obtained a higher average score of 4.43 (agree) as compared with the average score of 3.25 (undecided) of the non-FFS farmers. Looking at the different crop management areas, the non-FFS farmers had the lowest scores in nutrient management implying

that majority of them did not have the right knowledge on this technology. Likewise, they had relatively lower scores about the PalayCheck System as most of them never heard of it (Table 1). This low level of knowledge influenced their technology adoption behaviors.

Table 1. Average knowledge test score among the FFS farmers and non-FFS farmers

PALAYCHECK CROP MANAGEMENT AREA	FFS FARMERS (n=24)	NON-FFS FARMERS (n=24)
1. Overview of the PalayCheck System	4.42	2.54
2. Variety and seed selection	4.67	3.02
3. Land preparation	4.35	3.50
4. Crop establishment	4.35	3.90
5. Nutrient management	4.40	2.62
6. Water management	4.39	3.18
7. Pest management	4.40	3.45
8. Harvest management	4.49	3.83
Average	4.43	3.25

Legend: 1=strongly disagree, 2=disagree, 3=undecided, 4=agree, and 5=strongly agree

These findings supported the claims of Erbaugh et al. (2001) and David (2007) that participation in FFS was an effective mechanism for increasing both the knowledge on IPM and ICPM and the adoption of integrated cowpea-specific IPM strategies as compared with the non-participants. Likewise, the farmer's level of IPM knowledge had a very significant effect on technology adoption (Erbaugh et al., 2001; Mutandwa & Mpangwa, 2004; David, 2007; Erbaugh et al., 2010).

Other factors that influenced technology adoption behaviors were their level of skills or competencies on these technologies. The FFS farmers had higher levels of skills and competencies on the technologies as compared with the non-FFS farmers, primarily because they had tried using these technologies while still undergoing the FFS (Appendix 3).

After the implementation of the FFS in 2012, most of the participants adopted the PalayCheck System component technologies learned in the FFS, consistent with their level of knowledge, skills, and competencies (Appendix 4). This finding was similar to the experiences in all five Eastern and South African countries wherein there was immediate uptake of the technology by participants because trainees discovered, learned, and then integrated positive ideas into their own production systems (Anandajayasekeram et al., 2001). Similarly, the immediate uptake of poultry production technologies (e.g., vaccine, housing, and feeding) by farmers in the poultry FFS in Kakamega, Kenya was a good example of such farmer behavior (Mweri, 2001).

In the 2013 cropping seasons, all of the farmers used high-quality seeds of recommended varieties, followed the proper way of land preparation, transplanted at 25 cm x 25 cm planting distance to obtain sufficient number of healthy seedlings, used CI, and harvested and threshed their crops at the right time. Ninety-two percent adopted nutrient management technologies (i.e., use of LCC to determine when to apply nitrogen fertilizer) and pest management technologies (i.e., proper identification of insect pests and natural enemies, proper diagnosis of diseases).

Majority of FFS farmers were no longer using pesticides heavily to control pests and diseases. They used an integrated approach in management and applied pesticides judiciously only when necessary. This contrasted with majority of the non-FFS farmers who still heavily used pesticides to control pests (Appendix 4). This was supported by the findings of Rola (1997) in other countries that showed that lack of knowledge about the effects of pests on the cotton crop contributed to the overuse of chemical pesticides.

Further, the technologies, with only 50 percent adoption, were the use of HR and synchronous planting. Only half (50%) of them used HR because the technology entailed higher cost for seeds and inputs as compared with using inbred varieties. Likewise, only half (50%) of them were able to adopt synchronous planting because of the unavailability of irrigation water in some areas. They were not able to establish their farms for planting on time. On the other hand, only a few (25%) of the non-FFS farmers adopted the HR technology. Only 63 percent adopted the use of high quality seeds of a recommended variety primarily because of the relatively higher seed cost as compared with their own saved seeds. Some (63%) of them were already using certified seeds before because of the seed subsidy program of the government. However, they did not know the science behind using quality rice seeds. They did not realize that the yield advantage of using high-quality seeds could only be attained if all the crop management areas, which are integrated and interrelated, were properly implemented. Likewise, 67 percent harrowed their fields twice at one-week interval unlike before when majority of them just prepared their lands just one week before transplanting. Nobody adopted the nutrient management technologies such as the use of LCC, MOET, and MOP because of unavailability of MOET kits and the high cost of MOP (Appendix 4).

The case study found that the FFS farmers acquired new knowledge and skills in managing their rice crops that subsequently increased their yields. Table 2 shows the yield and gross income differences between FFS and non-FFS farmers for two cropping seasons in 2013. The FFS farmers had more than 1 ton/ha increase in yield; hence, translating to more income of about Php47,710 in one year. The increase in productivity and profitability of the FFS farmers was attributed to their adoption of the different technologies taught in the FFS. These results were supported by the findings of David (2007) showing that FFS farmers in Cameroon in Africa increased their yields and income by adopting the cocoa IPM strategies. Moreover, Erin et al. (2004) found that Peruvian farmers who participated in the FFS were able to raise their average potato seed output/input ratio by approximately 52 percent of the average value in a normal year.

Table 2. Yield and gross income differences between FFS and non-FFS farmers for two cropping seasons (CY 2013)

ITEM	FFS FARMERS (n=24)	NON-FFS FARMERS (n=24)	DIFFERENCE BETWEEN FFS AND NON-FFS FARMERS
Average yield (t/ha) in the dry season (DS) of 2013	6.42	5.32	1.10
Average yield (t/ha) in the wet season (WS) of 2013	5.08	4.05	1.03
Average yield for 1 year (WS and DS 2013) (t/ha)	5.75	4.68	1.07
Average gross income (PhP) DS 2013	115,560.00	90,440.00	25,120.00
Average gross income (PhP) WS 2013	91,440.00	68,850.00	22,590.00
Total gross income (PhP) for 1 year (WS and DS 2013)	207,000.00	159,290.00	47,710.00

Knowledge Diffusion of FFS Farmers

The effectiveness of the diffusion process is one of the key factors for the success of the FFS approach. If information diffuses extensively from farmer to farmer through informal communication, higher impact could be achieved at a reasonable cost. The multiplier effect of knowledge diffusion can extend technology promotion and use, but the effect is quite hard to account for because it is often undocumented. This study was able to determine the knowledge sharing done by FFS farmers to non-FFS farmers but not with the knowledge sharing done with their families, relatives, friends, and other farmers.

All of the FFS farmers claimed that they shared some of the technologies learned in the FFS to other non-FFS farmers. All of them shared the technologies on the use of high quality seeds, planting synchronously, and IPM. Majority of them also shared other pest management and nutrient management technologies primarily because they themselves benefitted in adopting these technologies by reducing their pesticide cost and increasing their income. However, many of them (37%) did not share the use of HR technology owing to its complexity and non-applicability to their situations.

Majority of the FFS farmers shared technologies to non-FFS farmers because they wanted to share the benefits of using these technologies (Appendix 5). Moreover, knowledge sharing was done by both farmer-groups to their own family members, relatives, friends, and to other farmers, though it was not determined what specific technologies they have shared. These results were corroborated by the FC during the KII who said that walk-in farmers from nearby and distant *barangays* were inquiring about certified seeds, LCC, and MOET. Furthermore, the FC shared his knowledge during informal discussions with other farmers and visitors in his farm. Moreover, the FFS farmers shared what they knew to hundreds of farmers and other rice stakeholders during the farmers' field day and forum. Such knowledge sharing created the multiplier effect of knowledge diffusion, mainly through farmer-to-farmer diffusion.

This knowledge diffusion from FFS farmers was also one of the factors why non-FFS farmers adopted some of the technologies. While this study did not analyze in-depth how these technologies were diffused (Feder et al., 2004) or while knowledge sharing may not have been as intensive as in formal trainings, still there was knowledge diffusion from FFS farmers to non-FFS farmers. This finding was supported by the study of David (2007), which showed that FFS farmers in Cameroon, Africa were more likely to provide other farmers with information on how to implement management practices rather than share knowledge about concepts and principles of cocoa ICPM.

Social Impacts of the FFS

While there have been considerable evidences that FFS contributes to improved knowledge (Erbaugh et al., 2001; Rola et al., 2002; Erin et al., 2004; Mutandwa & Mpangwa, 2004; David, 2007; Erbaugh et al., 2010), studies on the social impacts of FFS had been less conclusive. This is probably because, according to David (2007), measuring the social impacts of FFS poses major methodological challenges.

This case study asked FFS farmers on their perception on the social benefits of FFS. Table 3 shows that majority (84%) of them perceived that they improved their critical thinking and decision-making skills through AESA. Doing AESA in the FFS led many farmers to base their farm management decisions on observations rather than on habit or recommendations. The FC even commented: "Before, I heavily used chemicals to control pests. I lost a lot of money in calendar spraying. I was harming myself and the environment. Now, I make critical observations on the rice crops by looking at the dynamics of insect pests and natural enemies before deciding whether to spray or not."

Also, 75 percent of them claimed that they were now able to arrive at a consensus, their cooperative behavior had improved, and their social cohesion and solidarity were enhanced. In fact, the group being formally organized into a cooperative showed high spirit of solidarity and cooperativism as a result of the FFS. Because they have become a cooperative, the FFS farmers continued to meet with each other aside from their regular meetings. Likewise, their networks and linkages have expanded to cover stronger partnerships with the LGU-Victoria, the Provincial Government of Tarlac, the DA-Regional Field Office 3, PhilRice, Central Luzon State University, NGOs, and some micro-financing institutions. The cooperative also maintains good partnerships with input suppliers. These claims were corroborated by the AEWs assigned in the area during the KII.

Because of the different group dynamics implemented in the FFS, their interpersonal relationship skills were also enhanced. Furthermore, because of the weekly AESA they conducted in

Table 3. Social benefits from FFS as perceived by the participants

SOCIAL BENEFITS AND CHANGES	NO.	%
Our critical thinking and decision-making skills improved through the agro-ecological system analysis (AESA).	20	84.2
We were always able to arrive at group consensus.	18	75.0
Our cooperative behaviors improved.	18	75.0
Our social cohesion and solidarity were enhanced.	15	62.5
Our networks and linkages increased.	15	62.5
Our interpersonal relationships skills were enhanced.	14	58.3
Our confidence in public speaking was developed and enhanced.	14	58.3
Our leadership skills were developed and further honed.	12	50.0
We developed a positive attitude towards the whole PalayCheck System, especially on experiential group learning.	12	50.0

Note: Multiple responses

which the participants not just observed but reported and defended their observations in front of their fellow farmers and the facilitators, their confidence in public speaking was developed and enhanced. One farmer said: “Before I joined the FFS, I was so timid. I could not even address people in a group, but now I am confident. I can now present in front of many people and freely talk with anyone with confidence.”

According to the AEWs who facilitated the FFS, most of the farmers presented the results of their demonstration farms and variety trials to hundreds of farmers and other stakeholders during the Farmers’ Field Day and Forum conducted two weeks before the end of every cropping season.

Half of them claimed that their leadership skills were developed and further honed. The terminal report showed that some of them emerged as leaders in their villages. They initiated the establishment of 'baby variety trials' and recruited farmers in their areas to observe the performance of these varieties. Also, as evidence of their good leadership, the Masalasa-STBF Marketing Cooperative was in good standing and was continuously growing in membership. Lastly, half of them (the 12 original FFS farmers) claimed that they have developed a positive attitude towards the whole PalayCheck System, especially on experiential group learning.

All these social benefits could have accrued because of the longer implementation of the FFS (i.e., four seasons unlike other FFS that was implemented for one cropping season only) that enabled the farmers to stay together longer. These findings supported the study of David and Asamoah (2011) on the impact of FFS on human and social capital of Ghanaian cocoa farmers. Results showed that FFS had developed the capacity of farmers in decision making over resources management by inculcating a spirit of self-help among the farming community. Due to confidence building of the FFS, farmers have become good public speakers, and thus, could raise their voices for their rights at any forum. The FFS developed leadership qualities among the participants besides enabling them to resolve conflicts by themselves.

And lastly, the FFS had helped them improve their families' health through better housing facilities and children education as a result of their elevated social status in society. Five case studies of Anandajayasekeram et al. (2001) in East and South Africa showed that FFS contributed to changes in attitudes and perceptions of participants, and facilitated the development of new relationships among farmers, researchers, extension workers, and community development personnel. Lastly, Van de Fliert (1993 as cited in Anderson & Feder, 2004), showed that through group interactions, FFS farmers sharpened their decision-making abilities and their leadership, communication, and management skills.

CONCLUSIONS AND RECOMMENDATIONS

This case study provided empirical evidences on the effectiveness of FFS as a training approach, the potential contribution of farmer-to-farmer diffusion in the scaling up process, and the positive social and economic impacts of this approach.

The FFS was shown to be effective as a discovery-based learning approach. It provided farmers with the new knowledge and skills on the PalayCheck System, especially in using high quality seeds, in properly preparing the land before transplanting, in properly managing nutrients using LCC and MOET, in properly managing pests employing the concepts and principles of IPM, and in the timely harvesting and threshing of rice crops. Generally, the FFS farmers demonstrated superior knowledge and level of competence as evidenced by their relatively higher scores on the whole PalayCheck System and component technologies as compared with the non-FFS farmers. Most of the FFS farmers applied their knowledge and skills acquired from the training to their own farms, which translated to higher yields and incomes.

The important role of farmers in knowledge diffusion was demonstrated. All the FFS farmers were able to share their knowledge to their families, relatives, friends, and to other farmers. Results indicated that FFS can be a good avenue for increasing farmers' human and social capital by improving their technical knowledge and skills; improving their ability to make good decisions through critical observations; applying new knowledge to solving other problems; improving social cohesion, solidarity, and cooperativeness; communicating better; and building self-confidence and leadership skills to form groups in support to rice production activities as well as other livelihood initiatives.

However, these outcomes can be sustainable only with appropriate support mechanisms (e.g., from local and national level institutions) and policies for continuous capacity development. The key challenge is to link the FFS group with other rural development initiatives of other government or non-

government agencies that promote farmer empowerment. It is also useful to develop and/or strengthen other farmer groups to sustain the gains created by FFS, and eventually, replicate similar interventions in other villages. The LGU-Victoria should continue to support such initiatives so that more and more farmers in the other *barangays* will be trained and thereby increase their yields and incomes.

PhilRice should continue its development efforts by implementing more FFSs nationwide in close partnerships with the different LGUs and RFOs; hence, increasing productivity and eventually uplifting the lives of poor farmers in rural communities.

Finally, considering the limitations of this study, the following are recommended:

- Other methods must be employed because formal surveys alone cannot provide the kind of in-depth analyses required to understand diffusion pathways, farmer experimentations, and empowerment. Qualitative studies using diffusion and social network mapping, focus group discussions, and participant observation, among other methods, are needed to complement formal surveys.
- More in-depth studies are needed on farmer-to-farmer diffusion processes of agricultural knowledge and practices to fully understand this phenomenon. Areas of research can include the extent of the farmers' knowledge sharing and diffusion, which includes questions such as how many farmers have they shared with? With whom they have shared their learnings? And, what they have shared to others (e.g., whole concepts and principles, or just shared management practices, etc.)?
- Cross-cultural comparative studies could determine the importance of socio-cultural factors in determining impact, particularly technology diffusion and adoption behaviors of farmers.

