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Editor's Note

The Journal of Public Affairs and Development (JPAD) is a double-blind peer-reviewed journal published annually by the College of Public Affairs and Development, University of the Philippines Los Baños. It accepts research articles, research notes, and policy papers on development studies and governance, particularly on agrarian and urban development, agricultural and extension education, community development, development management and governance, education management, and strategic planning and public policy.

The fourth issue of the JPAD contains studies on community participation in rice security programs, performance of the Rice Crop Insurance Program, challenges in climate information service provisioning, adoption and implementation of TQM/ISO 9001, role of internal revenue allotments in decentralization and achieving shared growth, self-assessed knowledge and farm practices of climate field school graduates, and lastly, adaptation practices of rice farmers.

In the first article, **Martins** and **Dizon** explored the factors affecting community participation in the rice security programs in Cailaco and Maliana, Timor-Leste. The study revealed the beneficiaries' very favorable attitude toward joining farmers' groups and very high trust toward co-farmers and farmers' group. Using binary logistic regression, results showed that the farmers were fully involved from project identification, planning, implementation, and up to monitoring and evaluation. Specifically, year of membership in farmers' group and trust in co-farmers significantly affected problem identification. Household size, adequate income for family support, and year of membership in farmers' group affected planning; age and financial resources were related to implementation; and age affected monitoring and evaluation.

Using both primary and secondary data sources, the paper by **Rola** and **Querijero** assessed the performance of the Rice Crop Insurance Program (RCIP) of the Philippine Crop Insurance Corporation (PCIC) to explain the low number of insured farmers and suggest ways to improve the program's efficiency and effectiveness. Having found the RCIP to be moderately effective, this study recommends that the PCIC should: a) intensify technical capacity-building training for the team of adjusters; b) deputize officers and staff of the municipal agricultural office as

members of the team of adjusters; c) provide stronger and more hands-on assistance to participating farmers; and d) increase the incentives and number of personnel involved in RCIP implementation.

The collaborative research by **Elazegui, Rola, Luyun, Anastacio, Faderagao, and Alvarez** described the global and national policies on climate information services (CIS) as well as the institutions involved in provisioning through the characterization of pathways from data generation to dissemination. Further, it identified the various intermediary users of the CIS and how CIS are ultimately disseminated to the municipal agricultural offices and the farmers. Their paper concludes that the Philippines needs a better system to provide climate information through more modern technologies, improved capacities, and more stable institutional partnerships, among others. To sustain or bolster the provisioning of CIS, they further recommend that there must be compliance to standards in the establishment, use, and maintenance of the CIS equipment; improved capacities in the dissemination; and commitment of partners to institutionalize collaboration among the providers and the users of CIS.

De Leon's case study investigated the adoption and implementation of TQM/ISO 9001 programs in selected Philippine state universities. His study revealed that total quality management (TQM) was regarded as a holistic approach to the continuous improvement of work processes while International Organization for Standardization (ISO) 9001 was perceived as an international quality management system (QMS) standard and a quality assessment instrument. The study recommends programs that minimize resistance to and promote internalization of TQM/ISO 9001 adoption and the creation of a government certifying body that can serve as an alternative to the private international certifying bodies.

In a macro study, **Maquito** shed light on the role of internal revenue allotments in decentralization to help the Philippines achieve shared growth. Results showed that growth in the Philippines has been more of the inclusive than the shared growth type. Moreover, the research article tendered arguments against two criticisms of the internal revenue allocation (IRA) formula, thereby effectively revealing the potential of the IRA to contribute to shared growth. Recommendations were given for future research on crucial causalities, for example, among IRA, per capita income, population growth through internal migration, as well as the causalities underlying the dynamics among average income, poverty incidence, and income distribution.

At the farmer's level, the paper by **Ruelos, Umali, Olviga, Villa, Jacobo, Paunlagui, and Rola** presents the results of the study that disseminated the Palayamanan technology through the climate field school (CFS) in rainfed areas in Bicol. Findings pointed to significant differences in the pre-test and post-test scores especially on the clustered topics of climate, land preparation and seedling establishment, soil nutrient management, pest management, and harvesting. Due to varying results, the study highlighted the need to conduct similar study that investigates other factors or variables that could affect farmer's participation in the CFS. Overall, the paper concludes that CFS as a mode of extension delivery in rainfed areas is still in its infancy stage. Furthermore, more funds can be poured into strengthening its curriculum as well as capacitating the agricultural technicians to be competent resource persons.

Lastly, the farmer's level study by **Khaing, Baconguis, Serrano, Sta Cruz, and Cambel** analyzed the association of adaptation practices on production and income of rice farmers in Myinmu Township, Myanmar. Results revealed that adaptation practices were categorized into changing cultivated varieties and crops, changing farming systems, conserving rain water, improving irrigation systems, and engaging in non-farm activities. Factors associated with adaptation practices were type of agriculture (ecosystem), total cultivated area, total rice cultivated area, credit accessibility, attendance to training programs and access to inputs. In sum, results shed light on the observable pattern of increased weather variability and minimal adaptation practices, which calls for a more vigorous extension intervention to promote practices that can minimize the impact of weather variability on farmers' production and income.

MARIA ANA T. QUIMBO

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Community Participation in the Local Rice Security Programs in Cailaco and Maliana Sub-Districts in Timor-Leste

¹MICAEL SOARES DOS SANTOS MARTINS and ²JOSEFINA T. DIZON

ABSTRACT. This study was conducted to analyze the factors affecting community participation in the rice security programs in Cailaco and Maliana, Timor-Leste in 2015. Respondents were 103 farmer-members randomly selected from seven farmer groups who worked in the rice programs. Socio-demographic and economic characteristics of the farmers were gathered. Primary data were collected using a structured survey questionnaire, supplemented with data from key informant interviews and focus group discussions. Secondary data were collected from government institutions and donor agencies. Results of the study show that farmers in Cailaco and Maliana have a mean age of 44 years. They have been farming for about 20 years and members of farmers' group for four years. They have an average farm size of 2 ha with two parcels used for farming. They have very favorable attitude toward joining farmers' groups and very high trust toward co-farmers and farmers' group. Using binary logistic regression, results show that the farmers were fully involved from project identification, planning, implementation, and up to monitoring and evaluation. It also reveals the socio-economic factors that affected the respondents' participation in the different phases of the programs. Year of membership in farmers' group and trust in co-farmers significantly affected problem identification. Household size, adequate income for family support, and year of membership in farmers' group affected planning; age and financial resources were related to implementation; and age affected monitoring and evaluation.

Keywords: *rice security, community participation, rice shortage, level of participation*

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INTRODUCTION

Timor-Leste has been largely dependent on agricultural production since its independence restoration in 2002. About one-third of its national gross domestic product came from agriculture, the source of income of majority of the population (Correia, Janes, Rola-Rubzen, Freitas, & Gomes, 2009). Within the agricultural sector, rice production has gained an increasing importance because of the rising domestic demand for rice. The Ministry of Agriculture and Fisheries (MAF, 2008) reported that the local demand reached 77,200 tons annually at 90 kg per capita. This is higher by about 50,000 tons than the local production that is 27,000 tons of milled rice, equivalent to 45,000 tons of paddy at 60 percent milling efficiency (Food and Agriculture Organization [FAO], 2003).

Among the 13 districts in Timor-Leste, the Bobonaro district ranked first in terms of percentage contribution to national rice production. Its rice production area totalled 5,004 ha, contributing 21 percent to the national production (MAF, 2008). Although rice is more expensive compared to its substitutes, it has become the main staple food of almost 60 percent of about 864,000 people in Bobonaro, with substitute foods such as corn, cassava, and potatoes for the rest of the population. Bobonaro was the most productive district for rice and maize with an average yield of 2 tons/ha per cropping (Adelino & Mahinda, 2006).

The domestic demand for rice continued to increase as average income per capita increased over time (Adelino & Mahinda, 2006). The Timor-Leste government had to import rice to overcome the shortage of 4,000 tons of rice per month, according to FAO (2003). MAF (2008) also estimated rice imports at 78,000 tons x \$750/ton (2008 prices) = US\$58.5 million annually to address the gap on rice demand as well as the need for cross-substitution for other staple foods. With the continuous rise of food prices in the world market, the government encouraged farmers to produce more rice and prioritize investment in the rice sector. It has adopted programs to increase domestic rice production.

The country's Strategic Development Plan (SDP) 2011–2030 emphasized the contribution of community participation in the development of sustainable program for rice security in the country. However, the Asia Foundation (2013) and Irish Aid Report (2013) stressed the weakness of community involvement in project identification at village level. There is a need to determine why a low level of community

participation has been observed and reported. Community participation according to Mitchell (1999), as cited in Sharma and Deepak (2001), means stakeholders' involvement in planning, decision-making, and evaluation.

In this light, this study was conducted to analyze the community participation in the rice security programs in Cailaco and Maliana, Timor-Leste. Specifically, the study aimed to: 1) describe the socio-demographic and economic characteristics of the participants of the programs in the study villages; 2) determine the level of community participation in the different phases of the programs; and 3) analyze the factors affecting community participation in the program.

There are two rice security programs in the study areas: IMPACT (Improve Marketing Production through Agricultural Cooperative in Timor-Leste) and Centro Desenvolvimento Comunitario which were established by the Ministry of Agriculture and Fisheries (Seed of Life, 2012).

IMPACT started in 2013 and is expected to be completed by 2019. The objectives of the program are to: 1) introduce to the farmers the SRI so that farmers can apply in their own farm and maximize cost in agriculture; 2) train farmers' cooperative in management of small scale business to maximize benefits from SRI and seeds diversification and help farmers to have access to government support; 3) improve food security for households and increase income in eight districts of Timor-Leste; and 4) provide access to market and bring farmers' agricultural products and compete in the market. The program components are System of Rice Intensification, food processing, and market access.

The Centro Desenvolvimento Comunitario was established in 2013 and is expected to finish in 2017. It aims to: 1) enhance farmers' capacity in problem analysis; 2) improve farmers' capacity through training, field visit and exposure visits; 3) enhance farmers' network through the provision of regular information about agriculture issues and policies; and 4) provide agricultural facilities particularly in seed distribution to farmers. The program components include evaluation of improved food crop varieties, seed production and distribution, construction of irrigation system, and training and information.

METHODOLOGY

Conceptual Framework

Community participation is an essential element of any community-based development program. In the general context of rural development programs in Timor-Leste, community participation involves the major stakeholders and responsible actors of development including individuals, households, and community members. In the case of the rice security programs, households and farmers' groups are involved in the different phases of the programs such as project identification, planning, implementation, and monitoring and evaluation. As major stakeholders, members of farmers' groups should be described in terms of their socio-demographic characteristics, namely: age, number of years of organizational membership, household size, farming experience, attitude toward joining farmers' group, trust in co-farmers, and trust in farmers' groups.

In addition, the economic characteristics such as farm size, land parcel used for farming, rice production income, household income, and financial resources of the farmers' groups are important factors to consider. The relationship between the respondents' socio-economic characteristics (independent variables) and their participation in the different phases of the rice security programs (dependent variable) is shown in Figure 1.