- Longitudinal studies would also be very useful in evaluating and documenting long-term changes in the knowledge, attitudes, and skills of FFS farmers.
- There is also a rich area for research in conducting rigorous studies evaluating the ultimate impacts of the FFS on PalayCheck System on the lives of the farmers, and how it can contribute to the sustained increase in rice productivity of the country.

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LITERATURE CITED

- Anderson, J. & Feder, G. (2004). Agricultural extension: Good intentions and hard realities. *The World Bank Research Observer*, 19(1): 41-58.
- Anandajayasekeram, P., Mweri, A. M., Zishiri, O. J., Odogola, W., Mkuchu, M. & Phiri, M. (2001). Farmer Field Schools: Synthesis of experience and lessons from FARMESA member countries. Harare, Zimbabwe: FARMESA.
- David, S. (2007). Learning to think for ourselves: Knowledge improvement and social benefits among Farmer Field School participants in Cameroon. *Journal of International Agricultural and Extension Education*, 14(2): 35-49.

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- David, S. & Asamoah, C. (2011). The impact of Farmer Field Schools on human and social capital: A case study from Ghana. *Journal of Agricultural Education and Extension*, 17(3): 239-252.
- Davis, K. (2006). Farmer Field Schools: A boon or bust for extension in Africa? *Journal of International Agricultural and Extension Education*, 13(1): 91-97.
- Davis, K. & Place, N. (2003). Non-governmental organizations as an important actor in agricultural extension in semiarid East Africa. *Journal of International Agricultural and Extension Education*, 10(1): 31-36.
- Erbaugh, J.M., Donnermeyer, J., Amujal, M., & Kidoido. M. (2010). Assessing the impact of Farmer Field School participation on IPM adoption in Uganda. *Journal of International Agricultural and Extension Education*, 17(3): 5-17. Retrieved from DOI: 10.5191/jiaee.2010.17301 on January 15, 2014.
- Erbaugh, J. M., Donnermeyer, J. & Kibwika, P. (2001). Evaluating farmers' knowledge and awareness of integrated pest management (IPM): Assessment of the IPM collaborative research support project in Uganda. *Journal of International Agricultural and Extension Education*, 8(1): 47-53.
- Erin, G. E., Sadoulet, E., de Janvry, A., Murgai, R. & Ortiz, O. (2004). The impact of Farmer Field Schools on knowledge and productivity: A study of potato farmers in the Peruvian Andes. CUDARE Working Paper 963. CA: Department of Agricultural and Resource Economics, University of California Berkeley.
- Feder, G., Murgai, R., & Quizon, J. B. (2004). The acquisition and diffusion of knowledge: The case of pest management training in Farmer Field Schools, Indonesia. *Journal of Agricultural Economics*, 55(2): 221-243.
- Ilar, G. Y. (2012). STBF on increasing yield through utilization of quality rice seeds of recommended varieties. Terminal report. Philippine Rice Research Institute, Maligaya, Science City of Muñoz, Nueva Ecija.
- Inter-American Development Bank (IDB). (2010). Assessing the effectiveness of agricultural interventions. Retrieved from www.iadb.org/pub on January 15, 2014.

- Muhammad, S., Chaudhry, K. M., Khatam, A. & Ashraf, I. (2013). Impact of Farmer Field Schools on social wellbeing of farming community in Khyber Pakhtunkhwa, Pakistan. *The Journal of Animal & Plant Sciences*, 23(1): 319-323. Retrieved from <http://www.thejaps.org.pk/docs/v-23-1/49.pdf> on January 15, 2014.
- Mutandwa, E. & Mpangwa, J. F. (2004). An assessment of the impact of Farmer Field Schools on integrated pest management dissemination and use: Evidence from smallholder cotton farmers in the low veld area of Zimbabwe. *Journal of Sustainable Development in Africa*, 6 (2): 245-253.
- Mweri, A. (2001). Farmer Field Schools (FFS): Experience from Kenya. In P. Anandajayasekeram et al. (Eds.). *Farmer Field Schools: Synthesis of Experiences and Lessons from FARMESA Member Countries*. Harare, Zimbabwe: FARMESA
- Ooi, P. A. C. (1998). Beyond the Farmer Field School: IPM and empowerment in Indonesia. Paper presented at the International Conference of IPM - Theory and Practice, Developing Sustainable Agriculture, Guangzhou, China, June 15-20, 1998.
- Praneetvatakul, S. & Waibel, H. (2006). Impact assessment of Farmer Field Schools using a multi-period panel data model. Paper presented at the International Association of Agricultural Economist Conference, Gold Coast, Australia, August 12-18, 2006.
- PhilRice. (2008). PalayCheck Booklet. Nueva Ecija, Philippines: The Philippine Rice Research Institute.
- Quizon, J., Feder, G., & Murgai, R. (2001). Fiscal sustainability of agricultural extension: The case of the farmer field school approach. *Journal of International Agricultural and Extension Education* 8 (1): 13-24.
- Rola, A. C. (1997). The socio-economic component of IPM. FAO Proceedings of Regional Consultative Workshop on IPM. SEARCA, Los Baños, Laguna, Philippines, June 17-21, 1997, pp. 17-21.
- Rola, A. C., Jamias, S. B. & Quizon, J. B. (2002). Do farmer field school graduates retain and share what they learn? An investigation in Iloilo, Philippines. *Journal of International Agricultural and Extension Education*, 9(1): 65-76.

- Simpson, B. & Owens, D. M. (2002). Farmer Field Schools and the future of agricultural extension in Africa. *Journal of International Agricultural and Extension Education*, 9(2): 29-36.
- Tripp, R., Wijeraratne, M., & Piyadasa, V. H. (2004). What should we expect from FFS? A Sri Lanka Case study. *World Development*, 33(10): 1705-1720.
- van den Berg, H. (2004). IPM FFS: A synthesis of 25 impact evaluations. Report prepared for the Global IPM Facility, Wageningen, The Netherlands.

APPENDICES

Appendix 1. Socio-demographic characteristics of the respondents

SOCIO-DEMOGRAPHIC CHARACTERISTICS	FFS FARMERS (n=24)		NON-FFS FARMERS (n=24)	
	No.	%	No.	%
Age				
Below 40 years old	5	20.8	6	25.0
40 to 50 years old	10	41.7	8	33.3
Above 50 years old	9	37.5	10	41.7
Mean	47.71 years		49.25 years	
Standard deviation	11.56 years		12.60 years	
Range	23–65 years		32–81 years	
Sex				
Male	23	95.8	22	91.7
Female	1	4.2	2	8.3
Marital status				
Single	3	12.5	3	12.5
Married	21	87.5	18	75.0
Widow/Widower	0	0.0	3	12.5
Educational attainment				
Elementary graduate	3	12.5	1	4.2
High school undergraduate	2	8.3	9	37.5
High school graduate	12	50.0	2	8.3
College undergraduate	1	4.2	7	29.2
College graduate	4	16.7	1	4.2
Vocational graduate	2	8.3	4	16.7

Appendix 1. Socio-demographic characteristics...(Continued)

SOCIO-DEMOGRAPHIC CHARACTERISTICS	FFS FARMERS (n=24)		NON-FFS FARMERS (n=24)	
	No.	%	No.	%
Farm size				
Small (below 1.0 ha)	10	41.7	14	58.3
Medium (1.0–3.0 ha)	10	41.7	10	41.7
Large (above 3.0 ha)	4	16.7	0	0.0
Mean	2.07 ha		1.32 ha	
Standard deviation	1.52 ha		0.69 ha	
Range	0.5–6.5 ha		0.5–2.90 ha	
Farm ownership				
Owned	12	50.0	9	38.5
Mortgaged	1	4.2	0	0.0
Tenant/Rented	11	45.8	15	62.5

Appendix 2. PalayCheck System component technologies covered in FFS as recalled by the participants

PALAYCHECK SYSTEM COMPONENT TECHNOLOGY	% WHO MENTIONED THAT THE TECHNOLOGY WAS COVERED IN FFS	% WHO ACQUIRED NEW KNOWLEDGE ON THE COMPONENT TECHNOLOGY
Variety and Seed Selection		
Use of high quality seeds of a recommended variety	100	96
Use of hybrid rice	58	50
Land Preparation		
Plow the field 3–4 weeks before transplanting	96	100
Harrow the field at least two times at one-week interval	83	50
Crop Establishment		
Plant synchronously after a fallow period of 1 month	96	100
Plant sufficient number of healthy seedlings	100	100
Nutrient Management		
Use of leaf color chart (LCC)	100	100
Use of minus-one element technique (MOET)	100	100
Use of muriate of potash (MOP)	75	100
Water Management		
Use of controlled irrigation (CI)	100	100

Appendix 2. PalayCheck System component... (Continued)

PALAYCHECK SYSTEM COMPONENT TECHNOLOGY	% WHO MENTIONED THAT THE TECHNOLOGY WAS COVERED IN THE FFS	% WHO ACQUIRED NEW KNOWLEDGE ON THE COMPONENT TECHNOLOGY
Pest Management		
Identification of natural enemies (NEs)	100	92
Identification of insect pests (IPs)	100	92
Proper diagnosis of diseases	88	100
Integrated pest management (IPM)	100	92
Agro-ecological system analysis (AESAs)	100	100
Management of golden apple snail (GAS)	96	75
Management of weeds	79	67
Management of field rats	92	83
Harvest Management		
Cut and thresh the crop at the right time	100	96

Appendix 3. Level of skills and competencies of the FFS and non-FFS participants on the PalayCheck component technologies

PALAYCHECK SYSTEM COMPONENT TECHNOLOGY	LEVEL OF COMPETENCIES OF FFS FARMERS	LEVEL OF COMPETENCIES OF NON-FFS FARMERS
Variety and Seed Selection		
Use of high quality seeds of a recommended variety	4.58	3.21
Use of hybrid rice	3.33	2.42
Land Preparation		
Plow the field 3–4 weeks before transplanting	4.50	3.71
Harrow the field at least two times at one-week interval	4.58	3.71
Crop Establishment		
Plant synchronously after a fallow period of 1 month	4.54	2.0
Plant sufficient number of healthy seedlings	4.58	2.0
Nutrient Management		
Use of leaf color chart (LCC)	4.29	1.0
Use of minus-one element technique (MOET)	3.38	1.0
Use of muriate of potash (MOP)	3.33	1.0
Water Management		
Use of controlled irrigation (CI)	4.54	2.75

Appendix 3. Level of skills...(Continued)

PALAYCHECK SYSTEM COMPONENT TECHNOLOGY	LEVEL OF COMPETENCIES OF FFS FARMERS	LEVEL OF COMPETENCIES OF NON-FFS FARMERS
Pest Management		
Identification of natural enemies (NEs)	4.29	1.79
Identification of insect pests (IPs)	4.38	1.75
Proper diagnosis of diseases	4.33	1.83
Integrated pest management (IPM)	3.79	1.50
Agro-ecological system analysis (AESA)	4.13	1.25
Management of golden apple snail (GAS)	4.29	1.50
Management of weeds	3.79	1.25
Management of field rats	4.33	1.17
Harvest Management		
Cut and thresh the crop at the right time	4.58	3.21

Legend: 1 = not competent; 2=less competent; 3=slightly competent; 4=competent; 5=very competent

Appendix 4. Adoption of PalayCheck System component technologies by FFS and Non-FFS farmers

PALAYCHECK SYSTEM COMPONENT TECHNOLOGY	% OF FFS FARMERS WHO ADOPTED THE TECHNOLOGY	% OF NON-FFS FARMERS WHO ADOPTED THE TECHNOLOGY
Variety and Seed Selection		
Use of high quality seeds of a recommended variety	100	63
Use of hybrid rice	50	25
Land Preparation		
Plow the field 3–4 weeks before transplanting	100	29
Harrow the field at least two times at one-week interval	100	67
Crop Establishment		
Plant synchronously after a fallow period of 1 month	50	50
Plant sufficient number of healthy seedlings	100	29
Nutrient Management		
Use of leaf color chart (LCC)	92	0
Use of minus-one element technique (MOET)	79	0
Use of muriate of potash (MOP)	83	0
Water Management		
Use of controlled irrigation (CI)	100	58

Appendix 4. Adoption of PalayCheck...(Continued)

PALAYCHECK SYSTEM COMPONENT TECHNOLOGY	% OF FFS FARMERS WHO ADOPTED THE TECHNOLOGY	% OF NON-FFS FARMERS WHO ADOPTED THE TECHNOLOGY
Pest Management		
Identification of natural enemies (NEs)	92	21
Identification of insect pests (IPs)	92	21
Proper diagnosis of diseases	92	4
Integrated pest management (IPM)	83	13
Agro-ecological system analysis (AESAs)	71	4
Management of golden apple snail (GAS)	67	8
Management of weeds	58	8
Management of field rats	71	21
Harvest Management		
Cut and thresh the crop at the right time	100	29

**Appendix 5. Diffusion of knowledge and practices acquired by the
FFS farmers to the Non-FFS farmers**

PALAYCHECK SYSTEM COMPONENT TECHNOLOGY SHARED BY THE FFS FARMERS	% OF FFS FARMERS WHO SHARED THE COMPONENT TECHNOLOGY TO FARMERS	% OF NON- FFS FARMERS WHO HAVE SHARED THE TECHNOLOGY
Variety and Seed Selection		
Use of high quality seeds of a recommended variety	100	87
Use of hybrid rice	63	50
Land Preparation		
Plow the field 3–4 weeks before transplanting	92	58
Harrow the field at least two times at one-week interval	92	58
Crop Establishment		
Plant synchronously after a fallow period of 1 month	100	83
Plant sufficient number of healthy seedlings	83	79
Nutrient Management		
Use of leaf color chart (LCC)	100	87
Use of minus-one element technique (MOET)	92	87
Use of muriate of potash (MOP)	88	79
Water Management		
Use of controlled irrigation (CI)	92	83

Appendix 5. Diffusion of knowledge...(Continued)

PALAYCHECK SYSTEM COMPONENT TECHNOLOGY SHARED BY THE FFS FARMERS	% OF FFS FARMERS WHO SHARED THE COMPONENT TECHNOLOGY TO FARMERS	% OF NON- FFS FARMERS WHO HAVE SHARED THE TECHNOLOGY
Pest Management		
Identification of natural enemies (NEs)	96	87
Identification of insect pests (IPs)	96	87
Proper diagnosis of diseases	92	83
Integrated pest management (IPM)	100	87
Agro-ecological system Analysis (AESA)	88	87
Management of golden apple snail (GAS)	67	58
Management of weeds	79	67
Management of field rats	79	58
Harvest Management		
Cut and thresh the crop at the right time	92	87

Addressing Food Security: *Saba* Banana and Rootcrops as Alternative Food Staples to Rice in Quezon Province, Philippines

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ABSTRACT. The Philippines considers rice self-sufficiency as vital to food security; hence, possible alternative food staples are being identified in case of persistent shortfalls in domestic rice production. This paper explores the potential of *Saba* (cardava) banana, sweet potato, potato, yam, and cassava as alternative staples for the local communities in the Quezon province, Philippines, which grow all these crops. Socio-economic surveys of 375 farmers, 82 traders, and 625 consumers were conducted in 2013 but covered crop year 2012. Results showed that *Saba* banana, sweet potato, and cassava had the highest demand among the five crops based on per capita consumption. These crops ranked top three in terms of possible substitutes for rice. However, willingness to substitute is largely for breakfast and relatively less for other meals. While findings indicated a demand for alternative crops, average yield per hectare and production per farm of each of the five crops were low as compared with the provincial average. Despite low production levels, a greater proportion of total produce was marketed reflecting the crops' marketability and potential as additional income source. Recommendations on how to intensify production and to encourage rice substitution particularly with *Saba* banana, sweet potato, and cassava are forwarded.