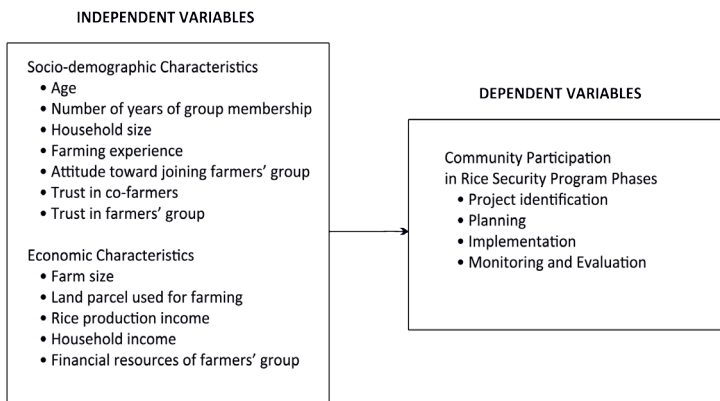


Figure 1. Conceptual framework of the study

Location and Time of Study

The study was conducted in January-February 2015 in Bobonaro district, one of the 13 administrative districts in Timor-Leste. Bobonaro district is located at the western district of the country. It is comprised of six sub-districts, namely: Atabae, Balibo, Bobonaro, Cailaco, Lolotoi, and Maliana. Among these sub-districts, Maliana and Cailaco were purposively selected for this study because these are the primary rice-growing areas in the Bobonaro district.

The study covered specifically three villages in Maliana (Holsa, Odomau, and Ritabou) and two villages in Cailaco (Purugua and Marco). Selection was based on the following criteria: 1) rice production is the primary source of income, 2) lowland rice production is practiced, and 3) the community members are involved in local cooperatives or community-based organizations.

Data Gathering and Analysis

Primary data were gathered from the farmers with the use of a structured survey questionnaire. Information gathered were supplemented with data from the key informant interviews (KIIs) and focus group discussions (FGDs). The KIIs were conducted with community leaders, extension workers and key officers of the *Movimentu Cooperativa Economia e Agricola* (MCE-A) and the Department of Agricultural Extension of Bobonaro district, and other stakeholders. The FGDs involved the participation of 8-12 farmers, local leaders, and other members not included in the household survey.

Secondary data were collected from the institutions and donor agencies namely, Food and Agriculture Organization, Seed of Life, and Department of Agriculture of MAF. Review of documents such as annual reports, project evaluation report, official records, and research papers was done.

Data analysis involved the use of the Statistical Package for the Social Science (SPSS). Descriptive statistics such as frequency distribution, percentage, and mean was applied. Furthermore, the binary logistic regression was used to assess the factors affecting community participation in the rice security programs.

Table 1. Respondents' socio-demographic characteristics

PARTICULARS	CAILACO (n=46)		MALIANA (n=57)		TOTAL (n=103)	
	No.	%	No.	%	No.	%
Age (years)						
30 and below	10	9.7	7	6.8	17	16.5
31-40	12	11.7	7	6.8	19	18.5
41-50	9	8.7	25	24.3	34	33.0
51-60	13	12.6	13	12.6	26	25.2
61 and above	2	1.9	5	4.9	7	6.8
Range	18 -61		20 – 66		18 - 66	
Mean	42.39		45.77		44.26	
Length of group membership (years)						
1-2	7	6.8	13	12.6	20	19.4
3-4	23	22.3	23	22.3	46	44.7
5-6	16	15.5	13	12.6	29	28.1
7-8	0	0	8	7.8	8	7.8
Range	1-6		1-8		1-8	
Mean	4.00		3.95		3.97	
Household size						
1-5	26	25.2	27	26.2	53	51.4
6-10	20	19.4	27	26.2	47	45.6
11-15	0	0	3	2.9	3	2.9
Range	3-10		3-12		3-12	
Mean	5.83		6.003		5.92	
Farming experience (years)						
1-10	14	13.6	11	10.7	25	24.3
11-20	14	13.6	25	24.3	39	37.9
21-30	12	11.6	13	12.6	25	24.2
31-40	5	4.9	4	3.9	9	8.7
41-50	1	0.9	4	3.9	5	4.9
Range	2-50		3-50		2-50	
Mean	20.93		18.74		19.71	

RESULTS AND DISCUSSION

Respondents' Socio-demographic Characteristics

The respondents were generally in their prime age with a mean of 44 years. Only 16 percent of them were aged 30 years and younger, and 18 percent belonged to the age group 31-40 years old. Adults or those who belonged to age groups of 41-50 and 51-60 years old composed 33 percent and 25 percent of the respondents, respectively. Lastly, only seven percent of them were elders or 61 years old and above (Table 1).

In terms of length of organizational membership, slightly less than half (45%) of the respondents had three to four years, 28 percent had five to six, 19 percent had one to two years, and about 8 percent had been members for seven to eight years.

On household size, the families were relatively large comprised of 3 to 12 members with an average size of six. This shows that families are largely extended families.

On farming experience, 38 percent of farmer-respondents had been farming for 11 to 20 years, while 24 percent had been farming for 1-10 and 21-30 years, with a mean of almost 20 years.

Farmers' Attitudes and Trust in Co-farmers and their Organization

To determine the farmers' attitude toward joining a farmers' group and trust in co-farmers and in their group, the respondents were asked to answer statements using a three-point scale assigned with a numerical value of 1 for disagree, 2 for undecided, and 3 for agree. Adjectival rating of the attitude was based on the following scale: 1.00-1.66 = unfavorable, 1.67-2.33 = favorable, and 2.34-3.00 = very favorable. The adjectival rating for trust was based on the scale of 1.00-1.66 = low, 1.67-2.33 = moderate, and 2.34-3.00 = high. Table 2a shows that in general, the respondents had very favorable attitude toward joining farmers' groups. All of them were members of farmers' groups.

Tables 2b and 2c show that the farmers, as a community, had a strong social capital based on their high score on trust in co-farmers and trust in their farmers' group. The farmers believed that their co-farmers in their village can be trusted and will provide help if they ask for assistance. Likewise, respondents were confident that their farmers' group will help them in times of need. They see the officers of their farmers' group as trustworthy.

Table 2a. Farmers' attitudes towards joining farmers' groups

STATEMENT	AGREE		UN-DECIDED		DIS-AGREE		WMS ^a	ADJECTIVAL RATING ^a
	No.	%	No.	%	No.	%		
If farmers join the farmers' group, the family and community will benefit more.	98	95.1	5	4.9	-	-	2.95	Very favorable
Farmers should attend group meetings regularly.	98	95.1	5	4.9	-	-	2.95	Very favorable
It is important to interact with other members of the farmers' group.	100	97.1	3	2.9	-	-	2.97	Very favorable
The farmers' group should create activities that can improve rice security in the village.	100	97.1	3	2.9	-	-	2.97	Very favorable
I will attend group meetings or interact with other members of the farmers' group to benefit from other activities.	96	93.2	7	6.8	-	-	2.93	Very favorable
							2.95	Very favorable

^aWMS (weighted mean score) and Adjectival Rating:
 1.00 – 1.66 = Low; 1.67– 2.33 = Moderate; 2.34 – 3.00 = High

Table 2b. Farmers' trust in co-farmers

STATEMENT	AGREE		UN-DECIDED		DIS-AGREE		WMS ^a	ADJECTIVAL RATING ^a
	No.	%	No.	%	No.	%		
If I need help, I am sure that my co-farmers would help me.	64	62.1	39	37.9	-	-	2.62	High
I can totally trust other farmers in our village.	76	73.8	27	26.2	-	-	2.74	High
I can trust most members in the farmers' group.	77	74.8	26	25.2	-	-	2.60	High
In times of need, I can ask for help from other farmers in our village.	83	80.6	20	19.4	-	-	2.80	High
If I were to leave my family, I would entrust its protection to my co-farmers.	63	61.2	32	31.1	8	7.8	2.53	High
							2.66	High

^aWMS (weighted mean score) and Adjectival Rating:
1.00 – 1.66 = Low; 1.67– 2.33 = Moderate; 2.34 – 3.00 = High

Table 2c. Farmers' trust in the farmers' group

STATEMENT	AGREE		UN- DECIDED		DIS- AGREE		WMS ^a	ADJECTIVAL RATING ^a
	No.	%	No.	%	No.	%		
If I need help, my group would provide me assistance.	89	86.4	14	13.6	-	-	2.86	High
I can trust my group to help me improve my performance in rice production.	96	93.2	5	4.9	2	1.9	2.91	High
I can trust the officers of my farmers' group.	95	92.2	8	7.8	-	-	2.92	High
In times of need, I can ask for help from the officers of my farmers' group	98	95.1	5	4.9	-	-	2.95	High
If I were to leave my family, I would entrust its protection to my group.	95	92.2	8	7.8	-	-	2.92	High
							2.91	High

^aWMS (weighted mean score) and Adjectival Rating:

1.00 – 1.66 = Low; 1.67– 2.33 = Moderate; 2.34 – 3.00 = High

Economic Characteristics of Farmer-Respondents

Majority (77%) of the respondents had 1-2 ha of rice farms. Similarly, majority (79%) of the farmer-respondents from both sub-districts had 1-2 parcel/s of land used for farming (Table 3).

In terms of major sources of income, the respondents were primarily engaged in rice farming and other activities such as poultry and vegetable and livestock production (Figure 2). Income from rice production ranged from US\$10 to US\$180 per month. Majority (78%) of the respondents from Cailaco and more than half (56%) from Maliana reported the lowest monthly income within US\$10-66 range (Table 3).

The monthly household income of the respondents, which ranged from US\$65 to US\$742. Majority of respondents in both sub-districts recorded a monthly farm income ranging from US\$65 to US\$290. Only one was recorded in Cailaco with a monthly income of US\$291-516, while in Maliana one had the highest monthly farm income falling within the range of US\$517-742 (Table 3).

Overall, about 44 percent of the farmer-respondents stated that their group have financial resources, which mostly came from group contributions. The financial resources ranged from US\$751 to US\$1150, according to some respondents (16%), while others (15.5%) said that their resources amounted from US\$750 and below (Table 4).

Rice Security Status in the Study Villages

Rice security in the study villages was determined using rice availability, rice accessibility, and rice utilization as indicators. Rice availability refers to the availability of rice to the respondents based on the following criteria: 1) whether the respondents experienced rice shortage before joining the farmers' groups, 2) sufficiency of rice production since involvement in the farmers' groups, and 3) level of sufficiency of rice production categorized as enough, more than enough, sometimes enough, and not enough. Meanwhile, rice accessibility refers to the respondents' access to rice and their alternative courses of action in case there is rice shortage. Lastly, rice utilization refers to the respondents' utilization of rice as a staple food, sale of rice as source of family income, and preference for other food over rice.

Table 3. Respondents' economic and farm characteristics

PARTICULARS	CAILACO (n=46)		MALIANA (n=57)		TOTAL (n=103)	
	No.	%	No.	%	No.	%
Total area of rice farm (ha)						
1-2	37	35.9	42	40.8	79	76.7
3-4	9	8.7	12	11.7	21	20.4
5-6	0	0	3	2.9	3	2.9
Range	2.00		1.85		1.91	
Mean	1-6		1-4		1-6	
Parcels of land for farming						
1-2	38	36.9	43	41.7	81	78.6
3-4	6	5.8	11	10.7	17	16.5
5-6	2	1.9	3	2.9	5	4.9
Range	1-6		1-4		1-6	
Mean	1.87		1.86		1.86	
Rice production income/month (US\$)						
10 – 66	36	78.3	32	56.1	68	66.0
67- 123	10	21.7	22	38.6	32	31.0
124 – 180	0	0	3	5.3	3	2.9
Range	10-150		20-180		10-180	
Mean	56.63		63.02		60.16	
Household income/month (US\$)						
65-290	45	97.8	54	94.7	99	96.1
291-516	1	2.2	2	3.5	3	2.9
517-742	0	0	1	1.8	1	1.0
Range	70 – 742		65 - 330		65-742	
Mean	186.87		160.98		172.50	

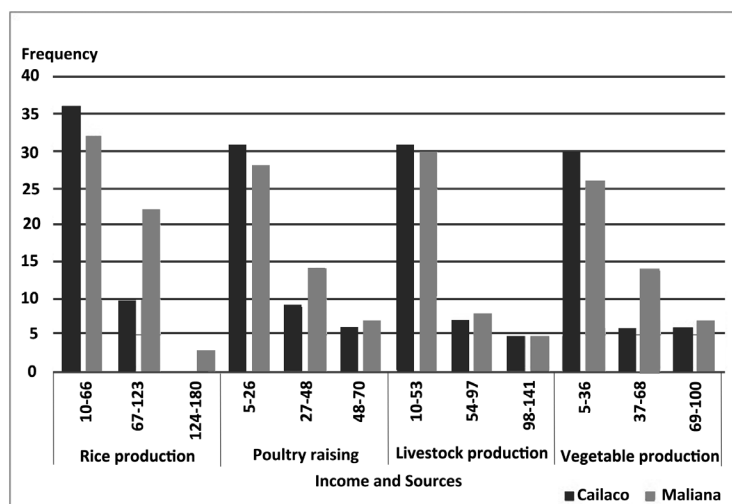


Figure 2. Farmer-respondents' major sources of income

Table 4. Farmer groups' financial resources

PARTICULARS	CAILACO (n=46)		MALIANA (n=57)		TOTAL (n=103)	
	No.	%	No.	%	No.	%
Financial resources						
With	22	21.4	23	22.3	45	43.7
Without	24	23.3	34	33.0	58	56.3
Amount of financial resources (US\$)						
750 and below	5	22.7	11	47.8	16	15.5
751 to 1150	12	54.5	5	21.7	17	16.5
1151 and above	5	22.7	7	30.4	12	11.7
Total	22	21.4	23	22.3	45	42.7
Sources of financial resources ^a						
Group contributions	32	31.1	45	43.7	77	74.7
NGO contributions	3	2.9	1	0.9	4	3.9
Individual contributions	3	2.9	-	-	3	2.9

^aMultiple response

In relation to rice availability, majority of the respondents (92%) experienced rice shortage. The shortage was highly experienced in 2007 (33%), 2004 (26%), and 2006 (23%). Rice shortage was experienced for as long as six months to as short as one month. More than half (53%) experienced rice shortage for three to four months; some (33%) experienced it for one to two months; and only a few (6%) mentioned five to six months (Table 5). The findings indicate that rice shortage is primarily caused by reasons beyond the control of the farmers. Infestation and long dry spell in 2004, 2006, and 2007, which had seriously affected rice farms brought about low yield, and therefore less amount of food for the household. These results are supported by the report of Da Costa et al. (2013) that Timor-Leste suffers from seasonal food insecurity. Weather changes and pest damage had grave consequences on rice production. However, rice production is more stable than maize and provides some food security for the household (Anderson & Cook, 1999).

The status of rice security in terms of rice accessibility in the study villages was improving. More than half of the respondents (53%) shared that the prevailing market price of rice is just enough, while the remaining 47 percent perceived it as low. To cope with rice shortage, respondents bought rice from the market (53%), borrowed from relatives (35%) or exchanged labor for rice (12%) (Table 5).

Rice security in terms of rice utilization was indicated in the respondents' consumption of rice and rice substitutes like maize and cassava, in case of rice shortage. In terms of number of meals per day, almost all (99%) mentioned that they had three meals a day. More than half (58%) stated that they consumed 1.5 to 2.0 kg of rice per day for a family of six (Table 6). This could be attributed to the big family size of an ordinary household in Timor Leste. As recorded, household size was mostly comprised of at least five to six members. This implies that a bigger quantity of rice is consumed especially those with extended families. The result fell within the national consumption of rice, which was 115 kg per year per person as reported by Seeds of Life (2013). This is equivalent to at least 0.31 kg per person per day consumption or at least six family members consumed 1.8 kg per day.

Several years before the study, Timor Leste has been food sufficient due to its annual rice importation. However, some rural households expressed food shortages when their rice and maize stocks have been consumed. In case of cereal shortage, root crop such as cassava and sweet potato are substituted. Another response to food shortage

Table 5. Status of rice security in the study sites according to rice availability and accessibility

PARTICULARS	CAILACO (n=46)		MALIANA (n=57)		TOTAL (n=103)	
	No.	%	No.	%	No.	%
Experience rice shortage						
Yes	39	37.9	56	54.4	95	92.3
No	7	6.8	1	0.9	8	7.7
Year when rice shortage was experienced ^a						
2002	1	0.9	2	1.9	3	2.9
2004	10	9.7	17	16.5	27	26.2
2005	1	0.9	0	0	1	0.9
2006	12	11.7	12	11.7	24	23.4
2007	13	12.6	21	20.4	34	33.0
2009	1	0.9	0	0	1	0.9
2010	6	5.8	2	1.9	8	7.8
2011	2	1.9	3	2.9	5	4.9
Number of months rice shortage was experienced						
1-2	20	19.4	14	13.5	34	33.0
3-4	19	18.4	36	35.0	55	53.4
5-6	0	0	6	5.8	6	5.8
Total	39	37.8	56	54.3	95	92.2
Range	2 – 3		3 -3		2 – 3	
Mean	2.98		3		2.97	
Causes of rice shortage ^a						
Long dry season	23	22.3	15	14.6	38	36.9
Insect attack	27	26.2	22	21.4	49	47.6
Absence of irrigation	5	4.9	1	1.0	6	5.8
Lack of farm workers	5	4.9	27	26.2	32	31.1
Political crisis	8	7.8	8	7.8	16	15.5

^aMultiple response

Table 5 Continued...

PARTICULARS	CAILACO (n=46)		MALIANA (n=57)		TOTAL (n=103)	
	No.	%	No.	%	No.	%
Level of rice sufficiency after joining farmers' group						
Enough	20	19.4	43	41.7	63	61.2
More than enough	24	23.3	9	8.7	33	32.0
Sometimes enough	2	1.9	5	4.8	7	6.8
Prevailing market price of rice						
Low	24	23.3	24	23.3	48	46.6
Just enough	22	21.4	33	32.0	55	53.4
Action to cope with rice shortage						
Bought from the market	4	3.9	5	4.8	9	8.7
Borrowed from relatives	3	2.9	3	2.9	6	5.8
Exchanged labor	1	1.0	1	1.0	2	1.9

Table 6. Status of rice security in the study sites according to rice utilization

PARTICULARS	CAILACO (n=46)		MALIANA (n=57)		TOTAL (n=103)	
	No.	%	No.	%	No.	%
Food staples ^a						
Rice	46	44.7	57	55.3	103	100.0
Maize	26	25.2	33	32.1	59	57.3
Cassava	23	22.3	38	36.9	61	59.2
Papaya	7	6.8	14	13.6	21	20.4
Banana	12	11.7	35	34.0	47	45.7
Potatoes	4	3.9	14	13.6	18	17.5
Beans	2	1.9	9	8.7	11	10.7
Wild food	6	5.8	8	7.8	14	13.6

^aMultiple response

Table 6 Continued...

PARTICULARS	CAILACO (n=46)		MALIANA (n=57)		TOTAL (n=103)	
	No.	%	No.	%	No.	%
Food substitutes during rice shortage ^a						
Maize	36	35.0	38	36.9	74	71.8
Cassava	30	29.1	33	32.1	63	61.2
Papaya	2	1.9	8	7.8	10	8.7
Banana	21	20.4	37	35.9	58	56.3
Potato	9	8.7	18	17.5	27	26.2
Beans	4	3.9	6	5.8	10	8.7
Wild food	13	12.6	30	29.1	43	41.7
Coconut	4	3.9	5	4.9	9	8.7
Sweet potato	7	6.8	3	2.9	10	8.7
Number of meals per day						
Two (2)	1	1.0	0	0	1	1.0
Three (3)	45	43.7	57	55.3	102	99.0
Estimated quantity of rice consumed/day/family (kg)						
0.5-1.0	6	5.8	10	8.7	16	15.5
1.5-2.0	30	29.1	30	29.1	60	58.2
2.5-3.0	6	5.8	12	11.7	18	17.5
3.5-4.0	4	3.9	4	3.9	8	7.8
4.5-5.0	0	0	1	0.9	1	0.9
Range	1 – 4		1 – 5		1 – 5	
Mean	2.06		2.05		2.05	

^aMultiple response

is for the adults to take one or two meals a day while the children are assured of two to three meals a day. Moreover, to augment food shortage, the farmers gather wild food from the forest and buy or borrow food from off-farm sources (Glazebrook, Lopes, Da Costa, & Ximenes, 2007).

Furthermore, most farmers in Timor-Leste produced one staple crop (rice or maize) or perhaps two (with cassava). Maize is the major crop for 83 percent of the farming households while rice is cultivated in lowland villages and is the most important crop for 13 percent of the Timorese farmers. Rice production is more stable than maize. However, cassava is less influenced by environmental factors and provides some food security if the harvest from rice and maize fails (Oxfam, 2007).

Rural people in Timor-Leste are basically involved in agriculture directly or indirectly. Hence, enhancing agricultural production is the best way to address poverty and food insecurity. To ensure food security, small-scale farmers should practice appropriate agricultural production technologies such as the use of high yielding varieties, soil fertility enhancers, and bio-fortification of staple crops, among others (Hazell & Diao, 2005).

Level of Community Participation in Rice Security Programs

Table 7 shows the level of community participation in rice security programs determined through the different phases of the program such as project identification, planning, implementation, and monitoring and evaluation. Respondents were asked to choose among five statements, which describe their level of participation in the different phases of the rice security programs. The rating scale used was low = 1-1.33; moderate = 1.34-2.66; and high = 2.67-4.0.

Overall, the mean score for participation in rice security programs was highest in project identification with a mean score of 3.7. In the planning phase, the highest mean score was in yearly planning (3.9), followed by problem analysis (3.7), goals/objectives setting (3.6), and rules and regulation crafting (3.1). For the implementation phase, the highest mean score was for implementation of the project activities (3.7), followed by setting up of the project organizational structure (3.6) and conduct of monthly meeting (3.4). Under the monitoring and evaluation phase, mean score for information for monitoring and evaluation was 3.7 while monitoring and evaluation activities got a mean score of 3.6. Based on the rating scale used in the study, there was high participation in all phases of the rice security programs.

Table 7. Level of participation in rice security program phases

RICE SECURITY PROGRAM PHASES	CAILACO	MALIANA	TOTAL
1. Project identification	3.2	3.8	3.7
2. Planning			
Problem analysis	3.6	3.8	3.7
Goals/Objectives setting	3.3	3.8	3.6
Rules and regulations crafting	2.9	3.3	3.1
Yearly planning	3.6	3.8	3.9
3. Implementation			
Conduct of monthly meeting	3.2	3.6	3.4
Setting up of the project organizational structure	3.2	3.5	3.6
Implementation of the project activities	3.6	3.7	3.7
4. Monitoring and Evaluation			
Monitoring and evaluation activities	3.7	3.6	3.6
Information for monitoring and evaluation	3.7	3.7	3.7

Rating scale: 1 – 1.33 Low; 1.34 – 2.66 Moderate; 2.67 – 4.0 High

In general, the data imply that the respondents were able to take part actively in the different phases of the rice security programs. The results indicate that the farmers were fully involved since project identification until monitoring and evaluation. Zoghy (1987) emphasized that organizations should put premium on enhancing the local people's participation. This can be realized by responding to their basic needs and allowing them to participate in the solution of their problems.