Keywords: *Saba* banana, root crops, rice substitution, consumption, marketing

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INTRODUCTION

At the 1996 World Food Summit, food security was defined as a condition “when all people at all times have access to sufficient, safe, and nutritious food to maintain a healthy and active life.” It involves complex and multifaceted issues influenced by culture, environment, and geographic location (The Economist Intelligence Unit, 2016).

Food security can be measured by various means. The Philippines uses the Food Security Index (FSI), which involves three aspects, namely: food availability, accessibility, and utilization (PhilFSIS, 2013). PhilFSIS (2013) defines food availability as the dimension that addresses the supply side of food security, wherein indicators measure quantities of quality food from domestic agriculture production or import, while food accessibility refers to the economic and physical resources needed by individuals to acquire appropriate foods for a nutritious diet. Meanwhile, food utilization, according to PhilFSIS (2013) is “the ability of the human body to ingest and metabolize food through adequate diet, clean water, good sanitation, and health care to reach a state of nutritional well-being where all physiological needs are met.” A fourth dimension relates to the stability of the food and nutrition status, which emphasizes the vulnerability of and risks faced by households as well as their resilience by way of adopting livelihood strategies and coping mechanisms when they are hit by temporary negative shocks (Pieters, Guariso, & Vandeplass, 2013).

However, Cabanilla (2006) noted that the country’s objectives of food security has been equated with self-sufficiency in rice and corn. The Philippines’ high reliance on the sufficient supply of rice, in particular, can still be gleaned from the Philippines Food Staples Self-sufficiency Program (FSSP) 2011-2016. The FSSP’s target was to achieve rice self-sufficiency for the country by 2013 and maintain it through 2016 (Department of Agriculture, 2012). The program argues that self-sufficiency in rice must be pursued since it can only be bought from few sources such as

Thailand, Vietnam, Pakistan, India, and the USA. Demand for rice is also growing in non-traditional rice-eating African countries; hence, sufficient quantities of rice in the world market cannot be assured.

However, rice production systems, as stated in the FSSP, are vulnerable to climate change including those in large producing countries like Vietnam and Thailand. Consequently, rice exports of these countries are expected to decline, and this may limit the amount that could be bought by importing countries like the Philippines. Less importation may lower the country's buffer stock, which could not be augmented from local production because of the series of El Niño and La Niña phenomena that historically affects rice production. Until 2016, the country remains below the rice self-sufficiency level.

The FSSP 2011-2016 emphasized the importance of non-rice food staples such as white corn, cassava, sweet potato, and *Saba* (Cardava) banana. These are usually eaten solely or in combination with rice in some rural areas in the Philippines. The share of these items in total food intake has declined over time, but they continue to be significant in many local diets, particularly for households living in remote areas and in adverse environments. Corollary to this, Portilla and Pagaduan (2014) mentioned that scientists have identified rice alternative staples such as *Saba* banana, cassava, sweet potato, taro, and yam.

Among the strategies identified in the FSSP 2011-2016 is the management of the demand of food staples by diversifying consumption and intensifying the production of other staples. The program encourages planting of non-rice staples and raising productivity to address food security at the household level. This food security problem is especially true for farmers in less favorable environments such as rainfed lowlands, low-elevation uplands, and higher-elevation rice-based areas.

The five alternative crops are grown and also serve as staples in other countries. For instance, sweet potato ranks sixth as food crop after rice, wheat, potatoes, maize, and cassava

particularly in developing countries where 95 percent of the global sweet potato output is produced (International Potato Center, n.d.). Yam is planted in tropical regions worldwide such as in Southeast Asia, but production is heavily concentrated in West Africa accounting for about 90 percent of the total output. However, yam is normally raised as an intercrop (CGIAR Technical Advisory Committee, 1997). Taro is also an important crop in the Asia-Pacific region where it provides food security and serves as a cash crop according to the Food and Agriculture Organization (Onwueme, 1999). The Philippines is among the biggest producers of taro along with other Asian countries such as China, Japan, and Thailand. Meanwhile, cassava is grown widely in African countries such as Nigeria and Ghana (Stumpf, 1998). Another significant crop in Nigeria is plantain banana, which is not only a staple food for rural and urban households but also a source of income particularly for smallholder farmers (Nwaiwu, Eze, Amaechi, & Osuagwu, 2012). Because of the importance of highland bananas as starchy food and cash crop, the Government of Uganda in its National Development Plan 2010-2015 has targeted high agricultural productivity for key staple crops such as bananas to alleviate poverty in rural areas and to ensure national food security (Nyombi, 2013).

In the Philippines, *Saba* banana, cassava, sweet potato, taro, and yam are all raised in Quezon, the country's sixth largest province. Quezon has a total land area of 870,660 ha, 59 percent (513,681 ha) of which is classified as agricultural (Quezon Provincial Government, n.d.). Coconut is the primary crop grown in the Province (325,545 ha), followed by rice (60,767 ha) and banana (5,658 ha). The Quezon Provincial Commodity Investment Plan (PCIP) in 2016 mentioned that Quezon is a major producer of other food staples (e.g., cassava, sweet potato), supplying the Province 83 percent or 67,680 mt of alternative staple foods in the region per year as opposed to about 17 percent combined production of the remaining four provinces (Provincial Government of Quezon, 2016). Thus, the Province states in its PCIP (2016) that "the stability of rice production in Quezon has a very large impact on the whole region and to the attainment of 'national food security' by extension." Its contribution to

the volume of alternative food staples is another reason for the Province's importance in improving food security (Provincial Government of Quezon, 2016).

Though known to be grown in Quezon, there are hardly any empirical studies on the potential substitution of alternative crops to rice and demand for these crops in the Province. Hence, this paper analyzed the demand for *Saba* banana, cassava, sweet potato, taro, and yam and the possibilities of substituting these crops to rice. Production as well as the proportion marketed and market outlets were also examined.

METHODOLOGY

Primary data were gathered in 2013 through the conduct of socio-economic surveys of farmers, traders, and consumers of these crops in the cities of Lucena and Tayabas and in the municipalities of Candelaria, Dolores, and Sariaya. A large part of the two cities is still primarily rural. Lucena City belongs to the top five producers of *Saba* banana, and its urban part is a key commercial area in Quezon. Sariaya is one of the five largest producers of sweet potato and cassava, while other areas are basically producers of all the selected crops. The *Bagsakan* Center, a central trading post in the Province, is located in Sariaya.

The surveys, which covered the year 2012, selected randomly three types of respondents: 375 farmers, 82 traders, and 625 consumers (Table 1). Some respondents belong to multiple types, i.e., a respondent may be a producer, trader, or consumer of more than one crop. For instance, consumers include 1) consumer-producers or those who produce (the farmers) and at the same time consume the crop; and 2) consumer-buyers or those who buy these for consumption.

Using structured interview schedules, information was gathered on production, area, yield, degree of commercialization and market outlets for the crops, demand potential, consumption levels, factors affecting demand for the crops, and possible

Table 1. Distribution of survey respondents by type and crop, Quezon, 2012

CROP	TYPE OF RESPONDENT		
	Farmers	Traders	Consumers
<i>Saba</i> banana	319	44	621
Sweet potato	216	33	570
Cassava	159	54	602
Taro	220	41	557
Yam	139	16	506
All	375	82	625

substitution of the crops for the main staple, which is rice. The surveys were supplemented by key informant interviews and focus group discussions with local agriculture officers and a farmers' group called the Tayabas Federation of Farmers Association. Secondary data were likewise obtained from the Bureau of Agricultural Statistics (BAS), now part of the Philippine Statistics Authority (PSA), and its provincial office in Quezon.

The data were processed and summarized using descriptive statistics such as means, totals, and percentages. They were presented in tabular or graphical form as appropriate. T-test was used to determine if there was any significant difference in per consumption of consumer-producers and consumer-buyers. Multiple regression analysis involving ordinary least squares (OLS) method was employed to determine significant variables affecting the demand for these commodities. The demand functions shown in a generalized form below were estimated using the STATA software.

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon$$

Where:

Y = per capita consumption of commodity (kg/person/year)

X_1 = age of consumer (years)

X_2 = educational attainment (years)

X_3 = household size (number)

X_4 = monthly household income (PhP)

X_5 = own price of commodity (PhP/kg)

X_6 = price of rice (PhP/kg)

α = Y-intercept or value of Y when X_s are 0

β = slope coefficients, each indicating the change in Y for a given change in X , other factors constant

ε = error term

RESULTS AND DISCUSSION

Demand for the Alternative Crops

For any of the five crops to be considered as an alternative to rice, the demand for them was established based on perceptions of farmers and traders as well as on consumption patterns. The farmer-respondents were asked to rank the five crops from 1 to 5, with 1 being the most in demand and 5 the least in demand. Among the five alternative crops, *Saba* banana got the highest ranking, while cassava came in second, followed by sweet potato (Figure 1). Meanwhile, traders ranked *Saba* banana first and sweet potato second.

As to consumption of the five crops, majority of the consumers consumed these as snack food (Figure 2). A considerable proportion of yam consumers (42%) consumed these as dessert, while a substantial share (28%) of taro consumers used these as ingredients to viands. Some *Saba* banana (18%), sweet potato (11%), and cassava (6%) consumers substituted these commodities for rice.

Table 2 shows that consumer-producers generally had higher per capita consumption than consumer-buyers. Among the five crops, *Saba* banana registered the highest per capita consumption. It is the only crop that was bought twice a month,

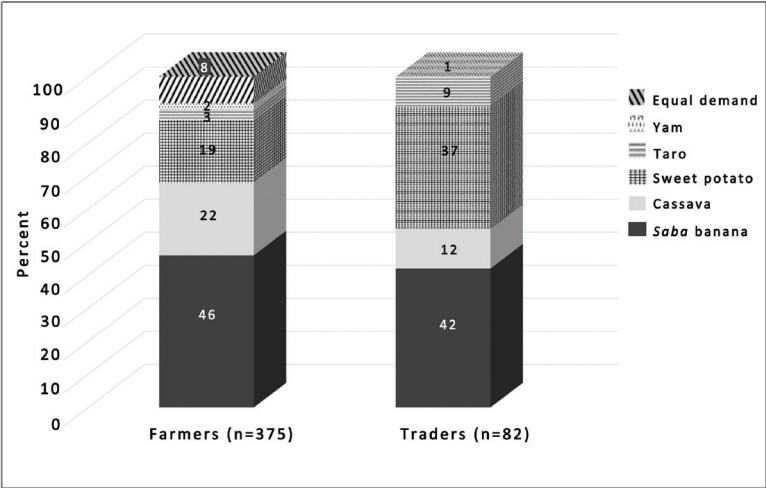


Figure 1. Proportion (%) of respondents who ranked the commodity as having the highest demand, Quezon, 2012
(Pabuayon, Pantoja, Manila, & Santos, 2014)

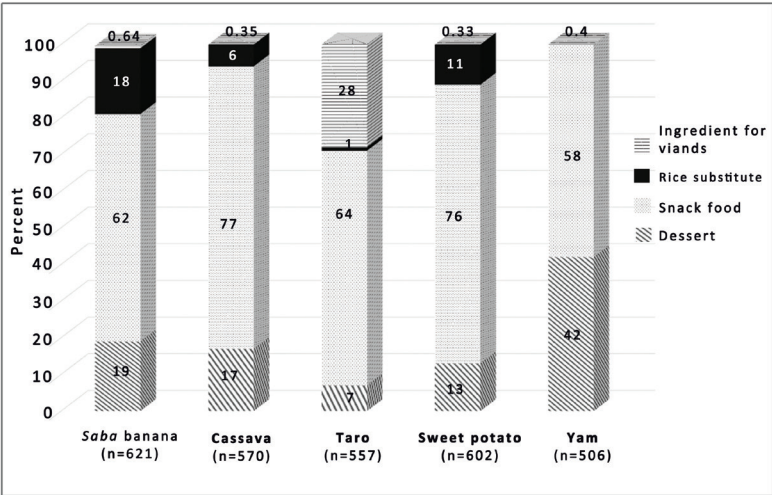


Figure 2. Purpose of consumption by crop, Quezon, 2012
(Pabuayon et al., 2014)

Table 2. Frequency of buying and per capita consumption, by commodity, Quezon, 2012

CROP/ITEM	CONSUMER-PRODUCERS	CONSUMER-BUYERS	DIFFERENCE
<i>Saba banana</i>			
Frequency of buying		2x/month	
Per capita consumption: Survey (kg/year)	26.61	20.58	6.0326ns
BAS provincial	14.61	14.61	
<i>Cassava</i>			
Frequency of buying		1x/month	
Per capita consumption: Survey (kg/year)	20.07	4.92	15.1473***
BAS provincial	3.28	3.28	
<i>Sweet potato</i>			
Frequency of buying		1x/month	
Per capita consumption: Survey (kg/year)	10.28	4.64	5.6423***
BAS provincial	4.47	4.47	
<i>Taro</i>			
Frequency of buying		1x/month	
Per capita consumption: Survey (kg/year)	3.38	2.25	1.1342***
BAS provincial (2011)	1.09	1.09	
<i>Yam</i>			
Frequency of buying		1x/year	
Per capita consumption: Survey (kg/year)	1.73	0.43	1.2999***
BAS provincial (2011)	0.17	0.17	

***Significant at 1% probability level, ns: not significant at 10% probability level
Source: Pabuayon et al., 2014

and it was the most commonly purchased crop by both consumer-producers and consumer-buyers resulting in the non-significance of the difference in consumption between the two groups. Cassava, sweet potato, and taro were bought only once a month, and yam, only once a year, mainly for festivities such as fiesta or Christmas holidays. Yam also recorded the lowest per capita consumption. The per capita consumption in the study sites of all these crops was higher than the provincial averages reported by BAS (2013).