Factors Affecting Community Participation in the Rice Security Programs

The regression analysis as shown in Table 8 indicates that year of membership and trust in farmers' group, with odds ratio of 0.578918 and 17.76533, respectively, were found to have significant correlation with project identification phase of the rice security programs. This

Table 8. Regression analysis of respondents' participation in the project identification phase of the rice security programs and selected socio-economic variables

SOCIO-ECONOMIC VARIABLES	ODDS RATIO	P > z
Age	1.004289	0.921
Year of membership	0.578918	0.026*
Household size	0.901434	0.603
Farming experience	0.985808	0.751
Total area of rice farm (ha)	0.824691	0.791
Parcel of land used for rice farming	1.228747	0.771
Household income per month (US\$)	0.997065	0.464
Rice production income per month	0.979841	0.126
Financial resources of farmers' group	0.392561	0.099
Attitude towards joining farmers' group	5.864384	0.215
Trust in co-farmers	1.811430	0.222
Trust in farmers' group	17.765330	0.002*

*significant at 0.05% level

means that longer duration of membership ($p=0.036$) and presence of trust in farmers' groups ($p=0.002$) increase the probability that the farmers will participate fully in the project identification phase of the program.

For the planning phase, Table 9 summarizes the results of the regression analysis of the different planning activities and selected socio-economic variables. With respect to problem analysis, no variable was found significant based on the computed odds ratio. In terms of goals/objectives setting, years of membership with an odds ratio of 0.6722593 and total number of household size which recorded an odds ratio of 0.6773216 were significant variables. This indicates that the farmer-respondents who have been members of a farmers' group for a long time and have large families participate more in the planning activities. Long membership means commitment and loyalty to the farmers' group while a big family size serves as a motivation for the farmers to join farmers' groups for the benefits that they can derive such as attendance to training, free seeds, and other materials.

Table 9. Regression analysis of participation in the planning phase of rice security programs and selected socio-economic variables

SOCIO-ECONOMIC VARIABLES	PROBLEM ANALYSIS		GOALS/ OBJECTIVES SETTING		RULES AND REGULATIONS CRAFTING		YEARLY PLANNING	
	Odds Ratio	P> z	Odds Ratio	P> z	Odds Ratio	P> z	Odds Ratio	P> z
Age	1.032522	0.385	1.03998	0.278	1.007900	0.766	0.981153	0.590
Year of membership	0.767356	0.187	0.672259	0.049*	0.940613	0.668	0.956976	0.826
Household size	1.103091	0.539	0.677322	0.030*	0.947353	0.649	1.291306	0.145
Farming experience	0.945035	0.132	1.011362	0.769	0.999848	0.995	1.015340	0.684
Total area of rice farm (ha)	0.405715	0.225	0.534265	0.400	0.499173	0.338	3.415518	0.567
Parcel of land used for rice farming	2.676994	0.182	2.180733	0.293	1.376714	0.654	0.538253	0.776
Household income per month (US\$)	0.997654	0.479	0.997427	0.483	1.006677	0.102	1.008283	0.169
Rice production income per month	0.985862	0.194	1.021627	0.247	1.007978	0.463	0.989929	0.506
Financial resources	0.667638	0.530	0.630937	0.464	0.524358	0.174	0.519103	0.309
Attitude towards joining farmers' group	5.468954	0.148	1.169862	0.947	1.035985	0.975	11.131550	0.085
Trust in co-farmers	1.222337	0.593	1.43278	0.719	1.109358	0.726	0.294709	0.032*
Trust in farmers' group	1.799887	0.495	9.16958	0.675	0.704494	0.638	0.722377	0.768

*significant at 0.05% level

Table 10. Regression analysis of participation in the implementation of rice security programs and selected socio-economic variables

SOCIO-ECONOMIC VARIABLES	CONDUCT OF MONTHLY MEETING		SETTING UP THE ORGANIZATIONAL STRUCTURE		IMPLEMENTATION OF PROJECT ACTIVITIES	
	Odds Ratio	P> z	Odds Ratio	P> z	Odds Ratio	P> z
Age	1.051455	0.123	1.031316	0.286	0.871726	0.004**
Years of membership	1.12233	0.541	1.119077	0.490	0.921359	0.683
Household size	1.084644	0.579	0.935381	0.603	1.287513	0.205
Farming experience	0.985528	0.641	0.998242	0.950	1.069139	0.780
Total area of rice farm (ha)	0.465543	0.340	0.624517	0.476	5.270895	0.311
Parcel of land used for rice farming	1.714732	0.488	1.667111	0.433	0.396846	0.559
Household income per month (\$)	1.001855	0.547	1.00019	0.953	0.997409	0.497
Rice production income per month	1.000539	0.965	1.006244	0.560	0.989701	0.440
Financial resources	0.073992	0.000**	.4931318	0.168	1.344525	0.564
Attitude	7.232459	0.199	4.365362	0.244	2.747052	0.509
Trust in co- farmer	0.557822	0.150	0.979527	0.944	1.354009	0.477
Trust in farmers' group	0.849875	0.840	1.290426	0.887	1.311879	0.804

** significant at 0.01% level

With regard to rules and regulations crafting, no variable showed significant odds ratio. However, in terms of yearly planning, trust in co-farmers with an odds ratio of 0.294709 implies that trust enhances participation among the farmers and is important to sustain through time.

For the implementation phase, Table 10 shows that among the variables in the conduct of monthly meeting, financial resources of farmers' group with an odds ratio of 0.073991 had a significant p-value of 0.000. This suggests the probability of farmers participating fully in implementing the programs if the farmers' groups have resources to support the group activities.

In setting up the organizational structure, no variable was found significant in terms of the computed odds ratio and p-values. However, in terms of implementation of project activities, age with an odds ratio of 0.871726 (p-value = 0.004) indicates that older farmers tend to participate more due to their experience.

Finally, in the monitoring and evaluation activity, not one among the selected variables analysed was found significant. However, in terms of information for monitoring and evaluation activity, age recorded an odds ratio of 1.116144 (p-value = 0.009). This suggests that farmers participate more as they get older maybe due to their wisdom and experience (Table 11).

CONCLUSIONS

Majority of the farmers in Cailaco and Maliana who joined the farmers' groups were in their prime age with a mean of 44 years. They have been members of their farmers' group for four years and have been into farming for about 20 years. They were married, with low formal education and had relatively large household size. They had very favorable attitude toward joining farmers' groups and very high trust toward co-farmers and their farmers' group. Their farms generally measured 2 ha with two parcels used for farming. Their household income averaged US\$172.50 per month, while income from rice production ranged from US\$10 to US\$180 per month.

Table 11. Regression analysis of participation in the monitoring and evaluation of rice security programs and selected socio-economic variables

SOCIO-ECONOMIC VARIABLES	MONITORING AND EVALUATION		INFORMATION FOR MONITORING AND EVALUATION	
	Odds Ratio	P> z	Odds Ratio	P> z
Age	0.997278	0.943	1.116144	0.009**
Years of membership	0.771408	0.185	0.761369	0.162
Household size	0.937615	0.706	0.816089	0.218
Farming experience	0.994992	0.900	0.972272	0.508
Total area of rice farm (ha)	0.423517	0.311	0.259669	0.219
Parcel of land used for rice farming	2.197373	0.574	3.755490	0.222
Household income per month (US\$)	0.997976	0.574	0.992749	0.086
Rice production income per month	0.985272	0.205	0.979486	0.084
Financial resources	1.545885	0.543	1.356120	0.622
Attitude	10.39565	0.072	0.896352	0.934
Trust in co- farmer	1.182164	0.697	1.081149	0.853
Trust in farmers' group	1.54047	0.652	2.481384	0.237

** significant at 0.01% level

Among the four phases of the rice security programs, respondents' participation was highest in project identification. In other phases, participation was highest in yearly planning (planning phase), implementation of the project activity (implementation phase), and information for monitoring and evaluation (monitoring and evaluation phase). The results indicate that the farmers were fully involved from the beginning of the project until its monitoring and evaluation.

Several socio-economic factors affected the respondents' participation in the different phases of rice security programs. Year of membership in farmers' group and trust in co-farmers significantly affected problem identification phase; household size, income to support the family, and year of membership in farmers' group affected planning; age and financial resources were significantly related to implementation; and age significantly affected monitoring and evaluation.

RECOMMENDATIONS

Farmers' groups have significant contribution in the implementation of rice security program in Cailaco and Maliana sub-district, Timor-Leste. Based on the contribution extended by the farmers' groups, it is recommended that the project implementers strengthen the use of participatory project cycle management to enable members of farmers' groups to participate from the beginning until the implementation of food security programs. In this manner, they would appreciate the programs and develop a sense of belongingness in the farmers' groups.

Although farmers have attended a number of trainings to improve their farming practices, they still need to be empowered with knowledge on irrigation and off-season intensive farming of high-value crops to improve food security. This should be given attention because most of the farmers depend on rice and cassava as their main food staples.

Farmers' groups were initiated by the government and other non-government organizations in Cailaco and Maliana. For this reason, support should be properly provided so that farmers' groups until such time that they can stand by themselves once left on their own.

Farmers' groups should adopt and continuously practice improved rice technologies in order to be sufficient even during the "lean months." They should have a reserve supply of their staples and should not rely on the government's importation of rice during shortage.

Lastly, a further study should be done on the role of the various stakeholders in the sustainability of food security programs. This requires the involvement of the community in coordination with the Ministry of Agriculture and Fishery to ensure the adoption of improved agricultural practices. Policies that would safeguard and strengthen stakeholders' participation should be anchored on the needs of farmers' groups.

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LITERATURE CITED

- Adelino, P. & Mahinda, S. (2006). *Trade protection in the rice industry. Implication of tariff on rice Import in Timor-Leste*. India: ICFAI University Press.
- Anderson, M. D. & Cook, J.T. (1999). Community food security: Practice in need of theory? *Agriculture and Human Values*, 16(2): 141-150.
- Correia, V. P., Janes, J. A., Rola-Rubzen, M. F., Freitas, J., & Gomes, M. (2009, February). Prospects from Vanilla Agribusiness Development in Ermera and Manufahi, Timor Leste. Paper Presented at the 2009 Australian Agriculture and Resource Economics Society (AARES) Conference, Cairns, Queensland, Australia.
- Da Costa, M. D. J., Lopes, M., Ximenes, A., Ferreira, A. D. R., Spyckerelle, L., Williams, R., Nesbitt, H., & Erskine, W. (2013). Household food insecurity in Timor-Leste, *Food Security*, 5(1): 83-94.
- Food and Agriculture Organization (FAO). (2003). Special report: Crop and food supply assessment mission to Timor-Leste. In FAO. Global Information and Early Warning System on Food and Agriculture. World Food Programme. Retrieved from www.fao.org on 5 May 2015.
- Glazebrook, D., Lopes, M., Da Costa, M. D. J., & Ximenes, A. (2007). *Stocks and Flows of Household Food Supplies during the Wet and Dry Seasons and Food Shortage Period: Longitudinal Case Study among Subsistence Farmers in Aileu, Baucau*. Timor Leste: Liquica and Manufahi districts.
- Hazell, P. & Diao, X. (2005). The role of agriculture and small farms in economic development. Retrieved from URL:[http://www.ifpri.org/events/seminars/2005 /small farms/sfproc/SO1_hazell.pdf](http://www.ifpri.org/events/seminars/2005_small_farms/sfproc/SO1_hazell.pdf) on 10 June 2015.
- Irish Aid. 2013. Annual Report. Retrieved from <https://www.irishaid.ie/media/irishaid/allwebsitemedia/20newsandpublications/publicationpdfsenglish/irish-aid-2013-annual-report.pdf> on 10 May 2015.

- Ministry of Agriculture and Fisheries (MAF). (2008). Commodity Profile Series: No.1. Version 3 - Rice. Directorate of Agribusiness.
- OXFAM. (2007). Food Security. Retrieved from www.oxfam.org.nz/resources/Timor-Leste%20Food-Security-Baseline on 10 June 2015.
- Seeds of Life. (2013). Impact of rice import on rice production in Timor-Leste. Retrieved from www.Seedsoflifetimor on 10 May 2015.
- Sharma, M. & Deepak, S. (2001). Rehabilitation in practice: A participatory evaluation of the community-based rehabilitation programme in North Central Vietnam. *Disability and Rehabilitation Journal*, 23: 352-358.
- The Asia Foundation. 2013. Addressing the critical issues facing Asia. 60 Years. Annual Report FY 2013. Retrieved from <https://asiafoundation.org/resources/pdfs/AR2013.pdf> on 10 May 2015.
- Zoghy, S. (1987). Variables affecting popular participation in organization and community development activities in the new desert communities in South Taharir, Egypt. Desert Development Centre, The American University in Cairo.

Efficiency and Effectiveness of the Philippine Crop Insurance Corporation's Rice Crop Insurance Program: The Case of Laguna Province, Philippines

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ABSTRACT. The performance of the Rice Crop Insurance Program (RCIP) of the Philippine Crop Insurance Corporation (PCIC) was assessed to explain the low number of insured farmers and suggest ways to improve the program's efficiency and effectiveness. Documents were reviewed and primary data were collected through survey of participating rice farmers and key informant interview of the officers and staff of PCIC Region 4 and National Irrigation Administration Region IV Employees Multipurpose Cooperative (NEMCO). Descriptive statistics, gap analysis, and Likert scale scoring were used in data analysis. Results of the study revealed gaps in enrollment in the program, duration of filing of application for cover, number of days in team of adjusters' response, damage estimates, and delays in receipt of indemnity, which resulted in a low efficiency score of the program. Data analysis also revealed that the RCIP was moderately effective. Hence, to boost its efficiency and effectiveness, this study recommends that the PCIC should: a) intensify technical capacity-building training for the team of adjusters; b) deputize officers and staff of the municipal agricultural office as members of the team of adjusters; c) provide stronger and more hands-on assistance to participating farmers; and d) increase the incentives and number of personnel involved in RCIP implementation.

Keywords: *crop insurance, program efficiency, program effectiveness, program management*

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INTRODUCTION

The Philippines is highly vulnerable to bad weather and is branded as a natural disaster hotspot. Half of its total area and about 81 percent of its population were being vulnerable to natural disasters (World Bank, 2008). It had a Risk Index of about 28 percent, making it the third most disaster risk country in the world (United Nations University Institute of Environment and Human Security, 2012). From 2000 to 2012, natural disasters in the country resulted to the death of 12,899 people and injury of 138,116 persons. More than 71 million individuals and almost 375,000 became homeless because of natural disasters. Furthermore, the total cost of socio-economic damages reached an estimated amount of US\$3.37 billion, with an average of US\$251.58 million annually (Senate Economic Planning Office, 2013). These socio-economic damages include those in the agriculture sector, which is very much dependent on the weather.

Agricultural crop production is highly vulnerable to natural disasters. The viability of agricultural enterprises is affected with a bad harvest, particularly for small farmers who could not recover their investments (Magno & Bautista, 1989). However, there are risk management tools or adaptation strategies that could reduce the economic problems encountered by farmers when losses are incurred due to natural hazards (Reyes, Mina, Reneli, & Mercado, 2015). The Philippine government recognizes the need for a risk management program for its farmers through the creation of the Philippine Crop Insurance Corporation (PCIC), which provides the Rice Crop Insurance Program (RCIP).

The PCIC, created under Presidential Decree No. 1467, as amended by Republic Act No. 8175, is a government organization that is mandated to “provide insurance protection to the country’s agricultural producers particularly the subsistence farmers, against loss of their crops and/or non-crop agricultural assets on account of natural calamities such as typhoons, floods, droughts, earthquakes and volcanic eruptions, plant pests and diseases, and/or other perils.” It also provides guarantee cover for production loans extended by lending institutions for crops not yet covered by the insurance (PCIC, 2016b).

The existence of the insurance program could protect farmers from financial losses. Regarded as a risk-pooling instrument, crop insurance involves the collection of individual premiums and assessment and payment of indemnity claims for all or part of financial losses (Bangsal & Mamhot, 2012).

In a study conducted by Reyes, Mina, Reneli, and Mercado (2015), farmers' participation rate in the RCIP had been below 10 percent from 1981 to 2013. Despite the inclusion of the budget in the General Appropriations Act (GAA), RA 10651, which was used exclusively for the full (100%) cost of insurance premiums of subsistence farmers and fisherfolk listed in the Registry System for Basic Sectors in Agriculture (RSBSA), the number of insured farmers was still low. Evidences on the reasons why farmers do not participate in the crop insurance program are narrow.

This study assessed the performance of the PCIC's RCIP in the Province of Laguna. Specifically, the study aimed to: 1) describe the status of implementation mechanism of the RCIP; 2) analyze the efficiency of program implementation; 3) assess the program implementation effectiveness; and 4) recommend strategies to improve the performance of the RCIP implementation.

METHODOLOGY

The study covered the rice-growing municipalities in the Province of Laguna namely, Bay, Calauan, Victoria, Pila, Santa Cruz, and Nagcarlan. Aside from their accessibility, the coastal municipalities of Bay, Calauan, Victoria, Pila, and Santa Cruz are vulnerable to climatic hazards such as typhoons and floods, while the lowland municipality of Nagcarlan is vulnerable to typhoons.

Serving as key informants were selected officers of the National Irrigation Administration Region 4 Employees Multi-Purpose Cooperative, Incorporated (NEMCO) and PCIC Regional 4 manager and selected officers. They were asked about the issues on the implementation of the RCIP and their perspectives on program efficiency and effectiveness. NEMCO also provided the names of rice farmer-participants in the study sites. Meanwhile, the PCIC Region 4 office provided secondary data on the farmers' participation rate as well as the income and expenses of PCIC Region 4.

Thirty (30) rice farmer-respondents (five per municipality) who were all insured by the PCIC's RCIP served as respondents in the farm survey using pre-tested interview schedule. The Small Sample Theory (Lehmann, 1999) states that when the population is homogenous, a sample of 30 can already characterize the population. In this study,

all respondents were rice farmers, NEMCO members, enrolled in the RCIP, and doing farming activities in Laguna province. Given these, the population can be considered as homogenous.

The farmer-respondents were randomly selected from NEMCO's list using a random start. Data collected from the respondents covered the following: socio-economic characteristics (i.e., sex, age, years of education, farm size, and production cost/ha), premium paid during the latest cropping season, indemnity received from the latest crop damage, differences between farmers' own damage estimates with the estimates of the team of adjusters, knowledge about the program in terms of enrolling in the program, process of filing damages, and their knowledge about the insurable damages.

The farmer-respondents were also asked to evaluate the efficiency of the program in terms of number of days it took: to process admissions to the program, to finish filing of damages, to receive indemnity payments, and for team of adjusters to arrive in the damaged farm. Furthermore, they were asked to rate the PCIC's services, helpfulness of the staff, income loss reduction of indemnity payments, expectations met, and the overall efficiency and effectiveness of the RCIP.

Descriptive statistics such as means, frequency counts, and percentages were computed and used to describe the socio-economic characteristics, problems encountered by the respondents in the RCIP and by the PCIC personnel, as well as their suggested solutions to address the problems. Using means and percentages, helpfulness of the program in reducing income loss during times of extreme events was also determined.

The Gap Analysis developed by Parasuraman, Zeithaml, and Berry (1985) was used to assess the efficiency of the RCIP. The Gap Analysis seeks to define the current state of a company or organization and its target state. In this study, the gaps between the ideal services of the RCIP and the actual services given to the farmer-participants were determined. Particularly, these include: 1) days of processing of application for admission (gap = PCIC ideal days – average actual days); 2) days of filing for damage claims (gap = PCIC ideal days – average actual days); 3) days it took before the team of adjusters came on-site (gap = PCIC ideal days – average actual days); 4) estimation of damages (gap = average team of adjusters' estimate – average farmers' estimate); and 5) days before indemnity payment was received (gap = PCIC ideal days – average actual days).

To determine the critical fit between the tasks of the program and the competency of the PCIC Region 4, the overall efficiency scores for each were computed. Using a scale from 1, being the lowest, to 5, being the highest, each score was computed as the percentage of rice farmer-participants who did not experience gaps multiplied by the highest score. The overall efficiency score is the average of each computed scores as they consisted of equal weights.

The overall effectiveness of the program was identified through the Likert scale scoring, a method of ascribing quantitative value to qualitative data (see also Dunn-Rankin, Knezek, Wallace, & Zhang, 2004). To determine the knowledge of the respondents regarding the enrollment, damage filing, and insurable damages, the scale used includes: 1 = no knowledge, 2 = low knowledge, 3 = moderate knowledge, 4 = high knowledge, and 5 = very high knowledge. In terms of program accessibility, the scale used includes: 1 = no access, 2 = low access, 3 = moderate access, 4 = high access, and 5 = very high access. Furthermore, PCIC staff's helpfulness was also assessed using a 5-point scale: 1 = not helpful, 2 = sometimes helpful, 3 = helpful, 4 = most of the times helpful, and 5 = always helpful. Lastly, the extent to which the expectations of the respondents were met was measured by this scale: 1 = never, 2 = rarely, 3 = sometimes, 4 = most of the time, and 5 = always.

The data were treated as ordinal. Likert responses were collated into bar charts and central tendencies wherein the mean rating, median, and mode were identified. The relationship between the indicators used and overall effectiveness of the program was identified through scatterplots. Meanwhile, the Spearman's rank correlation coefficient was used to determine the strength of relationship between sets of data. The variable of helpfulness of the program was measured by the perception of income loss reduction due to indemnity payments received using a 3-point scale: 1 = not effective, 2 = moderately effective, and 3 = effective.

RESULTS AND DISCUSSION

Socio-demographic Profile of the Respondents

Majority of the farmer-respondents were male, representing 73 percent of the total sample. The mean age of the respondents was 58.97 years ranging from 34 years to 83 years, while 7.63 was the average

years the respondents attended school. Further, the farmer-respondents' production cost per hectare amounted to PhP31,833.33 on an average of 2 ha of farm area (Table 1).

Status of Implementation of the Rice Crop Insurance Program in Region 4

An upward trend was seen in terms of the number of rice farmers and area insured from 2011 to 2016 (Table 2 and Figure 1) for the RCIP Region 4. An increase in farmers' participation of 108 percent and area insured of about 40 percent were seen in 2013 and 2014, respectively. These were caused by strong typhoons and monsoons such as Haikui which induced a southwest monsoon (locally known as Habagat) in 2012 and Typhoon Haiyan (locally known as Yolanda) in 2013. Meanwhile, the Registry System for Basic Sectors in Agriculture-Agricultural Insurance Program contributed to a 4-percent increase of the total area insured in the Region from its implementation in the 2015 fiscal year. However, the total rice land area insured was still low because it was only 14 percent of the total rice farm area (398,474 ha) in the Region (Rola, 2017).