Secondary data on the demand and supply situation of the five commodities were gathered from the BAS central and provincial offices. Results indicated that there was a surplus for sweet potato, cassava, and taro while there was a deficit for *Saba* banana and yam. These findings were consistent with the survey findings.

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Factors affecting demand for the crops. Table 3 shows that the R^2 values derived from the regression analysis on factors affecting demand for each commodity was low, which is not uncommon in social science and demand studies involving cross-sectional analysis. Although this implies that the estimated equations did not have much predictive power, the F-values indicated that the equations generally had good fit. Moreover, there were significant variables from which interesting insights could be derived.

The significant variables for *Saba* banana and sweet potato included age, education, monthly household income, price of the crop, and price of rice. Education, own price, and price of rice were the significant variables for cassava, while only one variable was significant for taro (own price). For yam, education and own price

Table 3. Regression results showing the relationship between per capita consumption and explanatory variables on age, household size, household monthly income, education, own price of the commodity and price of rice (double-log)

CROP/ITEM	<i>SABA</i> BANANA	CASSAVA	SWEET POTATO	TARO	YAM
Age	0.4961**	0.5924***	-0.0539ns	0.0864ns	-0.1791ns
Education	-1.3629***	-0.3609**	-0.3711***	0.0527ns	0.6011***
Household size	-0.2044ns	0.1303ns	-0.0906ns	-0.0736ns	0.0087ns
Monthly household income	-0.4720***	-0.4165***	-0.0643ns	0.0676ns	0.0559ns
Own price	-0.5849**	-1.4108***	-0.6224***	-1.0159***	-0.4001*
Price of rice	-2.4268**	2.5654***	0.5277*	0.1925ns	0.6887ns
Adj. R ²	0.1501	0.2608	0.1292	0.1790	0.0778
F-value	17.87	30.23	11.21	14.01	4.22
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0005

***Significant at 1% probability level, **Significant at 5% probability level,

*Significant at 10% probability level, ns: not significant

Source: Pabuayon et al., 2014

were significant variables to the consumers. For all the alternative crops, the significant variables were age (positive), education (negative), monthly household income (negative), and own price (negative). However, the sign of price of rice was positive for sweet potato and cassava but negative for *Saba* banana.

These results imply that, other things being the same, older consumers ate more *Saba* banana and sweet potato than younger ones. Consumers with higher educational attainment tended to consume less *Saba* banana, sweet potato, and cassava, probably because they knew of other commodities that could provide them better nutrition. Also, as households derived higher monthly incomes, the respondents consumed less *Saba* banana

and sweet potato, which meant that these crops often served as alternative staples among low income earners.

Moreover, the findings imply that all these commodities will be consumed less if their respective prices increase, other things being the same. The opposite signs of price of rice means that as the price of rice increases (or decreases), a greater (or lesser) volume of sweet potato and cassava will be consumed, while the opposite is true in the case of *Saba* banana. This supports the argument that sweet potato and cassava are substitutes to rice; hence, an increase (or decrease) in prices of these crops could trigger significant reduction (or increase) in consumption of rice as well as other commodities including *Saba* banana. On the other hand, *Saba* banana is possibly a good complement to rice, which is consistent with the findings of Lantican, Quilloy, and Sombilla (2011), which indicated that banana is a complement rather than a substitute to rice. *Saba* banana is generally consumed with rice-based meals as indicated by its higher consumption as compared with the root crops considered in this study. Nevertheless, consumers also consider *Saba* banana as a potential substitute to rice if the latter will be unavailable or if there will be a prohibitive increase in its price.

Possibility of Rice Substitution

Close to half of the respondents were willing to substitute the five crops for rice because of their nutritional and health benefits, their ability for filling the stomach, their good taste, and their lower prices compared to rice (Table 4). Nonetheless, substantial proportions ranging from 36 percent (taro) to 40 percent (yam) felt otherwise. Some favored substitution only on certain conditions such as unavailability of rice or prohibitive rice prices.

The consumer-respondents were asked to rank the five crops in terms of their substitutability to rice, with 1 being the highest and 5 the lowest. Among the crops, *Saba* banana had the

Table 4. Substitution possibilities of crops to rice (%), Quezon, 2012

ITEM	SABA BANANA (n=621)	CASSAVA (n=570)	SWEET POTATO (n=602)	TARO (n=557)	YAM (n=506)
Willingness to substitute					
Yes	45	48	46	44	44
No	38	39	38	36	40
It depends	17	13	16	19	16
Reason for willingness to substitute					
Health benefits/ nutritious	25	55	45	32	14
Filling	25	24	26	20	27
Likes the taste	23	10	15	45	37
Low price and others ^a	27	11	14	3	22
Situations where the respondent will substitute					
Unavailability of rice	88	94	78	78	62
High price of rice	12	6	22	22	38

^afor variety of diet and for breakfast only

Source: Pabuayon et al., 2014

highest ranking, averaging approximately 1 followed by sweet potato, which had a mean weighted score of around 2 (Table 5). Yam, which averaged about 5, got the lowest rank.

The consumers were made to select from three types of substitution, which were 1) full, 2) partial with more rice taken with the alternate crop, and 3) partial with less rice taken with the substitute crop. They had five choices of types of meal and these included breakfast, lunch, dinner, morning snacks, and afternoon

Table 5. Consumer ranking of crops as substitute for rice, Quezon, 2012

CROP	WEIGHTED AVERAGE SCORE	NO. OF RESPONDENTS WITH RANK 1 OR 2
<i>Saba</i> banana	1.43 ≈ 1	557
Sweet potato	2.18 ≈ 2	446
Cassava	2.81 ≈ 3	198
Taro	4.01 ≈ 4	21
Yam	4.67 ≈ 5	20

Source: Pabuayon et al., 2014

snacks. While the substitution for the main meal types refers to rice, the substitution during snacks was with respect to other snack items. Appendix 1 indicates that if substitution would be done, a greater number would do so on a partial basis with more rice taken with the alternative crops. Moreover, the substitution would be mainly during the morning and afternoon snacks wherein rice was not being substituted but the other snack items. Among the three main meals, breakfast was the most common time that consumers were willing to substitute the alternate crops for rice fully, particularly for *Saba* banana, sweet potato, and cassava. During rice shortage, particularly during El Niño, substitution of the five crops to rice should be encouraged. The respondents mentioned that they were open to the idea of rice substitution in case rice is unavailable. If consumers get used to the habit of substituting the five crops to rice, this will not only alleviate the problem of rice shortage but also ensure rice sufficiency and lower import costs.

Production Levels of Alternative Crops

The demand for the alternate crops had been established, but is there sufficient supply to meet consumption? Cassava (357 mt) had the highest production followed by *Saba* banana (189 mt), while yam (14 mt) had the least production (Table 6). The average area planted across all crops was small at less than one-third of a hectare. The largest areas were planted for cassava (0.31 ha) and for *Saba* banana (0.32 ha). The smallest areas were planted to yam (0.12 ha) and to taro (0.13 ha). The farmer-respondents' average yields per hectare of each crop were lower than the provincial averages. Mean yield per hectare of *Saba* banana, cassava, sweet potato, taro, and yam farmer-respondents stood at 1.93 mt, 5 mt, 3.8 mt, 2.1 mt, and 0.82 mt, respectively. Meanwhile, provincial averages per hectare were 3.95 mt, 6.73 mt, 5.47 mt, 5.27 mt, and 4.67 mt, respectively. Given the small farm area planted to the five crops and the low productivity, it is not surprising that the total production of the sample respondents comprised only a negligible proportion of the total provincial production.

Farmers claimed that the five crops were planted mainly for home consumption, thereby contributing to food security and providing a source of additional income (Table 7). Only less than 1 percent raised these crops as a rice substitute. Given that the five crops were not grown as main sources of income, it is not surprising that the production, area, and yields were generally low. Moreover, farmers admitted to applying minimal inputs. Even though the volume of production was low, the estimated share of marketed output was quite high ranging from 71 percent for *Saba* banana to 91 percent for cassava and yam (Figure 3). On the average, the disposal shares of all crops were 86 percent for sale, 10 percent for home use, and 4 percent for other purposes (e.g., given away, feeds, and seeds) indicating that a greater proportion of the total produce, though limited, were made available in the market for consumers which seems to negate the farmers' pronouncement that they only plant the five crops for home consumption. The farmer-respondents' claims could be due to the low volume of production; thus sales, which may provide some additional income may not be really substantial to the farmers; hence, to them, the crops are grown for home consumption only.

Table 6. Production, area planted, and average yield per hectare by crop, Quezon, 2012

CROP	PRODUC- TION (mt)	AREA PLANTED TO CROP (ha)		% OF CROP AREA TO TOTAL FARM	YIELD (mt/ ha)	PROVINCIAL YIELD (mt/ha)*	TOTAL PROVINCIAL PRODUC- TION (mt)*	% OF RESPONDENTS' PRODUCTION TO PROVINCIAL PRODUCTION
		Total	Ave/ Farm					
Saba banana	189	97.86	0.31	29	1.93	3.95	24,144	0.78
Cassava	357	69.03	0.32	26	5.0	6.73	38,976	0.92
Sweet potato	147	38.77	0.18	20	3.8	5.47	29,341	0.5
Taro	59	28.06	0.13	10	2.1	5.27	2,728	2.16
Yam	14	16.82	0.12	9	0.82	4.67	117	12

Source: Pabuayon et al., 2014 and Bureau of Agricultural Statistics, 2013

Table 7. Reasons for planting the crop, Quezon, 2012

REASONS FOR PLANTING CROP	%
Home consumption	60.0
Additional income	55.0
Animal feeds	0.8
Inherited	1.2
Rice substitute	0.4
Others	2.2

Note: Multiple responses
Source: Pabuayon et al., 2014

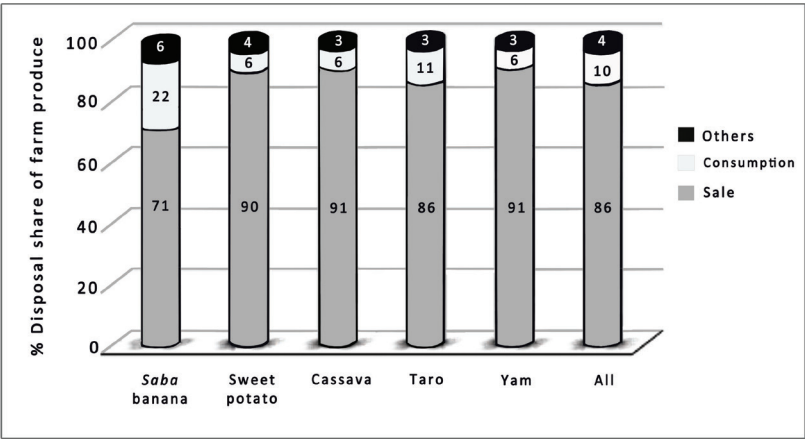


Figure 3. Disposal shares (%) of farm produce, Quezon, 2012
(Pabuayon et al., 2014)

Market Outlets

Farmers sold their produce to different market outlets, majority of whom were traders/*viajeros* who come from different areas (Figure 4). They usually bought whatever volume they could from individual farmers and consolidated these in large volumes for delivery to major market centers. About one-fourth of the farmers brought their produce to the public market where they sold to retailers. They also sold to end-users, mostly households in their respective communities. A very small proportion brought their produce to the trading post in Sariaya, a nearby town, implying that farmers do not necessarily patronize large wholesale markets, probably due to the small volumes for sale. Furthermore, a greater number of the farmer-respondents sold to market outlets that were accessible to them, usually within their villages or other villages within their municipalities (Figure 5). Nevertheless, some farmers sold to outlets from other provinces within Region IV-A, but in a few instances, *Saba* banana, cassava and yam farmers sold to buyers who reside outside Region IV-A. Farmers’ decision to sell to nearer markets may have considered the low volume of sales and additional marketing costs if they went to far areas.

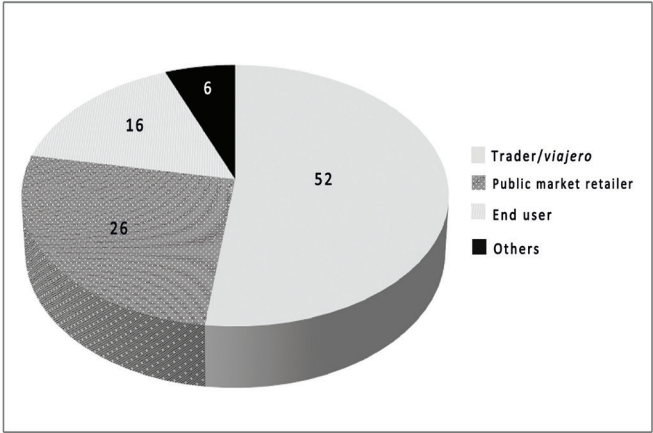


Figure 4. Proportion (%) of farmers selling to market outlets, Quezon, 2012 (Pabuayon et al., 2014)

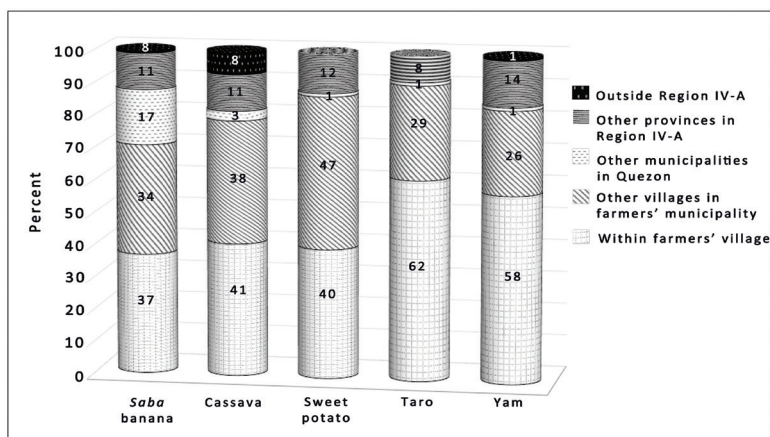


Figure 5. Proportion (%) of farmers selling to specific market locations, Quezon, 2012 (Pabuayon et al., 2014)

CONCLUSIONS

The potentials of *Saba* banana, sweet potato, and cassava are relatively higher as compared with taro and yam. Based on the per capita consumption, *Saba* banana had the highest demand among the five alternate crops, followed by sweet potato then cassava. Furthermore, farmers perceived that *Saba* banana was the most in demand among the alternative crops followed by cassava, while sweet potato ranked third. Traders shared the same opinion that *Saba* banana came first but they considered sweet potato as the second most in demand, while cassava came third. *Saba* banana, sweet potato, and cassava also ranked as the top three in terms of being possible substitutes for rice.

However, consumers still preferred to consume these crops as snack food items rather than full substitutes for rice in the main meals. They were willing to make full substitution largely for breakfast only and relatively much less for other meals. Nevertheless, the potential demand could be increased if substitution could be encouraged. Moreover, rice substitution will help alleviate rice shortage. However, the deficit in *Saba* banana and yam necessitates an increase in local production.