The PCIC Region 4 also increased their financial operations from 2011 to 2016 (Figure 2). As a result of the increase in farmers' participation, there was a massive increase in net income of PCIC Region 4 of PhP120 million from the same years. The income from individual premiums also increased from PhP43 million to PhP233 million in 2015 while it decreased by PhP10 million in 2016. Meanwhile, the claims paid by the PCIC Region 4 increased by PhP100 million from 2011 to 2015, while it lessened in 2016 by PhP46 million as the Region was not affected much by risks unlike the previous years.

Analysis of the Efficiency of the Rice Crop Insurance Program

Table 3 summarizes the identified gaps in the enrollment in the program, filing of applications for cover, response of the team of adjusters, and the days before indemnity payments were received. These "gaps" describe the quality of the service the RCIP gave to its beneficiaries. A positive to zero gap implied that RCIP was giving quality service while a negative gap indicated poor service. To illustrate, the ideal days of enrollment in the program and the application for cover takes only a day, according to the PCIC (2016a). However, it took an average of four days for the farmer-respondents to complete the enrollment

Table 1. Socio-demographic characteristics of the respondents

CHARACTERISTICS	NO. (n=30)	%
Sex		
Male	22	73.3
Female	8	26.7
Average no. of years in school	7.63	
Average age (years old)	58.97 (34-83)	
Average production cost/ha (PhP)	31,833.33	
Average farm size (ha)	2.00	

Table 2. Participation rate of rice farmers in Region 4, 2011-2016

YEAR	NUMBER OF FARMERS	% INCREASE FROM PREVIOUS YEAR	INSURED RICE AREA (ha)	% OF TOTAL RICE AREA (ha)
2011	6,216		12,065.03	3.03
2012	9,234	48.55	15,779.58	3.96
2013	19,224	108.19	29,743.68	7.46
2014	26,849	39.66	42,548.12	10.68
2015	31,421	17.03	57,066.07	14.32
2016	33,633	7.04	57,900.07	14.53

Source of basic data: PCIC Region IV Office

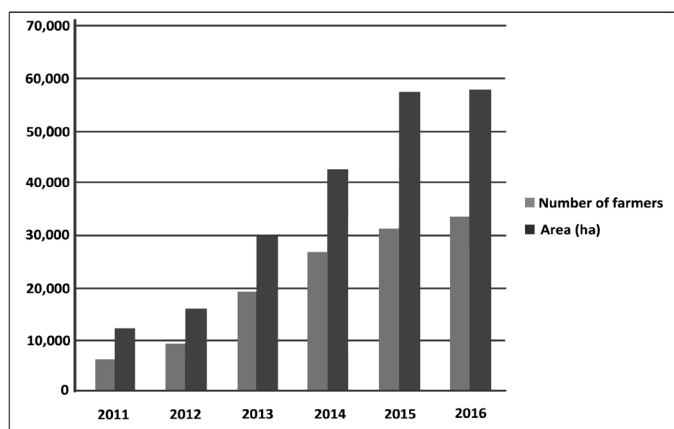


Figure 1. Participation rate of rice farmers in the Rice Crop Insurance Program in Region 4, 2011-2016 (Source of basic data: PCIC Region IV Office)

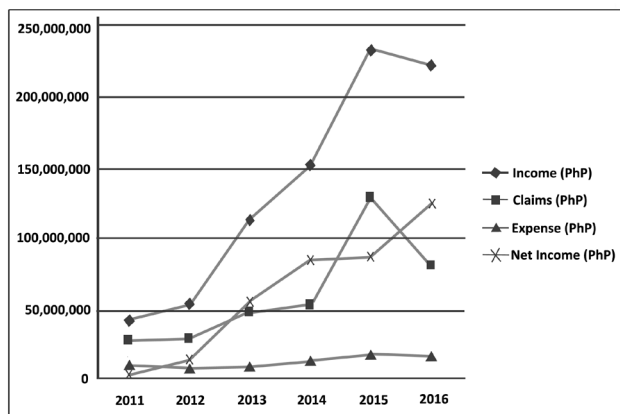


Figure 2. PCIC Region 4 financial operations, 2011-2016
 (Source of basic data: PCIC Region IV Office)

Table 3. Gaps identified on the efficiency of the Rice Crop Insurance Program in Laguna, 2016

TASKS	PERCEIVED COMPETENCE	IDEAL	GAP
Enrollment in program (days)	4	1	3
Filing of applications for cover (days)	3	1	2
Team of adjusters' response (days)	36	5	31
Indemnity received (days)	103	60	43
Damage estimate gap (PhP)	20,727.27		

processes which gives a gap of three days. Filing of cover for damages was usually completed in one day but it took an average of three days for the respondents to file for cover. These gaps were results of the difficulty of farmer-respondents in undertaking the tedious processes of enrolling in the program and filing for cover.

The team of adjusters (TAs) would ideally go into the damaged farm within five days, while the rice farmer-participants would receive their indemnity payments within 45 days. A three-day gap was identified on program enrollment, while a gap of two days was observed in terms of filing applications for cover. A huge gap is recognized in terms of the

TAs' response (31 days) and days before indemnity received (43 days). This implies that the quality of services the RCIP provided to their beneficiaries was very low in terms of the TA's response and delivery of indemnity payments.

On another aspect, a massive gap involving the estimation of damages was identified due to inaccurate estimates of the TAs. The farmer-respondents claimed that they should have received an average of PhP20,727.27 more when their farms were hit by extreme events. The massive gap was the result of the farmer-respondents and TAs not meeting half-way. The farmers stated that majority of the TAs were not trained well enough to estimate damages. On the other hand, the PCIC staff and TAs claimed that the farmers overestimate their crop damages most of the time. There seems to be no standard criteria to assess damages.

The key informants of the PCIC Region 4 explained the reason why there were gaps identified on most aspects of the services they provided. The processing of filing for cover of damages and late reimbursements of the indemnity payments were not consistent with the PCIC's desired timetable as set by top management. Some places in the Region were located in remote areas. The area without roads and those on the islands are very difficult to reach. In addition, the PCIC Region 4 lacked adequate personnel and those in service lacked proper training. The Region 4 office has 14 permanent positions only as of this writing and not all are filled up, according to the key informants. In addition, other personnel are on a job-order status and most likely leave once they found higher paying jobs. These affected the program's efficiency in handing out indemnity payments in times of widespread calamity as the Region 4 staff could not reach all the beneficiaries at once, especially those located in areas that are difficult to access.

According to the key informants, the TAs' late response in times of widespread calamities in the Region could be attributed to their job-order status and the low wages they receive (PhP491 per day plus meals and transportation). Because of these, the PCIC Region 4 was forced to hire those with no agriculture background. The newly hired adjusters were trained for only one to two days before going to the damaged farms. It seems that this is not enough for the adjuster to be competent in damage estimation.

Overall efficiency of the Rice Crop Insurance Program. As seen in Table 4, the RCIP was marked as inefficient with a low score of 1.66 (with 5 as the highest score and 1 as the lowest score). Majority of the farmers experienced gaps in the program enrollment (67%), filing processes (70%), response of the team of adjusters (83%), and the transmittal of indemnity payments (73%). Moreover, 40 percent had discrepancies in the estimation of damages.

The overall efficiency score of 1.73 implies that there was a poor fit between the competency of the PCIC and RCIP's tasks particularly in assisting rice farmer-participants in program enrollment, filing for damages, responding to damaged farms, estimating farm damages, and awarding of indemnity payments. As a result, the RCIP in the Region 4 was found to be inefficient.

Table 4. Overall efficiency score of the Rice Crop Insurance Program, Laguna, 2016

ITEM	RICE FARMERS WITHOUT GAP (n=30)		WEIGHT ^a (%)	SCORE ^b
	No.	%		
Enrollment in the program	10	33.3	20.0	1.66
Filing processes	9	30.0	20.0	1.50
Response of team of adjusters	5	16.7	20.0	0.83
Estimation of damages	18	60.0	20.0	3.00
Arrival of indemnity payments	8	26.7	20.0	1.33
Overall score			100	1.67

*Assuming equal weights

^bUsing a scale from 1, being the lowest, to 5, being the highest, each score was computed as the percentage of rice farmer-participants who did not experience gaps multiplied by the highest score. The overall efficiency score is the average of each computed scores as they consisted of equal weights.

Table 5. Knowledge of participants regarding the enrollment, damage filing, and insurable damages of the Rice Crop Insurance Program, Laguna, 2016 (n = 30)

ITEM	NK		LK		MK		HK		VHK	
	No.	%	No.	%	No.	%	No.	%	No.	%
Enrollment	1	3.3	8	26.7	10	33.3	9	30.0	2	6.7
Damage filing	1	3.3	7	23.3	13	43.3	7	23.3	2	6.7
Insurable damages	0	0.0	6	20.0	12	40.0	10	33.3	2	6.7

Legend: NK - No Knowledge, LK - Low Knowledge, MK - Moderate Knowledge, HK - High Knowledge, VHK - Very High Knowledge

Analysis of the Effectiveness of the Rice Crop Insurance Program

Knowledge of participants. Results showed that 33 percent had moderate knowledge about the enrollment processes, while 43 and 40 percent of the respondents were moderately knowledgeable about damage filing and insurable damages, respectively (Table 5). They had basic knowledge about the RCIP; hence, they could enroll to the program with little help from the PCIC staff. Because they also had basic knowledge on damage filing and insurable damages, it took them shorter time to file for damages compared to other farmers who did not have basic knowledge of the program.

Access to services. Majority of the respondents (80%) gave good ratings in terms of access to RCIP's services. About 37 percent rated the program accessibility as high, while 43 percent rated it as very high (Table 6). RCIP's services are accessible through their satellite offices. The RCIP can also be contacted through the cooperatives, municipal agriculture office, and satellite offices.

Helpfulness of PCIC staff. Forty percent of the respondents agreed that the program staff were always helpful. On other hand, some farmer-participants rated the program staff as sometimes helpful (30%) and not helpful (17%) (Table 7). Although the PCIC staff provide equal treatment to farmers (i.e., explaining the program mechanics), some farmers need more explanation than the others. Hence, some gave ratings as "sometimes helpful" and "not helpful at all."

Table 6. Extent by which participants were able to access the services offered by the Rice Crop Insurance Program in Laguna, 2016

ITEM	NO. (n = 30)	%
Low access	4	13.3
Moderate access	2	6.7
High access	11	36.7
Very high access	13	43.3

Table 7. Helpfulness of PCIC staff in responding to the needs of the participants, Laguna, 2016

ITEM	NO. (n = 30)	%
Not helpful	5	16.7
Sometimes helpful	9	30.0
Helpful	1	3.3
Most of the times helpful	3	10.0
Always helpful	12	40.0

Table 8. Extent by which expectations of the participants were met by the Rice Crop Insurance Program, Laguna, 2016

ITEM	NO. (n = 30)	%
Never	8	26.7
Rarely	9	30.0
Sometimes	1	3.3
Most of the time	3	10.0
Always	9	30.0

Table 9. Effectiveness as measured by perception on income loss reduction, Laguna, 2016

ITEM	NO. (n = 30)	%
Effective	20	66.7
Moderately effective	6	20.0
Not effective at all	4	13.3

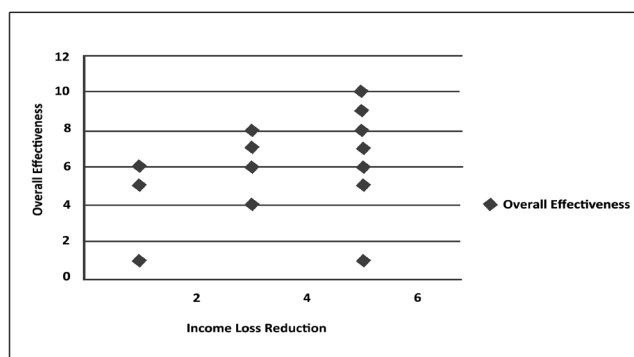


Figure 3. Scatter plot of the responses regarding perceived income loss reduction and overall effectiveness of the program (unit of measurement for both is mean rating)

Expectations. More than half (57%) of the respondents reported that their expectations were never and rarely met (Table 8). These include the expectation on the amount of indemnity they would receive will be as high or higher than their own estimates. Likewise, they expected that the time they would receive the indemnity payments would be quick enough for them to have capital to re-plant on the same cropping season. The results imply that the farmers considered the RCIP as beneficial but their expectations of the program were not always met. Thus, the delivery of services of the RCIP must be enhanced in order to meet the expectations of the farmers.

Perceived income loss reduction. The RCIP was perceived to be effective in reducing income loss as expressed by most participants (Table 9 and Figure 3). The services of the RCIP regarding income loss reduction should also be improved to enhance the program's effectiveness.

Relationship Between the Indicators and the Overall Effectiveness of the Program

The Spearman's rho correlation coefficient showed significant correlation (at 0.01 level) of knowledge on damage filing, helpfulness of staff, and the extent to which the expectations of participants were met with the overall effectiveness of the program. Access to the services of the program as well as helpfulness of the program staff also attained a high correlation with the success of the program (Table 10).

The scatter plots (Figures 4-9) illustrate a positive linear relationship between the indicators of effectiveness (i.e., enrollment, damage filing, knowledge about insurable damages, helpfulness of the PCIC Region 4 staff, and expectations met) and the overall effectiveness of the program as rated by the participants regardless of outliers. Regardless of the frequency of those with low rating for their knowledge on enrollment but gave a relatively high rating on the overall effectiveness of the program (Figure 4), a positive relationship was observed between

Table 10. Summary of the results of statistical tests used to show correlation between indicators and the overall effectiveness of PCIC's Rice Crop Insurance Program, Laguna, 2016

ITEM	SPEARMAN'S RHO CORRELATION COEFFICIENT
Knowledge	
Enrollment	0.142
Damage filing	0.496**
Insurable damages	0.227
Access	0.365*
Helpfulness of PCIC staff	0.629**
Helpfulness of the Program	0.364*
Expectations Met	0.697**

*Correlation is significant at 0.05 level

**Correlation is significant at 0.01 level

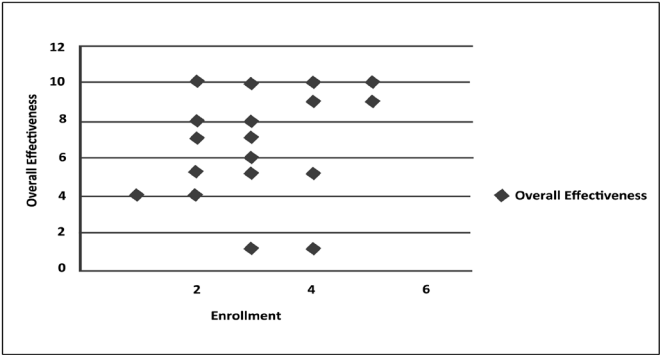


Figure 4. Scatter plot of the responses regarding knowledge on enrollment and overall effectiveness of the program (unit of measurement for both is mean rating)

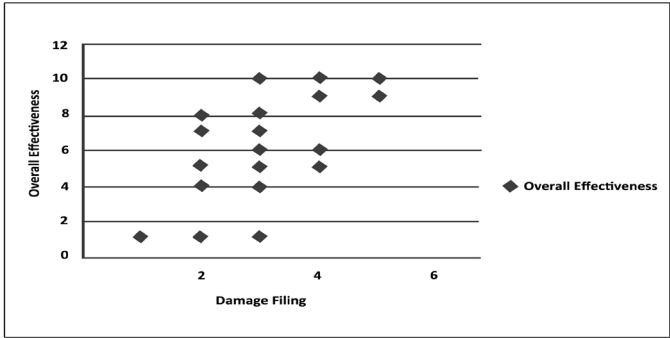


Figure 5. Scatter plot of the responses regarding knowledge on damage filing and overall effectiveness of the program (unit of measurement for both is mean rating)

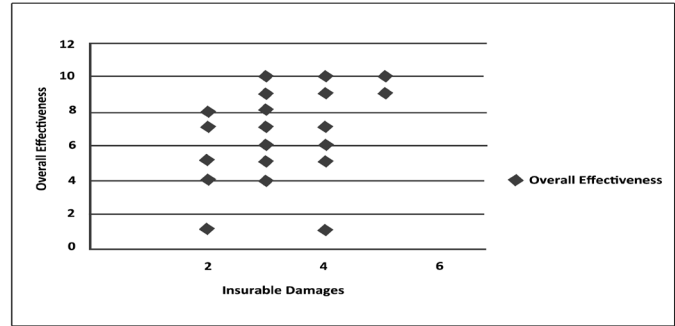


Figure 6. Scatter plot of the responses regarding knowledge on insurable damages and overall effectiveness of the program (unit of measurement for both is mean rating)

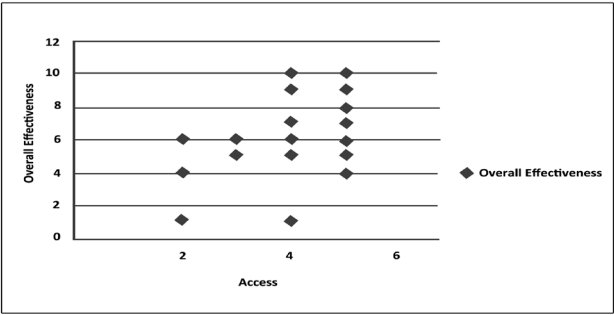


Figure 7. Scatter plot of the responses regarding access to services offered by PCIC’s RCIP and overall effectiveness of the program

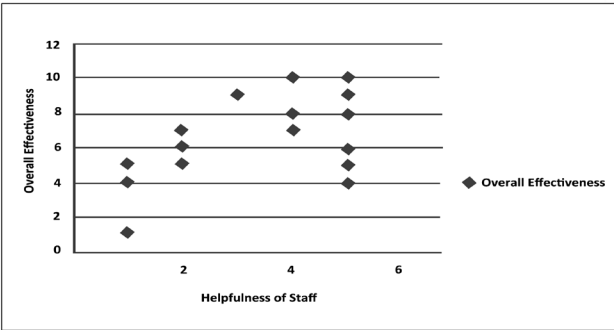


Figure 8. Scatter plot of the responses regarding helpfulness of PCIC staff and overall effectiveness of the program (unit of measurement for both variables is mean rating)

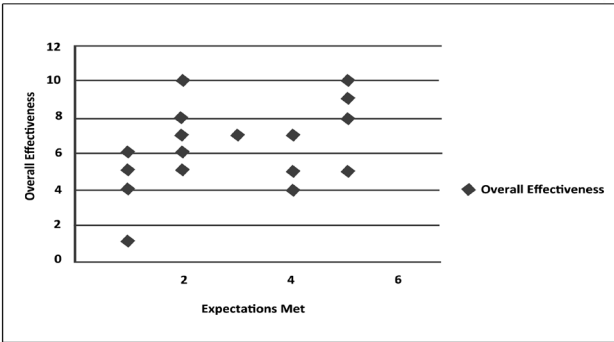


Figure 9. Scatter plot of the responses regarding the extent to which expectations of participants are met and overall effectiveness of the program (unit of measurement for both is mean rating)

knowledge on enrollment and overall effectiveness of the program as seen by the farmer-participants. Likewise, overall effectiveness of the program had positive relationship with knowledge on damage filing (Figure 5), knowledge on insurable damages (Figure 6), access to the PCIC's RCIP and the overall effectiveness of the program (Figure 7), helpfulness of the staff (Figure 8), and extent to which the expectations of the participants are met (Figure 9). These imply that the higher the score of these individual indicators, the higher the tendency that the farmers increase the ratings on the program's overall effectiveness.

Overall Effectiveness of the Rice Crop Insurance Program

Weights were assigned to indicators/criteria identified such as knowledge of the program, accessibility of the services offered by the program, helpfulness of PCIC staff in addressing the needs of farmer-participants, and extent to which the expectations of farmer-participants were met. The weights used given were based on the Spearman's rho correlation coefficient of the indicators considered as opposed to the ratings the farmers gave on their perceived effectiveness of the program. Among the indicators, knowledge on damage filing (3.27), helpfulness of

Table 11. Overall Effectiveness Scoring Interpretations of the Rice Crop Insurance Program, Laguna, 2016

CRITERIA	WEIGHT (%)	MEAN RATING	SCORE
Knowledge	15	3.14	0.471
Enrollment	30	3.10	
Damage filing	40	3.07	
Insurable damages	30	3.27	
Accessibility of services	20	4.10	0.820
Helpfulness of PCIC staff	25	3.27	0.818
Helpfulness of program	15	4.07	0.611
Expectations met	25	2.87	0.718
Overall score			3.44

1-2.50: not effective
2.51-2.90: slightly effective
2.91-3.90: moderately effective
3.91-4.50: effective
4.51-5: highly effective

PCIC staff (3.07), and the extent to which the expectations of participants were met (2.87) gained the highest correlation to the effectiveness of the program as perceived by the farmers. Thus, bigger weights were assigned to these factors. Results of the study showed that the overall effectiveness score of the Rice Crop Insurance Program is 3.44, which fall under moderate effectiveness (Table 11).

The critical fit between the farmer's needs and the resources as well as services made available to the farmers as outputs of the RCIP were the determinants on how effective the program was. Findings in the Likert scale showed that the RCIP was moderately effective with a score of 3.44 out of 5. The highest mean rating was the accessibility of the program with a score of 4.10, while expectations met was the lowest with a score of 2.87. A moderate mean rating was computed in terms of the participants' knowledge about the program and the helpfulness of the staff with mean ratings of 3.14 and 3.27, respectively. These imply that the program must improve the delivery of its services to effectively cater to the needs of the farmers.

Information dissemination to and from the farmers and the PCIC is critical in evaluating the needs of the farmers and the process by which the PCIC can effectively provide their needs. Improvement of the accessibility of the services of the program will help the PCIC reach out to more farmers and thus stimulate the achievement of their developmental goals. Helpfulness of the staff also plays a critical role in the success of the program because they are the primary actors in the delivery of services. Enhancements of these factors are critical and essential in achieving the perfect fit between the needs of the farmers and the services offered by the organization.

CONCLUSIONS

Key results of the study showed that there is an upward trend of participating farmers in the RCIP in Region 4 where area insured increased from 12,065.03 ha in 2011 to 57,900.07 ha in 2016, but this is only 14 percent of the total rice farm area in the Region. In addition, the net income of the regional office increased from PhP4,378,000 in 2011 to PhP125,464,000 in 2016. The Gap Analysis revealed that there are gaps in the program enrollment (3 days), filing of application for cover (2 days), team of adjusters' response (31 days), damage estimates (PhP20, 727.27), and receipt of indemnity (43 days). The result is an estimated mean score of 1.66 out of 5 in terms of efficiency of the program.

Findings in the Likert scale showed that the RCIP was moderately effective with a score of 3.44 out of 5. The highest mean rating was the accessibility of the program with a score of 4.10 while expectations met was the lowest with a score of 2.87. A moderate mean rating was computed in terms of the participants' knowledge about the program and the helpfulness of the staff with mean ratings of 3.14 and 3.27, respectively. A high rating of 4.07 was computed for the effectiveness of the program in terms of perception on reducing income loss during times of calamity.