Several factors influenced demand for the alternative crops. The respondents' age positively affected demand for *Saba* banana and sweet potato; monthly household income (negative) for *Saba* banana and sweet potato; and own price (negative) for all crops. Education negatively influenced demand for *Saba* banana, sweet potato and cassava, but positively affected the demand for yam. Price of rice had a positive effect on demand for cassava and sweet potato, but the contrary was true for *Saba* banana.

RECOMMENDATIONS

There is an impending probability of rice shortage in the Philippines because of El Niño and La Niña episodes that historically hit the country. The Philippines' sources of imported rice are not exempted from this worldwide phenomenon; hence, there is no assurance that the supply of rice in the world market would remain stable. Production from countries such as Vietnam and Thailand had dropped; consequently, exports of these countries are expected to decline. These trends will definitely limit the amount of rice that the country imports from these countries. This will eventually lower the buffer stock, and the Philippines may suffer another rice shortage. Moreover, the occurrence of La Niña towards the end of 2016 may aggravate the predicted low rice production level in the Philippines. This is where the substitution particularly of *Saba* banana, sweet potato, and cassava, to rice could be pushed. These crops are more resilient to climate change (i.e., drought) and may provide the necessary food supply in such eventuality. As shown in the results, many of the respondents were willing to substitute *Saba* banana and the four rootcrops to rice albeit on a partial basis or during breakfast most especially at times when rice is unavailable.

Encouraging substitution of the aforementioned crops to rice is best done in provinces or regions where these crops are grown abundantly and/or commercially. Local government units (LGUs) should be motivated to formulate policies and programs, and establish strategies that will stimulate substitution of *Saba* banana, cassava, sweet potato, yam, and taro to rice. However, this

does not prevent other areas where the five crops are not grown commercially from doing the same.

Respondents preferred to consume the five crops as snack foods. Considering that these food items are healthier choices as compared with junk food, which is the usual preference of children, an LGU policy to promote the serving of *Saba* banana, cassava, sweet potato, yam, and taro as snack food in schools could be pursued.

To raise production or farm yields, particularly for commodities with deficits such as *Saba* banana and yam, farm management practices should be improved. Meanwhile, for crops with surpluses such as sweet potato, cassava, and taro, market linkages that will enable them to sell their produce outside of the province and the region should be established.

The bigger challenge to the government is how to encourage consumers to substitute the five crops to rice when there is no rice shortage. Given the eating habits of Filipinos who are primarily biased to rice, particularly in Quezon and nearby Southern Tagalog provinces, this could not be easily done. Hence, information campaign regarding the benefits (e.g., economic) of substituting these crops to rice should be enhanced. In case the eating habits of Filipinos do change, this will ease the country's rice self-sufficiency problem as well as the costs of importation.

Based on the findings, it is recommended that both the supply and demand issues for the selected crops be addressed to maximize their potential for developing the communities in the study areas. On the supply side, production must be increased for deficit crops such as *Saba* banana and yam. Measures may include improving the farm management practices of farmers and availing of technical assistance from municipal and provincial agricultural offices in order to increase farm yields. An entrepreneurial mindset among the farmers is also required to fully explore the business opportunities present in these crops.

On the demand side, strategies are needed to enhance market linkages for surplus crops such as sweet potato, cassava, and taro. This will provide alternative markets that can offer better prices. In order to increase overall demand and take advantage of the nutritional benefits of these crops, substitution of rice, particularly with *Saba* banana, sweet potato, and cassava must be encouraged. However, this will entail implementing effective and innovative promotional and information campaigns focusing on factors that will influence or motivate the consumption of these crops as well as on the economic value and other benefits of these crops.

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LITERATURE CITED

- Bureau of Agricultural Statistics. (2013). Quarterly bulletins and industry performance reports. Retrieved <http://bas.gov.ph>.
- Cabanilla, L. (2006). Achieving food security: The role of and constraints faced by LGUs. In L. S. Cabanilla (Ed). Philippine Agriculture, Food Security, and APEC. Manila, Philippines: Philippine APEC Study Center Network and Philippine Institute for Development Studies.
- CGIAR Technical Advisory Committee. (1997). Report on the inter-centre review of root and tuber crops research in the CGIAR. Washington, D.C.: Consultative Group on International Agricultural Research. Retrieved from <http://www.fao.org/wairdocs/tac/x5791e/x5791e0q.htm> on 17 April 2016.

- Department of Agriculture. (2012). Food staples sufficiency program 2011-2016. Retrieved from <http://www.pinoyrice.com/wp-content/uploads/Food-Staples-Sufficiency-Program.pdf> on October 6, 2016.
- The Economist Intelligence Unit. (2016). Global food security index 2016: An annual measure of the state of global food security. Retrieved from: <http://foodsecurityindex.eiu.com/Home/DownloadResource?fileName=EIU%20Global%20Food%20Security%20Index%20-%202016%20Findings%20%26%20Methodology.pdf> on October 3, 2016
- International Potato Center. (n.d). Potato facts and figures. Retrieved from <http://cipotato.org/potato/facts/> on April 17, 2016.
- Lantican, F. A., Quilloy, K. P., & Sombilla, M. A. (2011). Estimating the demand elasticities of rice in the Philippines. Final report submitted to PhilRice. SEARCA. Retrieved from file:///Users/cem-uplb/Downloads/Demand_Final Report.pdf on November 7, 2015.
- Nwaiwu, I. U., Eze, C. C., Amaechi, E. C. C., & Osuagwu, C. O. (2012). Problems and prospects of large scale plantain banana (*Musa spp.*) production in Abia State, Nigeria. *International Journal of Basic and Applied Sciences*, 1(4): 322-327.
- Nyombi, K. (2013). Towards sustainable highland banana production in Uganda: Opportunities and challenges. *African Journal of Food, Agriculture, Nutrition and Development (AJFAND)*, 13(2): 7544-7561.
- Onwueme, I. (1999). Taro cultivation in Asia and the Pacific. Bangkok, Thailand: Food And Agriculture Organization of the United Nations Regional Office for Asia and the Pacific. Retrieved From <http://www.fao.org/docrep/005/ac450e/ac450e03.htm> on April 17, 2016.
- Pabuayon, I. M., Pantoja, B. R., Manila, A. C., & Santos, M. L. (2014). Food supply and demand assessment of selected alternative staple crops and livestock. Terminal Report. University of the Philippines Los Baños.
- Pieters, H., Guariso, A., & Vandeplas, A. (2013). Conceptual framework for the analysis of the determinants of food and nutrition security. FOODSECURE Working Paper No. 13, September 2013.

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- PhilFSIS. (2013). Food security situation and outlook. Retrieved from <http://www.gov.ph/2011/04/12/briefer-on-the-food-staples-self-sufficiency-roadmap-2011-2016/> on October 3, 2016.
- Portilla, J. C. & Pagaduan, J. M. R. (2014). Status of other staple crops as substitute to rice: An assessment in Isabela and Quirino, Philippines. *Philippine Journal of Crop Science*. 39 (Supplement 1): 132-133.
- Provincial Government of Quezon (2016). Provincial Commodity Investment Plan of the Province of Quezon.
- Quezon Provincial Government. (n.d.). Geographical and physical Characteristics. Retrieved from <http://www.quezon.gov.ph/homepage/?info=geographical> on October 3, 2016.
- Stumpf, E. (1998). Post-harvest loss due to pests in dried cassava chips and comparative methods for its assessment: A case study on small-scale farm households in Ghana. Dissertation. Berlin, Germany: Humboldt University. Retrieved from <http://www.fao.org/wairdocs/x5426e/x5426e02.htm#TopOfPage> on April 17, 2016.

APPENDIX

Appendix 1. Type of substitution of Saba banana to rice by meal, Quezon, 2012 (n = 557)

CROP/MEAL	TYPE OF SUBSTITUTION		
	Full	Partial (More Rice)	Partial (Less Rice)
<i>Saba banana</i>			
Breakfast	140	393	21
Lunch	43	503	11
Dinner	55	481	21
Morning snack ^a	465	86	6
Afternoon snack ^a	465	86	6
<i>Sweet potato</i>			
Breakfast	88	333	25
Lunch	29	413	4
Dinner	36	395	15
Morning snack ^a	354	56	30
Afternoon snack ^a	354	56	30
<i>Cassava</i>			
Breakfast	62	95	41
Lunch	21	176	1
Dinner	30	151	17
Morning snack ^a	174	1	23
Afternoon snack ^a	174	1	23
<i>Taro</i>			
Breakfast	6	13	2
Lunch	0	19	2
Dinner	5	12	4
Morning snack ^a	17	0	4
Afternoon snack ^a	17	0	4

Appendix 1. Type of substitution...(Continued)

CROP/MEAL	TYPE OF SUBSTITUTION		
	Full	Partial (More Rice)	Partial (Less Rice)
Yam			
Lunch	3	17	0
Dinner	2	17	1
Morning snack ^a	19	0	1
Afternoon snack ^a	19	0	1

^aWith respect to other snack items

Source: Pabuayon et al., 2014

Operational Policy Needs for Organic Agriculture Expansion in the Philippines: Focus on Vegetables

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ABSTRACT. In 2010, the Philippines passed a law (Republic Act No. 10068) to support the expansion of organic agriculture (OA) in the country, with a goal of 5 percent of total production area being devoted to this technology. Available data show that in 2012, only about 0.7 percent of the agricultural land area in the country was devoted to OA production. While several other administrative orders supported the law, there seems to be a need to understand the processes to operationalize the said law.

This paper analyzed the production, marketing, and consumption issues surrounding the organic vegetable industry to come up with operational policies to support the implementation of the law. The data came from a survey of 300 vegetable farmers and 180 consumers and non-consumers of organic vegetables supported by key information from government officials, farmers' associations, and traders. Results showed that the most critical constraint to OA production was the high cost of certification, lack of farmers' training on

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the technology, and access to organic inputs. Alternative certification processes, capacity building for both farmers and program implementers, and more IEC campaigns on the benefits of OA products are recommended.

Keywords: *organic agriculture, certification, labeling, vegetables, Philippines*

INTRODUCTION

The main rationale for research and development investments into organic agriculture is environmental sustainability and improved farmers' and consumers' health. Organic agriculture is "a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity, and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation, and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved" (IFOAM, 2009).

It is "a farming system, which avoids or largely excludes the use of synthetically compounded fertilizers, pesticides, growth regulators, and livestock feed additives to the maximum extent feasible; a farming system that relies on crop rotation, residues, animal manure, legumes, green manure, off-farm organic wastes, and the aspects of biological pest control measures, soil productivity and tilt, to supply plant nutrients and to control insects, weeds and other pests" (Alvares et al., 1999 as cited in Valerian, Domonko, Mwita, & Shirima, 2011, p. 1).

In developing countries, the health-related impacts of inorganic farming have become the central policy problems. Traditional farming with chemical technology affects farmers' health (Rola & Pingali, 1993) and the environment (Pingali & Roger, 1995). Organic agriculture was seen as one of the feasible options or valid substitute for such traditional farming. In general, it was observed that scientific studies on the environmental benefits of organic food production are lacking.

Organic Agriculture in the Philippines

Seen as a promising technology to support environmental sustainability and rural development, the Philippines enacted into law the Organic Agriculture Act (Republic Act No. 10068) in 2010. The Act provides for the development and promotion of organic agriculture in the Philippines. Its main goal is “to enrich the fertility of the soil, increase farm productivity, reduce pollution and destruction of the environment, prevent the depletion of natural resources, further protect the health of farmers, consumers, and the general public, and save on imported farm inputs.”

Furthermore, Executive Order No. 481 in 2005, also known as the “Promotion and Development of Organic Agriculture in the Philippines,” envisioned the establishment of organic agriculture in the country. The executive order provided for the extension of assistance to individuals and groups who practice and promote organic agriculture methods, as well as the documentation and evaluation of organic agriculture programs. House bills have been filed on various aspects of organic farming such as training programs at the *barangay* (village) level to educate more farmers about the organic farming practices; extension services to groups practicing organic farming; establishment of training facilities in every *barangay*; and grant of special loans to organic farmers. At the municipal and *barangay* levels, local government units are encouraged to engage in organic farming through various resolutions, master plans, and programs (Peñalba, Dizon, & Elazegui, 2007).

Several national institutions have also been assigned responsibilities for the promotion of organic agriculture in accordance with the provisions of the law. The National Organic Agricultural Board (NOAB), attached to the Department of Agriculture (DA) is the policy-making body that provides direction and general guidelines for the implementation of the National Organic Agricultural Program (NOAP). The DA-Bureau of Agricultural Research (BAR) has organized an organic agriculture research, development, and extension (RDE) network composed of research and educational institutions, local government units

(LGUs), non-government agencies, and the recognized associations of organic fertilizer manufacturers and distributors, agricultural engineers, agriculturists, soil technologists, farmers' groups and/or associations. The DA Bureau of Agriculture and Fisheries Product Standards (BAFPS) has been designated and authorized to grant official accreditation to organic certifying bodies or entities. All organic food and input establishments must register with BAFPS. The other policy requires retail establishments or stores of organic products to designate a separate area for the display of their harvest to avoid mixing it with non-organic produce.

At the local government level, the law likewise states that every provincial governor shall, insofar as practicable, form a provincial technical committee, and which shall, in coordination with and assistance of the BAFPS and/or the DA-Regional Field Offices (RFOs) implement activities in line with the NOAP. The LGUs as frontliners in the implementation of the program are expected to pass, provincial and/or city/municipal ordinances and/or resolutions as appropriate, thereby specifying the participatory and bottom-up approach to grassroots organic agricultural programs and projects. Subsequently, these would approve and adopt the provincial and municipal/city organic agriculture program in addressing concerns on food security, environment, health and wellness, and poverty alleviation.

At the farm level, social development groups since the 1980s have implemented projects on sustainable agriculture because of the perceived negative impact of conventional chemical farming on the environment. For instance, in 1984, MASIPAG started as a farmer-non-government organization (NGO)-scientist partnership that aimed to encourage and empower small rice farmers to develop their own technologies and farmer-to-farmer extension, and to have access to and control over production resources, especially on seeds. In the 1990s, organic agriculture became an important movement and many farmer organizations, and NGOs engaged in the development of organic agriculture (Källander & Rundgren, 2008).

The NOAP targets about 5 percent of the total agricultural areas to be devoted to organic agriculture. However, available data show that in 2012, only about 0.7 percent was devoted to organic agriculture production (FiBL-IFOAM Survey, 2014). According to Aquino (2005 as cited in Peñalba et al., 2007), the factors that constrained technology adoption included the following: slow conversion of conventional farms to organic agriculture due to the observed decline in yield; land tenure problem; limited support to production (lack of organic seeds and organic fertilizers; lack of training and extension services); marketing problems (lack of market information system, lack of marketing strategies and pricing scheme, lack of capital, inappropriate packaging); lack of government support for export of organic products; unorganized organic producers; low competencies in organic production; limited knowledge on national regulations; and limited skills on internal quality control systems.

Given these constraints to organic agriculture expansion, this paper aimed to understand from the policy perspective, the underlying reasons why organic agriculture was slow in its uptake. It hypothesized that there were operational policies that may have been needed to sustainably support the organic agriculture converts and to further facilitate farmer adoption.

Framework of Analysis

The national laws, ordinances, and other legal framework for organic agriculture cover the operational policies on certification, labeling, market support system, production and post-production support, LGU support, and other support services. These policies have an impact on the production, marketing, and utilization/consumption of organic produce. The framework in Figure 1 summarizes the policies that affect production, marketing, and consumption of organic crops that would ideally lead to the goals of environmental sustainability that would improve farmers' and consumers' health.

Operational policies. The implementing rules and regulations of the Organic Agriculture Act provides the operational guidelines for the implementing agencies/organizations in different levels. It contains policies pertaining to certification, labeling, support for marketing, production and post-production, as well as the inter-agency support from LGU, line agencies, academe, and NGOs.

Production. Several factors affect organic production including access to inputs, cultural and management practices, economic returns, role of farmers' organizations, and health and environmental benefits derived. For a farmer to go into organic production, it is important that natural inputs are available, accessible, and affordable. Cultural and management practices of organic farming are different from conventional farming. Additional knowledge gained will enhance their decision to go into organic farming. Meanwhile, returns to investments is a major consideration when farmers decide what crops to plant.

Marketing. Pressing concerns involving marketing of organic products include the sustainability of supply of these organic products including the lack of a sure or ready market, lack of product differentiation to take advantage of the price premiums, lack of market information system, high cost of third-party certification, and issues on pricing arrangements. All these factors would affect the profits or losses of farmers and traders.

Utilization/Consumption. Utilization or consumption focuses on the preference of consumers for organic food as indicated by their demand behavior. There are factors that affect consumers' willingness and decision to purchase. Price of organic products is a major determinant of demand. Consumers' knowledge and awareness of the benefits from consuming organic food may influence their consumption decisions. Further, consumers' perceptions on health and other benefits of organic food may also affect the extent of consumption of this food. Policies that would augment consumption of organic food are essential, i.e., labeling of organic food.

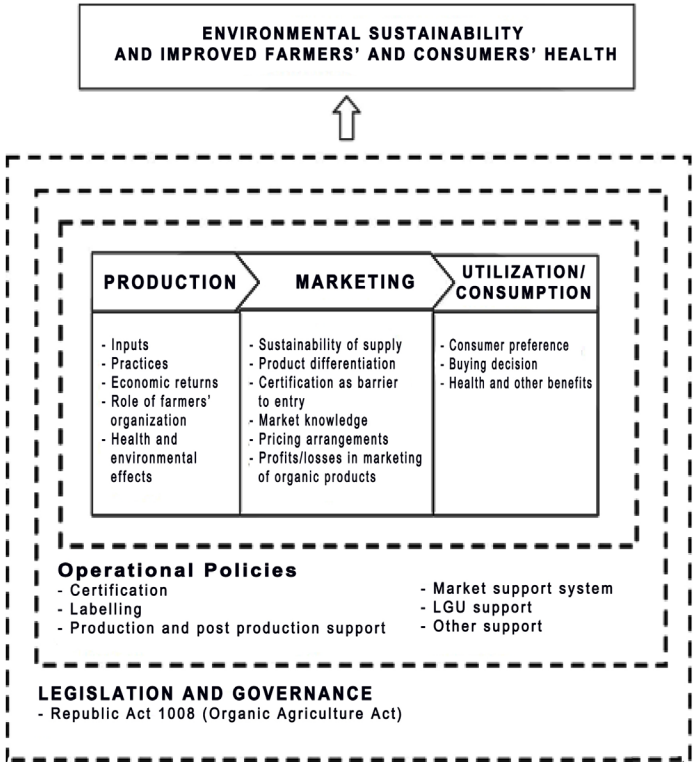


Figure 1. Policy and institutional framework for organic agriculture

The demographic characteristics of consumers such as age, education and income, among others, may influence their willingness and ability to buy organic vegetables. Their knowledge, attitude and perceptions, and practices likewise influence their willingness and decision to buy. Consumers' willingness and decision to buy would have influence on their level of utilization or consumption. Increases in demand for a product would most likely motivate producers or suppliers to offer more of a product or service. Increased production is viewed to improve the availability and affordability of organic vegetables in the local markets. Finally, increased consumption would have positive health and environmental effects that consumers perceive to gain from the utilization of organic vegetables.

Health and environmental impacts. The policies that support production, marketing, and utilization/consumption facilitate the achievement of the goal of environmental sustainability and improved farmer and consumer health. Rola and Pingali (1993) studied the effect of pesticide exposure on rice farmers' health by comparing the nonexposed group of rice farmers from Quezon with the exposed group of rice farmers from Nueva Ecija. The study revealed that prolonged exposure to pesticide results in health impairments affecting the eyes, skin, and respiratory tract. Prolonged pesticide exposure was also found to have cardiovascular and neurological effects. Pretty et al. (2001) stated that agricultural systems can have positive and negative effects. However, some costs are considered external and only a few have been costed. It is therefore important to carefully look at the interplay of agriculture, the environment, and consumer's health.

METHODOLOGY

Sources of Data and Data Analysis

Analysis in this paper was culled from a larger project funded by DA-BAR and implemented by the authors. In particular, the empirical application in this paper focuses on organic vegetables' production, marketing, consumption, and health and environmental implications. Both primary and secondary data were gathered.

Secondary data on production, area, yield, prices (e.g., farm, wholesale, and retail), and other relevant information were gathered from the Bureau of Agricultural Statistics (BAS) and related published and unpublished documents. Other secondary sources of data included reports and publications by the LGUs'–Office of the Provincial Agriculturist (OPAg) and Municipal Agriculture Office (MAO). Data obtained from the LGUs were the numbers, names, and addresses of farmers, traders, seed distributors, and dealers.

Primary data were gathered through consultations, key informant interviews, surveys, or focus group discussions (FGDs) with the industry's stakeholders such as the farmers; OPAG, MAO, and other LGU officials; DA; scientists/experts; traders of organic products; seed distributors and dealers; and household consumers.

Socio-economic surveys of vegetables farmers were done in the Provinces of Laguna, Benguet, and Bukidnon. The interviewed respondents chosen purposively were equally distributed within the three areas (Table 1). The respondents were classified into three: 1) organic (120 farmers); 2) combined (60 farmers), and 3) conventional (120 farmers). Overall, there were 300 farmer-respondents.

Table 1. Distribution of vegetable farmer respondents by province and classification, 2013

CLASSIFICATION	PROVINCE			TOTAL
	Benguet (n=100)	Laguna (n=100)	Bukidnon (n=100)	
Organic	40	40	40	120
Combined	20	20	20	60
Conventional	40	40	40	120

Respondents under the 'organic' category were farmers who did not use chemicals or synthetic fertilizers or those who applied concocted inputs such as Indigenous Microorganisms (IMOs). The IMOs have been found useful in removing bad odors from animal wastes and in hastening composting. These respondents were classified as such regardless of whether they acquired a third-party certification or not. Meanwhile, those belonging to the 'combined' category were adopting some organic farming practices but were also spraying or applying chemicals.

Respondents categorized under the 'conventional' group used chemicals and synthetic farm inputs in their operation.

Information on production and cultural practices, technologies developed and practiced, postharvest practices, marketing and distribution as well as health and environmental benefits of organically-grown vegetables were asked from farmers.

The study on marketing involved the interview of 149 vegetable-based market participants. Key informant interviews (KIIs) were done to generate the data. Analysis was done through careful investigation of the roles of the different market agents. Data on the volume of organic products that passed through the marketing intermediaries until they reached the household consumers, prices, marketing costs, marketing investments, marketing losses, marketing channels, marketing practices, factors affecting the trading business, and problems encountered were likewise important data gathered from the various stakeholders.

The 180 consumption study respondents comprised consumers and non-consumers of organic vegetables. Interviews were undertaken in major organic markets and restaurants as well as supermarkets and public markets in each study province. Consumers' data included knowledge, attitude, practices, perceptions, willingness to pay for organic products, and arguments on labeling of organic products. Perceptions and willingness to label their organic products were gathered from farmers and traders.

Moreover, KII was conducted among the focal/point persons for information on their education and communication activities in promoting organic agriculture. These persons came from the government and line agencies in the national, regional, provincial, and municipal levels; academic institutions/state universities and colleges (SUCs); research and development (R&D) and extension network offices; and NGOs in the areas under study.

Research tools included the use of structured questionnaires and observations of organic farms and organic markets. Descriptive analysis was employed in analyzing the various indicators.

RESULTS AND DISCUSSION

Production

Average area harvested and yield. The average effective area harvested per farm and the average yield per 1,000 m² were determined across respondent classifications and by type of vegetable crop (Table 2). For all types of vegetables covered in the study, conventional farmers registered the highest yield. Lettuce, broccoli, cabbage, and tomato planted under the combined farming system were found to have higher yields compared with those planted under the organic farming system. The inverse was true for string beans, Baguio beans, and eggplant. This shows that certain vegetables responded well to organic farming system as compared with other vegetables.

Average income. Organic vegetable farmers derived the highest gross income (PhP25,072.04) followed by farmers practicing combined farming system (PhP16,692.87), while the conventional farmers had the lowest gross income PhP11,064.86 (Table 3). This was attributed to the premium prices received by organic farmers as supported by the findings of the study. Among the three respondent types, organic farmers received the highest average price (PhP37.83/kg), followed by the combined farmers who received PhP20.91/kg. The lowest price received of PhP16.38/kg was reported by conventional farmers. Organic farmers also had the highest total expense with the bulk of cost coming from labor, followed by material inputs. As a result, farmers practicing combined farming system derived the highest net income followed by organic practitioners. Conventional farmers obtained the lowest net income (Table 2).

Constraints to production. About 60 percent of the vegetable farmers in the study expressed that they encountered production problems such as lack of access to inputs, pest and diseases, and labor constraints. Across respondent classifications, organic vegetable farmers registered the highest number of farmers with production problems (86%), followed by farmers practicing combined farming system (57%), and then the conventional vegetable farmers (33%).

Table 2. Average effective area harvested, production per farm, and yield per 1,000 m² of selected vegetables, by farmer-responder classification, 2013

ITEM	CLASSIFICATION		
	Organic	Combined	Conventional
String beans	n = 30	n = 7	n = 3
Average effective area harvested (m ²)	1,193.20	1,521.40	3,616.70
Average production per farm (kg)	264.07	165.33	1,669.13
Yield per hectare (kg/1000 m ²)	221.31	108.67	461.51
Baguio beans	n = 28	n = 9	n = 15
Average effective area harvested (m ²)	1,239.30	2,242.20	4,238.00
Average production per farm (kg)	493.87	588.80	2,509.40
Yield per hectare (kg/1000 m ²)	398.50	262.60	592.12
Eggplant	n = 26	n = 9	n = 9
Average effective area harvested (m ²)	885.10	2,666.70	625.00
Average production per farm (kg)	443.40	1,287.73	746.67
Yield per hectare (kg/1000 m ²)	500.96	482.89	1,194.67
Lettuce	n = 21	n = 20	n = 5
Average effective area harvested (m ²)	2,128.10	970.00	3,357.80
Average production per farm (kg)	956.40	869.00	3,580.00
Yield per hectare (kg/1000 m ²)	449.41	1,028.49	1,066.17
Broccoli	n = 10	n = 13	n = 20
Average effective area harvested (m ²)	1,455.00	2,846.20	3,709.90
Average production per farm (kg)	452.90	2,706.70	5,314.80
Yield per hectare (kg/1000 m ²)	11,031.70	19,398.00	21,624.60
Cabbage	n = 6	n = 11	n = 48
Average effective area harvested (m ²)	1,455.00	2,846.20	3,709.90
Average production per farm (kg)	301.93	1,804.47	3,543.20
Yield per hectare (kg/1000 m ²)	207.51	633.99	955.07
Tomato	n = 10	n = 8	n = 32
Average effective area harvested (m ²)	1,531.70	6,425.00	5,427.00
Average production per farm (kg)	583.20	4,979.33	5,391.47
Yield per hectare (kg/1000 m ²)	380.75	774.99	993.45

Table 3. Average gross income, total expenses, and net income by vegetable farmer respondents, by classification, 2013

ITEM	CLASSIFICATION		
	Organic (n=120)	Combined (n = 57)	Conventional (n=119)
(In PhP/1,000 m ²)			
Gross income	25,027.04	16,692.87	11,064.86
Total expenses	15,184.76	5,393.05	4,272.46
Material inputs	3,321.31	2,040.20	1,754.53
Labor	10,345.88	3,126.21	1,951.69
Post-harvest and marketing	1,517.57	226.64	566.24
Net income	9,842.28	11,299.83	6,792.40

Note: In the computation of income and expenses, extreme values from combined and conventional farming were excluded.

The spectrum of production problems reported by the farmers ranged from pest and diseases to financial concerns. Even with the advances in the packages of technology for production, the occurrence of pest and diseases (64%) remained to be a major concern for vegetable farmers across respondent classifications. The proportion of conventional farmers who suffered from the occurrence of pest and diseases (77%) was higher than the proportion of combined (68%) and organic vegetable farmers (57%).

Only 11 percent of the vegetable farmers across respondent classifications had labor constraints. Organic vegetable farmers had the highest proportion of farmers who encountered labor constraints (18%), followed by combined farmers (12%), and conventional farmers (4%). Organic vegetable farming was labor intensive and required a certain level of knowledge and skills.

In terms of accessing farm inputs across respondent classifications, only 17 percent expressed that they had problems accessing farm inputs. Organic vegetable farmers had the highest proportion of farmers with problems accessing inputs (23%), followed by combined farmers (17%), and conventional farmers (12%). Lack of capital remained to be the major concern of vegetable farmers in terms of accessing farm inputs. Organic farmers (37%) and combined farmers (40%) also cited the lack of supply of organic inputs.

Role of farmer organizations. More than half (54%) of the total respondents were members of an agriculture-related organization. Across respondent types, trends varied. Majority of organic farmers (77%) and combined farmers (63%) were affiliated with an organization. In contrast, only a fourth (26%) of the conventional farmers joined an organization (Table 4).

Table 4. Membership in organization by respondent type, 2013

RESPONSE	RESPONDENT TYPE							
	Organic (n=120)		Combined (n=60)		Conventional (n=120)		All	
	No.	%	No.	%	No.	%	No.	%
Member	92	76.7	38	63.3	31	25.8	161	53.7
Not member	28	23.3	22	36.7	89	74.2	139	46.3

Almost half (47%) of the respondents who were affiliated with an agriculture-based organization claimed that there were no problems inside their organization. Some of the respondents had problems on attendance during meetings (11%), availability of funds (10%), and minimal cooperation of members (9%).

Across respondent classifications, the organic farmers (40%) had the lowest share of respondents who said that their

organizations did not have any problem while the conventional ones, the highest at 61 percent. Poor attendance, inadequate funds, and lack of cooperation were usually cited by organic farmers. Poor attendance was also a common problem mentioned by the combined farmers. Financial matters seemed to hamper the conventional farmers and were also probably causing the disagreements and lack of cooperation among the members.

The role of farmers' organizations in the promotion and eventual adoption of organic farming system for vegetable production cannot be undermined. Across respondent classifications, 40 percent believed that the officers of their organization needed a refresher course in the manufacture of biological inputs (Table 5). Unlike conventional farmers who relied on readily available chemical inputs, combined farmers and organic farmers had limited supply of readily available organic fertilizers and biopesticides. Both organic and combined farmers had to learn how to use natural resources abundant in the area and process them into concoctions and fertilizers to be used in their farms. The preparation of organic inputs required a certain level of knowledge and a particular set of skills in order to produce their own organic fertilizers and concoctions.

Farm level health and environmental impacts.

Vegetable farmers suffered from various illnesses whether they were practicing organic, combined, or conventional farming. The most common types of illnesses mentioned were headache/migraine, dizziness/nausea, vomiting, cough, cold/flu, fever, body pain, over fatigue, and allergies. A comparison of the estimated cost incurred due to these illnesses was made. Organic vegetable farmers estimated cost of illness ranging from PhP250–PhP10,860 while they were producing vegetables through conventional methods. Conventional farmers on the other hand, estimated a cost of illness value ranging from PhP700–PhP3,600 while they were producing vegetables. Vegetable farmers under combined classification estimated the cost of illness value from PhP500–PhP5,660. One of the probable reasons why conventional vegetable farmers shifted to organic farming was to avoid the cost of illness attributed to conventional farming methods.

Table 5. Training needs of officers on vegetable organic farming identified by farmer respondents affiliated with organizations, by 2013

RESPONSE	RESPONDENT TYPE							
	Organic		Combined		Conventional		All	
	No.	%	No.	%	No.	%	No.	%
Follow up training/ refresher course in formulating inputs	34	37.0	15	39.5	15	48.4	64	39.8
None	30	32.6	15	39.5	9	29	54	33.5
Post-harvest handling, packaging and marketing of organic products	14	15.2	3	7.9	1	3.2	18	11.2
No answer	7	7.6	3	7.9	2	6.5	12	7.5
Do not know	2	2.2	1	2.6	4	12.9	7	4.3
Others	5	5.4	1	2.6	3	9.7	9	5.6

Organic vegetable farmers believed that organic farming methods had a positive effect on soil quality, soil fertility, soil structure, and texture. Likewise, organic farming was believed to have improved soil acidity. All these improvements were known to have a positive effect on productivity. It was estimated that on average, vegetable farmers could save as much as PhP180-PhP5,230 per year from improved soil quality. These estimates were based on the farmer's reduction or total abandonment on the use of synthetic/inorganic chemical fertilizers.

In terms of the effect of organic agriculture on water quality, vegetable farmers perceived that organic farming practices led to cleaner/safer water to drink. Estimated savings due to improved water quality ranged from PhP250 to PhP1,800 per year. These estimates were derived from not having to buy mineral water for drinking.

In terms of biodiversity, organic vegetable farmers perceived organic farming methods to have a positive effect on biodiversity and air quality. However, it was difficult to put a value on these effects.

In terms of health benefits, the organic vegetable farmers perceived the highest average total cost of illness while they are still producing vegetables through conventional means. Organic vegetable farmers gave an estimated range of values from PhP250 to PhP10,860, while conventional farmers gave estimates ranging from PhP700 to PhP3,600. The average cost of illness was estimated by factoring in the number of days the farmers are absent due to illness, the cost of medicines, doctor's fees, and the cost of transportation to and from the clinic or hospital.

Market

The lack of sustainable supply of organically grown products made it difficult for farmers to market their products, particularly to institutional buyers (e.g., malls). In order to market the organically grown produce to supermarkets in shopping malls, farmers had to be able to forecast and commit a steady volume of produce.

Differentiating the organic products from conventional produce at the local market created additional burden to organic farmers. Similar findings were observed by Piadozo et al. (2014) in their study on rice farmers' concept and awareness on organic agriculture. Without much product differentiation, farmers cannot benefit from the premium price set for organic vegetables. In order to differentiate organic vegetables from conventionally grown vegetables, farmers would have to go into certification.

There are first-, second-, and third-party certification for organic products. The law currently provides and acknowledges third-party certification only. However, there are only two accredited certifying bodies in the entire country. One is the Organic Certification Center of the Philippines (OCCP) and the other is the Negros Island Certification Services (NICERT). The cost of certification and the process that farmers and farmer-groups have to go through for certification serve as barriers to enter the organic vegetable market.

Likewise, imperfect market knowledge hampers price control and decisions by organic vegetable producers. Organic vegetable farmers were aware that their products must command a higher price because of environmental and health benefits. However, lack of a ready market outlet and the relatively small volume of produce from smallholder farms hindered them from controlling pricing decisions. Some farmer organizations realized the importance of and have adopted labeling to enjoy the premium price set for organic vegetables. However, labeling without certification guaranteed product differentiation only at the local level. The produce was generally not acceptable as organic without third-party certification. Without certification, information on labels is limited to the brand name, name of producer, and a claim of health benefits. Under RA 10068, these producers cannot use the word 'organic.'

On the demand side, Nocon and Fujimoto (2006) observed that "some food establishments were considering stopping or not expanding their purchase of organic vegetables due to unstable supply, high price, non-certification, unreliability, poor quality, and no demand from current clients."

Furthermore, approximately 70-80 percent of organically produced vegetables in the study areas are sold and a very limited proportion (4-21%) was consumed at home. More than half of those marketed went to Metro Manila. Payment scheme for organic vegetables was mostly in cash. However, selling prices of these organic vegetables were dictated by the prevailing market price for conventionally grown vegetables primarily due to lack

of certification rather than the lack of market price information for organically grown produce. In NOAP, the LGUs are supposed to take the lead in establishing trading posts specifically for organically grown products. The implementation of this provision in the program greatly relied on the political will of the local chief executive.

Lastly, organic vegetable producers with third-party certification enjoyed high profit margins. There were associations where the profit margin reached up to 25 percent of their selling price. Traders of certified organically grown vegetables also gained huge profits even when they experienced pull outs.

Utilization/Consumption

Given the increasing interest on food quality and food safety, consumption of organic food has become popular. This section highlights the results of the survey among consumers and non-consumers of organic vegetables. Surveys were carried out in organic markets, public markets, and restaurants.

Majority of the respondents for both consumers (73%) and non-consumers (78%) of organic vegetables were females, with ages averaging between 25-45 years old, and mostly married. Most of the organic vegetable consumers were college graduates, professionals, and with mean monthly household income ranging from PhP21,550 (Benguet) to PhP46,277 (Laguna) and PhP29,970 across the three provinces. Non-consumers of organic vegetables were mostly high school (27%) and college graduates (29%), with more than one third (36%) of them engaged in business and nearly one-fourth (24%) without work. Across the three provinces, mean monthly household income registered at PhP15,651.

Consumer preferences. Majority of the non-consumers (71%) were aware of organic vegetables, with friends/relatives (35%), media (32%), and market (11%) as the major sources of information. Based on this knowledge, most respondents perceived organic vegetables to be safe because none or less chemicals

had been applied and therefore safer to eat than conventional vegetables. They also perceived organic produce to be good for the health (i.e., a cure for illnesses, may prevent sicknesses, and a source of anti-oxidants) and for the environment.

Consumers of organic vegetables placed high importance on health, nutrition, food safety, and environmental effects. On the other hand, the food preference of non-consumers of organic vegetables depended on taste and appearance/freshness (35%), food safety (26%), health and nutrition effects (16%), and affordability (16%).

Buying practices. Organic consumers bought vegetables with frequency ranging from daily to once a week (73%) with 6 percent of them growing organic vegetables. Majority (72%) of them also ate at restaurants offering organic food, with almost half of them practicing this daily to once a week. Weekly expenditures for organic vegetables in organic markets were highest in Laguna (PhP797), followed by Benguet (PhP468) and lastly in Bukidnon (PhP268). Expenditures for organic vegetables (organic markets and organic restaurants) by respondents averaged at PhP418 per week.

Non-consumers of organic vegetables were asked whether they were willing to consume these vegetables. All respondents of Bukidnon (100%) and majority of Benguet (96%) and Laguna (95%) were willing to consume organic vegetables because they believed that organic vegetables were good for the health (73%). In contrast, some were not willing to consume organic vegetables because they viewed these to be too expensive (67%), not good tasting (17%), and not always available in the locality (8%).

For both types of respondents, product price, product effects, availability, eating experience (taste), and visuals/appearance influenced their decision to purchase. More than half (46%) of the non-consumers of organic vegetables preferred that the price of organic vegetables be the same as conventional ones. Close to one-third (32%) of them were willing to pay at price level higher by only 10 to 30 percent than conventional ones.

Health and other benefits. The growing interest on natural and organically grown crops is attributed to the perceived food safety and health benefits to consumers. Consumers' interest on food quality and food safety issues have resulted from the increased knowledge on the link between diet and health (McLennon, 2002). Piadozo et al. (2014) stated in their study that health benefits from consumption of organic products are enjoyed by both the consumers and the producers.

Respondents perceived that the consumption of organic vegetables to have benefits on health and nutrition. They said that these vegetables could lower sugar level, serve as sources of antioxidants, prevent some illnesses, regulate bowel movement, and lead to long life, among others. Another benefit of eating organic vegetables was the perceived food safety/quality because of no or less chemicals applied during production. Because these were naturally grown, these may be eaten raw or fresh.

Perceptions on labeling organic vegetables. Of the consumers of organic vegetables, 94 percent believed that organic vegetables should be labeled. Even non-consumers of organic vegetables (92%) perceived that organic vegetables should be labeled. The label should also indicate information on shelf-life, date of harvest, whether pesticides were applied or not (pesticide residue), and place of production. Most (87%) of the organic vegetable consumers surveyed were not aware of any policy on organic vegetables.

Operationalization of Organic Agriculture Law at the Local Level

It is important to know the status of the operationalization of the Organic Agriculture Law in the Philippines as previous studies have mentioned that advances in the organic agriculture sector have been driven by civil society (Salazar, 2005) and that there was a need for government to triple their efforts in disseminating information on organic agriculture (Piadozo et al., 2014).

Covering three selected vegetable growing provinces, Benguet, Bukidnon, and Laguna, the role and implementation mechanism of different stakeholder institutions (i.e., RFOs of line agencies, OPAG and MAOs, and NGOs) were studied.

The role of NGOs in promoting organic agriculture and in funding organic farming/sustainable agriculture and healthy lifestyle precedes the Organic Agriculture Act of 2010 (OAA). In Benguet (e.g., Jaime V. Ongpin Foundation, Inc. (JVOFI), Bukidnon (e.g., religious/church organizations), and Laguna (e.g., Costales Farm), organic agriculture was initiated by NGOs. When the Implementing Rules and Regulations (IRR) of OAA was finalized in 2012, the regional field offices (RFOs) of member-institutions of NOAB have been mobilized with DA, particularly BAFPS as the lead implementer.

The DA RFOs follow the guidelines (i.e., Philippine National Standards for Organic Agriculture and OAA-IRR) formulated by DA-BAFPS and the project monitoring system (PMS) of the certifying bodies (i.e., NICERT and OCCP). The NOAP funds are downloaded from DA and forwarded to RFO, which provide technical, financial, and other assistance to approved project proposals from the local government through the OPAG.

Both national and regional offices of the DA Agricultural Training Institute (DA-ATI) provide capacity-building activities (i.e., trainings and seminars) to provincial and municipal local government units (LGUs). It is mandated by law (e.g., OAA) that after the orientation training, LGUs should organize its Provincial and Municipal Local Technical Committee (P/MLTC). Once formalized, the LTC members would undergo a technical briefing to understand the organic protocols within the ambit of the Philippine National Standards on Organic Agriculture. The last activity in this capacity-building series would be the planning workshop for LTC to formulate the organic agriculture roadmap, which would specify the planned activities/projects. Project proposals that LGUs would submit to DA RFOs should be based on the roadmap. The capacity gap on project proposal preparation

and management, as respondents explained, was attributed to the low approval rate if not the low submission of project proposals (e.g., establishing trading post for organic product) from provincial LGU to DA RFOs).

Besides DA-ATI, the training (i.e., Internal Control System) that certifying bodies provide for group certification was seen as a mechanism to promote organic agriculture to farmers. The certifying bodies with membership and accreditation from international organizations [e.g., IFOAM, World Fair Trade Organization (WFTO), Certification of Environmental Standards (CERES), Gesellschaft mit beschränkter Haftung (GmbH)] link domestic organic products to the world market with adherence to global standards. At present, the country has only two certifying bodies accredited by DA-BAFPS. With additional International Standard Organization (ISO) accreditation requirement from the certifying bodies, the perceived high cost of certification and the rigid certification process were pointed out as stifling the promotion of third-party certification, which is required by law.

The personnel of both the DA RFOs and the provincial/municipal LGU agriculture offices narrated that they were “multi-tasking” due to lack of personnel in their offices. Multi-tasking meant that besides organic agriculture activities, they were carrying out other agriculture programs mandated for their offices. Aside from personnel, equipment and facilities were shared across different agriculture and fisheries programs. The DA RFOs relied on job contract (contractual) personnel due to fast staff turnover of focal persons on organic agriculture. The turnover came from retirement and transfer of office partly because of the rationalization plan. On the other hand, in the provincial/municipal LGU agricultural offices, the staff turnover and implementation of organic agriculture activities depended on the local leadership's priority programs. The active functioning of the Local Development Councils (LDCs) (i.e., conduct of regular meetings, formulation of organic agriculture ordinance or resolution for approval of *Sangguniang Bayan*, technology demonstration) necessitated the political will of the local executives.

Of the three provinces, Benguet (particularly La Trinidad) pioneered in organic agriculture and was named as the “Salad Bowl of the Philippines.” This reputé was earned through the initiatives of NGOs (e.g., JVOFI, the technical assistance of academic/higher education institution (e.g., Benguet State University), and the pro-active role of the provincial and municipal LGUs. Also in place were local ordinances for establishing organic market; the P/M LDCs that were regularly being convened; and interagency linkages among government, NGOs, farmers’ organizations, and market distribution outlets/traders.

The role of the academe is important in the promotion and institutionalization of organic agriculture. The Benguet State University (BSU) in La Trinidad, Benguet has been conducting numerous information, education, and communication (IEC) activities for pro-organic agriculture since 2004, before the OAA was approved in 2010. The BSU had been declared as the organic agriculture university in the Cordillera Administrative Region (CAR) by the Regional Development Council. It now aims to be the organic agriculture university in Asia. The University receives local and international funding support for its various activities on organic agriculture.

The BSU houses the Cordillera Organic Agriculture Research and Development Center since 2009, now named as National Organic Agriculture Research and Development Center (NOARDC). It has integrated organic agriculture in its undergraduate and graduate academic programs as well as in its extension and production activities. The BSU has developed its Internal Guarantee System for Organic Farming, particularly in the production of strawberry, highland vegetables, and Arabica coffee. Besides having a research and extension building, BSU has a covered space for an organic vegetable market. This serves as an outlet for the organic vegetables produced by farmers and farmer cooperatives as well as by students of the university from their field trials or experiments.

In Laguna, even before the Organic Agriculture Act of 2010, the University of the Philippines Los Baños (UPLB) has been conducting research and extension activities in organic agriculture,

particularly on vegetables since 2006, with the project entitled “Determinants to Promoting Transition from Conventional to Organic Vegetable Production in CALABARZON.” The project was funded by Japan International Cooperation Agency (JICA) through National Economic Development Authority (NEDA) IV-A. Moreover, UPLB faculty have developed learning modules for the non-formal education program of the University of the Philippines Open University (UPOU), which has been attracting more enrollees since it was first offered in 2012. The UPLB Institute of Plant Breeding and the DA-Bureau of Plant Industry Los Baños National Crops Research and Development Center (BPI-LBNCRDC) are in the forefront of developing organic seeds.

The Province of Bukidnon is popularly known as the ‘food basket’ of Mindanao, as well as “Mindanao’s Baguio” (Benguet). It can also grow semi-temperate crops due to its climate. However, in terms of organic agriculture, the province is still just in its startup phase. During the FGD among the OPAG staff in Malaybalay, Bukidnon, participants revealed that they were unprepared about organic agriculture. Some of the agricultural extension workers or technicians did not even have a clear idea on what was organic. Further, they were confused which farming system to promote - conventional or organic - because they were handling both.

In all the provinces, the regional agricultural resources research and development consortia house the one-stop-information shop containing printed and learning resources developed/produced by the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) of the Department of Science and Technology (DOST). In Bukidnon, the printed manual on organic agriculture of PCAARRD was photocopied by the regional and provincial agricultural offices, which served as their guide in providing technical assistance to farmers.

In the forefront of the implementation of organic agriculture program are the LGUs. They are expected to provide a conducive and supportive environment to expand more agricultural areas into organic farming especially with the lifting of the labeling moratorium in April 2016.

CONCLUSIONS

For all types of vegetables covered in the study, conventional farmers registered the highest yield, but they had the lowest gross income. Organic farmers incurred the highest total cost. Farmers practicing combined farming system derived the highest net income followed by organic farmers, and then the conventional farmers. Majority of the farmers were constrained by farm production problems, most especially the organic vegetable farmers. These problems included labor shortage, lack of access to inputs, and pest and diseases. Organic and combined farmers specifically pointed to the insufficient supply of organic fertilizers within their areas.

The organizations to which farmers were affiliated played pivotal roles in the promotion and adoption of organic farming as they served as providers of organic inputs as well as market outlets. Through such organizations (e.g., cooperatives), farmers were able to access information on organic vegetable farming. One concern in marketing was the relatively higher price of organic produce as compared with the conventional produce. Only high income groups could avail of or consume organic produce. Moreover, organic vegetables were not always available in the market.

The slow and costly certification process was another burden for organic farmers. For a developing country with numerous smallhold farmers, it is quite ambitious to pursue third-party certification at this time, especially in areas where organic farmers have not yet been organized into cooperatives or farmer associations. At the local level, the small number of traders and the lack of trading posts designated exclusively for organic product trading indicate that local demand for organic vegetables is still low.

The demand for organic products may be constrained by its high price as compared with conventionally or commercially grown products available in the market. While the Organic Agriculture Act of the Philippines in 2010 had long been passed,

implementing the salient provisions for market development is fraught with challenges. These challenges constrain both consumer demand and farm level expansion of organic agriculture. In the forefront of implementing the organic agriculture program are the LGUs, but capacity building is needed to enhance their effectiveness.

RECOMMENDATIONS

With the ASEAN integration in 2015 and the lifting (ending) of the moratorium on labeling/selling of uncertified products as organic in 2016, immediate action on supporting policies for the full implementation of the National Organic Agricultural Program is imperative. Below are the operational policy recommendations that can enhance expansion and adoption of organic agriculture as a technology.

Improve the Organic Agriculture Certification Process

Small-scale farmers do not have the financial capacity to certify their produce; hence, alternative methods of certification are needed. Although the law only allows third-party certification for organic products whether for domestic and international markets, the respondents recommended that certification should be relaxed. The government may consider the use of the Participatory Guarantee System (PGS) as first-party certification for locally consumed goods; the second-party certification will be for the country's regional consumption; and the third-party certification will be for the international market.

In preparation for the ASEAN integration, the BAFPS requires the organic certifying bodies in the Philippines to be ISO/IEC 17065 compliant to gain conformity with organic certifying bodies among ASEAN member countries. To intensify organic farming, more certifying bodies should be accessible to organic producers to enable them to compete in the ASEAN market.

The LGUs can help the organic agriculture industry by crafting ordinances to support the said industry in their locality, especially in helping farmer-groups undergo the certification process. The LGU can get an adviser for farmers to help them understand the certification process and prepare the requirements. Further, the LGU can assist in crafting guidelines for local or regional certification. For instance, the NICERT operates in the Visayas. In the same vein, a certifying body in the Cordilleras will be more efficient. There was also an observation that in other countries, the public sector certifies farmers' produce, while in the Philippines, this is done by the private sector. The public sector can possibly build capacities for a certification role.

The certification requirement has an implication on the labeling of organic products. Results of the study showed that consumers look for the following information from a label of an organic product: source or location of production, date of harvest, and the phrase 'natural,' 'environmentally-friendly,' 'pesticide free,' or 'chemical free.'

Certification is better carried out within the context of farmers' organizations. Farmers' organizations also provide both a legal personality and an avenue for small farmers to reach their target market and in accessing farm inputs. They serve as venues where farmers can directly sell their produce to consumers and enjoy a comfortable profit margin. Moreover, they play a major role in the post-harvest handling, packaging, and marketing of vegetables. Post-harvest handling and packaging inputs need equipment that may be considered costly if it is to be acquired by individual farmers. Packaging should also be considered in future studies as this has also some bearing on the quality and safety of organic vegetables.

Enhance Access to Organic Inputs and IEC Activities

Production of organic inputs can be enhanced to address farmers' problems on access to these inputs. Regional centers of the Bureau of Plant Industry (BPI) as well as the state universities

and colleges (SUCs) in the province may be tapped for this purpose. The BPI is mandated to develop new organic varieties and provide organic planting materials and seeds to farmers. The SCUs have instruction, research, extension, and production functions that can contribute to the IEC campaign for organic agriculture. For instance, these can be included in the schools' formal and non-formal education and extension activities. Agriculture-based SUCs have laboratory facilities and experimental stations, which can help develop new seed varieties and produce organic seeds for farmers. However, given their current financial resources, SUCs should be provided supplementary funding and be given upgraded facilities for organic seed development and production.

In each region, networks of agencies with common mandates can work together and coordinate one another's development activities. These agencies include the Regional Development Council of NEDA and the regional consortia of DOST-PCAARRD. Besides the LGU units, the regional consortia house the one-stop information shop and farmers information technology service (FITS) centers containing the repository of science-based publications and IEC materials (e.g., brochures, posters, calendars). Expertise of the researchers and extension personnel in the member-agencies can also provide technical assistance to farmers and LGU units.

The pivotal role of NGOs (i.e., foundations, religious sects, hobbyist groups) has been documented by the study. These organizations can start up the organic agriculture advocacy with initial funding for sustainable, chemical-free farming, and marketing assistance. Peoples' organizations and civic groups are also listed in some networks (e.g., councils and consortia) to have interest in organic agriculture.

Sustain the Role and Strengthen Capacities of Cooperatives in the Production and Commercialization of Organic Inputs and Products

Cooperatives are expected to serve as conduits of services needed by farmers. They are legal entities, which are allowed to

undertake business activities such as producing and marketing of organic inputs. However, their capacities have to be enhanced by continuous and updated trainings on organic agriculture production. The DA-ATI, SUCs, and line agencies can provide farmers and cooperative members with systematic capacity-building programs on the production of organic inputs (i.e., organic seeds, vermicomposting, bio-fertilizers, bio-pesticides); processing, packaging and labeling of organic products; and business operations in consolidating and commercializing organic inputs and products, and in the management of common facilities.

Facilities (e.g., vermi-chopper, greenhouse) should be subsidized by LGUs or LGUs can facilitate acquisition of these facilities from grants, which will enable farmers to be self-reliant in production inputs. With these facilities, cooperatives can be accessible sources of organic production inputs and products, which will ensure a steady, ready, and quality supply in the locality. Since the average production area for organic vegetables is small, smallholder farms must be organized to be able to consolidate their produce. Well-planned planting and harvesting or crop rotation should also be set in place.

Improve the Marketing System

Interviews with farmer-respondents revealed that no actual trading post specific for organic markets in the areas have been established. The provincial and municipal LGUs should be assisted in developing project proposals or a business plan for a public-private partnership in the establishment of trading posts. They should not only rely on government funds allotted for organic agriculture lodged in the DA RFOs. The establishment of trading posts in strategic market demand centers can increase access to organic products by consumers and traders as well.

In the marketing of organic produce, no apparent product disaggregation was observed in the study sites. For the protection of the consumers and easy identification of products, market outlets (e.g., public markets, supermarkets, trading posts, fairs, and exhibits) should provide separate display areas for organic

products and non-organic products. Likewise, with product disaggregation, farmers, farmer-traders, and other traders would receive a higher price premium for their organic commodities. Use of appropriate packaging and labels for easy handling and differentiation of organic from conventional products would benefit producers, traders, and consumers. The study found that consumers looked for the source or location of production, date of harvest, and the phrase 'chemical free' or 'pesticide-free', which were deemed as very important.

Provision of functional market information system will benefit the farmers who, in general, have limited knowledge on the market, price, and demand for organic products. On the other hand, traders and consumers need information on the sources of organic products. Market information system does not only require a good database but also wide media coverage in terms of public service announcements, news or advertisements in the mass media (e.g. television, newspapers), and online/telecom media (e.g., internet, text messaging) in support of organic agriculture.

Poor farm-to-market road affects both production and marketing of organic inputs and products. The Department of Public Works and Highways (DPWH) or the concerned LGUs should be able to address this infrastructure concern.

Adopt Strategies to Increase Demand for Organic Products

Apart from enhancing consumer awareness on the benefits of organic vegetables, the government can help increase demand for organic products by encouraging public establishments such as hospitals, schools, and government offices to serve organic produce. This will redound to more income for organic farmers. In related manner, if the price of organic produce is lower, more people can have access to organic products. Increasing the production of organic vegetables will result to lower price and make the produce more available in local markets. Farmers said that they would also like to reach out to the lower income groups.

Build Capacities of Local Implementers of the Organic Agriculture Program

A cadre of personnel in the LGUs, field, regional, and national offices dedicated solely to organic agriculture can increase their credibility and trustworthiness among organic producers. The present study found that personnel were multi-tasking with different agricultural programs assigned to them as they shared common agency facilities (i.e., computer, vehicle). Capacity building of LGU personnel should go beyond teaching them the appropriate technology and technical training on organic agriculture. The trainings should include linkage to market outlets, business operations in managing trading posts, and proposal preparation of organic agriculture projects and memoranda of agreement with local communities and cooperatives.

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LITERATURE CITED

FiBL-IFOAM. (2014). The world of organic agriculture: Statistics and emerging trends 2014. Retrieved from <https://www.fibl.org/fileadmin/documents/shop/1636-organic-world-2014.pdf> on June 18, 2014.

- IFOAM (2009). Definition of organic agriculture. IFOAM, Bonn, Germany. Retrieved from <http://www.systems-comparison.fibl.org/en/scp-systems-comparison/scp-org-agr.html> on August 3, 2015.
- Källander, I. & Rundgren, G. (2008). Building sustainable organic sectors. Retrieved from http://www.ifoam.bio/sites/default/files/page/files/building_sustainable_organic_sectors_web_1.pdf on September 29, 2014.
- McLennon, S. E. A. (2002). Analysis of consumer perceptions toward biotechnology and their preferences for Biotech food labels. Louisiana State University and Agricultural and Mechanical College. Retrieved from http://etd.lsu.edu/docs/available/etd-1114102-133418/unrestricted/McLennon_thesis.pdf on November 12, 2012.
- Nocon, N. & Fujimoto, A. (2006). Demand for organic vegetables in the Philippines – A study of food establishments and consumers in Metro Manila. *Journal of Agriculture Science Tokyo University of Agriculture*, 50(4): 112-120.
- Peñalba, L. M., Dizon, J. T., & Elazegui, D. D. (2007). Social and equity implications and public policy dimensions of innovative rice and corn technologies: The Philippine experience. Terminal Report. Unpublished.
- Piadozo, E. S., Lantican, F. A., Pabuayon, I. M., Quicoy, A. R., Suyat, A. M., & Maghirang, P. K. B. (2014). Rice farmer's concept and awareness of organic agriculture: Implications for sustainability of Philippine Organic Agriculture Program. *Journal of International Society for Southeast Asian Agricultural Sciences*, 20 (2): 142-156.
- Pingali, P. & Roger, A. (1995). Impact of pesticides on farmer health and the rice environment. Laguna, Philippines: International Rice Research Institute.
- Pretty, J., Brett, C., Gee, D., Hine, R., Mason, C., Morison, J., Dobbs, T. (2001). Policy challenges and priorities for internalizing the externalities of modern agriculture. *Journal of Environmental Planning and Management*, 44(2), 263–283. <http://doi.org/10.1080/09640560123782>.
- Rola, A. C. & Pingali. P. L. (1993). Pesticides, rice productivity and farmers' health: An economic assessment. Laguna, Philippines: International Rice Research Institute and Washington, D.C.: World Resources Institute.

- Salazar, R. C. (2005). Social and institutional opportunities and constraints of organic agriculture in the Philippines. Paper presented at the Conference on International Agricultural Research for Development, Stuttgart-Hohenheim, October 11-13, 2005. Retrieved from www.tropentag.de/2005/abstracts/full/288.pdf on April 5, 2016.
- Valerian, J., Domonko, E., Mwita, S., & Shirima, A. (2011). Assessment of the willingness to pay for organic products amongst households in Morogo Municipal. Report to Sustainable Agriculture in Tanzania. Retrieved from <http://kilimo.org/WordPress/wp-content/uploads/2012/01/Assessment-of-the-Willingness-to-Pay-for-Organic-Products-amongst-in-Morogoro-Households-in-Morogoro-Municipal.pdf> on January 3, 2014.

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