Based on the overall results, the study concludes that the performance of RCIP of PCIC Region 4 has not been ideally efficient but is moderately effective.

RECOMMENDATIONS

The PCIC should deputize officers/staff of the municipal agricultural office as members of the team of adjusters (TAs) to strengthen the efficiency of the RCIP. The PCIC can hire directly from agriculture-trained officers and/or staff of the office of the municipal agriculturist as TA members in their respective municipality. This will facilitate faster response by the TAs and therefore, increase the efficiency of the program.

Moreover, a stronger and more hands-on assistance to participating farmers should be provided by the PCIC. Lack of awareness on PCIC's policies, procedures, and documentation requirements among the farmer-participants appeared to be the root cause of the problems cited such as delays in processing of documents and failed expectations of the farmers. This has been a major contributing factor that led to a less efficient implementation of the program.

The PCIC should also streamline policies, procedures, and documentation requirements in enrollment to the RCIP to raise the program's efficiency. Streamlining the policies, procedures, and documentation processes of the RCIP would encourage former farmer-participants and farmer prospects to enroll in the program, and thus, encourage farmer participation. In addition, easing up the processes would boost efficiency as it would make it simpler for the farmers to enroll and file for claims in the RCIP.

LITERATURE CITED

- Bangsal, N. V. & Mamhot, P. C. T. (2012). Review of the Philippine crop insurance: Key challenges and prospects. CPBRD Policy Brief No. 2012-06 (November). Quezon City, Philippines: Congressional Policy and Budget Research Department, House of Representatives.
- Dunn-Rankin, P., Knezek, G. A., Wallace, S., & Zhang, S. (2004). *Scaling methods* (2nd ed.). pp. 11-17
- Lehmann, E. L. (1999). "Student" and small-sample theory. *Statistical Science*, 14: 418-426.
- Magno, M. T. & Bautista, E. D. (1989). Is there a role for crop insurance in Philippine agricultural development? ACPC Staff Paper 89-06. Quezon City, Philippines: Agricultural Credit Policy Council, Department of Agriculture.
- Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1985). A conceptual model of service quality and its implications for future research. *Journal of Marketing*, 49(4): 41-50.
- Philippine Crop Insurance Corporation. (2016a). The Philippine Crop Insurance Corporation: The Rice Crop Insurance Program. Retrieved from <http://pcic.gov.ph/index.php/programs/> on 22 May 2016.
- Philippine Crop Insurance Corporation. (2016b). Annual report. Retrieved from <http://pcic.gov.ph/about-us/> on 22 May 2016.
- Reyes, C. M., Mina, C. D., Reneli, A. B. G., & Mercado, S. J. P. (2015). Review of design and implementation of the agricultural insurance programs of the Philippine Crop Insurance Corporation (PCIC). Discussion Paper Series No. 2015-07. Quezon City, Philippines: Philippine Institute for Development Studies.

- Rola, A. C. C. (2017). Performance assessment of the Philippine Crop Insurance Corporation's Rice Crop Insurance Program in the Province of Laguna. Unpublished Graduate Field Study, College of Public Affairs and Development, University of the Philippines Los Baños, College, Laguna, Philippines.
- Senate Economic Planning Office. (2013). Natural disasters at a glance. Retrieved from https://www.senate.gov.ph/publications/AAG%20201304%20%20Natural%20Disasters_final on 2 November 2016.
- United Nations University Institute for Environment and Human Security. (2012). World risk report. United Nations University Institute for Environment and Human Security. Retrieved from: https://collections.unu.edu/eserv/UNU:2020/WRR_2012_en_online.pdf on 22 May 2016.
- World Bank. (2008). *Integrating disaster risk reduction into the fight against poverty*. Washington D.C.: World Bank.

Policy and Institutional Challenges in Climate Information Services Provisioning in Philippine Agriculture

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ABSTRACT. Current and immediate information about the increasingly unpredictable weather conditions are needed to augment conventional knowledge in local communities. Policy analysis on climate information services (CIS) provisioning in the agriculture sector is vital and warranted. This paper describes the global and national CIS policies as well as the institutions involved in provisioning through the characterization of pathways from data generation to dissemination. Further, it identifies the various intermediary users of the CIS and how CIS are ultimately disseminated to the municipal agricultural offices and the farmers. Secondary data sources were searched. Primary data were gathered through key informant interviews. Qualitative methods were used in the analysis. This paper concludes that the Philippines needs a better system to provide climate information through more modern technologies, improved capacities, and more stable institutional partnerships, among others. To sustain or bolster the provisioning of CIS, there must be compliance to standards in the establishment, use, and maintenance of the CIS equipment; improved capacities in the dissemination; and commitment of partners to institutionalize collaboration among the providers and the users of CIS.

Keywords: *climate information service, institution, policy, PAGASA, Philippines*

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INTRODUCTION

Current and immediate information about the increasingly unpredictable weather conditions in local communities are necessary to reinforce conventional knowledge in agriculture. The limited access of farmers to various scientific adaptation strategies holds true in developing countries (Ogallo, Boulahya, & Keane, 2000). Hazards such as flood and drought are faced by farming communities and households. These damages can be avoided if farmers can properly adapt through climate information services (CIS).

The response to climatic uncertainties led to the implementation of CIS projects globally, especially in the developing countries (Singh, Urquhart, & Kituyi, 2016). For instance, although uncertainties are still present, the African region has seen potential benefits from using CIS in managing their local agriculture sector (Roudier et al., 2014). Regional centers are located across the African region (e.g., African Centre for Meteorological Applications for Development) to manage the production and provision of climate information to various stakeholders (Singh, Urquhart, & Kituyi, 2016; Vaughan & Dessai, 2014). Not just within the African region, agriculture stakeholders' access to climate information is imperative to ensure that they are able to cope with the extreme climatic conditions (Campbell, Thornton, Zougmore, van Asten, & Lipper, 2014), which could ultimately lead to an increase in their resiliency.

In the Philippines, initiatives have been made to bring CIS to rural communities. The first known case was in the Local Government Unit (LGU) of Dumangas, Iloilo. The model consisted of establishing climate data collection equipment, building capacities to process and analyze the data, and coordinating with the Department of Science and Technology (DOST) - Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) in giving out climate forecast to farmers in the area. It also showcased the importance of building the resiliency of communities against weather uncertainties brought about by climate change and by empowering local institutions (Local Government Unit of Dumangas, 2010). Dumangas have an agrometeorological (AGROMET) station to provide weather advisories to farmers and fisherfolks. Monthly seasonal and daily forecasts from PAGASA were released together with extension advisories for farmers and fisherfolks.

In 2012, the Food and Agriculture Organization (FAO) had scaled up the Dumangas model through a project on the "Assessments of Climate Change Impacts and Mapping of Vulnerability to Food Insecurity under

Climate Change to Strengthen Household Food Security with Livelihoods' Adaptation Approaches" (AMICAF). The project was implemented in the Philippines (together with the Philippine Department of Agriculture [DA]) and in Peru (together with the Peruvian Ministry of Agriculture and Irrigation). This project established automatic weather stations (AWS) in the study areas and trained the partner DA Regional Field Office (RFO) officials to develop regional Seasonal Climate Forecast and Advisory Services.

In the Bicol region, Philippines, this mode of providing climate information to farmers was further pursued in the United States Agency for International Development-assisted Bicol Agri-water Project (BAWP) that also started in October 2012 (Rola, De los Santos, Faderogao, & Faulmino, 2017). This initiative was built on the Dumangas' experience by working with three municipal governments in the issuance of the Seasonal Climate Forecast (SCF) from PAGASA. Once the forecast at the municipal level is available, the project used climate crop models to generate agricultural extension advisories on top of the good practice options that were recommended by the local technicians and of the DA-RFO5. Capacities to do the modelling were then developed among state colleges and universities (SUCs) within the region. Then, the SUCs connected with the LGUs for the production and dissemination of the advisories. This CIS integration into the agricultural extension program was piloted in 10 regions of the country through the Adaptation and Mitigation Initiatives in Agriculture Phase 2 (AMIA2) project.

But to sustain and scale up and scale out what has been experienced in Dumangas remains as a challenge. In this policy analysis, the research questions raised were as follows: "How do we link the national CIS infrastructure to the local initiatives for the benefit of the agriculture sector?" and "What are needed to sustain provisioning of the CIS in the country?"

This paper is an analysis of the policy and institutional challenges in the CIS provisioning in Philippine agriculture. Specifically, it: 1) describes the CIS policy in the global as well as in the Philippine context; 2) describes how national level institution supplies the CIS and characterizes the pathways from data generation to dissemination; 3) identifies the various intermediary users of CIS; 4) analyzes the challenges and opportunities toward sustainable provisioning of the CIS; and 5) offers recommendations to sustain the CIS provisioning in agriculture.

The Climate Information Services (CIS)

The CIS involves the production, translation, transfer, and use of climate knowledge and information in climate-informed decision making and climate-smart policy and planning (Tall et al., 2014; Vaughan, 2016). The effective delivery of various CIS and products requires appropriate institutional mechanisms. Linkages from the international level to the regional, national, and local levels are necessary, not only to generate but also to assimilate CIS in the most useful way for decision making. In addition, CIS enhances adaptation to abnormal conditions and takes advantage of good climate conditions.

Ideally, climate information should be user-centered to be helpful in decision making. But more often, there is no systematic mechanism for the interaction between users and providers (World Meteorological Organization [WMO], 2014). From weather to climate timescales, agricultural decisions tend to become more context and farmer-specific; thus, requiring greater scope of CIS. These may include translating raw climate information into predictions of agricultural impacts or management advisories, training needs, assistance in the planning and organizing response mechanisms, and evaluation and feedback processes to consistently improve information products and services (Tall et al., 2014).

METHODOLOGY

This policy research used primary data gathered through key informant interviews (KIIs) with representatives of various institutions involved in CIS such as DOST-PAGASA; DOST-Advanced Science and Technology Institute (ASTI); Department of Agriculture's Bureau of Soils and Water Management of the (DA-BSWM); and Rice Watch Network (RWaN), a non-government organization. Interviews conducted covered the process flow of CIS within the respective institution of the key informants and the challenges in sustainably providing CIS, particularly to the stakeholders in agriculture.

Secondary data such as organizational profile and relevant policies were obtained from various documents coming from the institutions mentioned. Likewise, information from related literature were gathered to enrich the discussion.

The primary and secondary data were analyzed through policy and institutional analyses. As emphasized by Vincent Ostrom, “institutions are defined as systems of rule-ordered relationships” (Cole, 2013), which means that the analysis generates understanding of how and why different international and local CIS institutions interact with each other, or where these institutions are situated in the CIS pathways. As an analytical tool, institutional analysis investigates the existing social and institutional structures within a specified context (Corral Quintana, 2004 as cited in Hernandez, Barbosa, Corral, & Rivas, 2018). In this paper, the context examined was the provision and distribution of CIS. The roles (i.e., mandates based on policies) in the services chain of various CIS institutions were identified, including the prevailing dynamics between and among these institutions. Based on the institutional analysis, the issues and challenges confronting these institutions were identified. Lastly, policy recommendations were offered at the end of the paper.

RESULTS AND DISCUSSIONS

Global CIS Framework

The World Meteorological Organization (WMO), a specialized unit of the United Nations, recognized a wide range of activities encompassing CIS implementation (WMO, 2014). This included the following: 1) generation of historical climate data sets to characterize climate behavior across temporal and spatial scales; 2) climatological analysis on long-term means and trends and climate variability characteristics; 3) data monitoring which is useful for climate predictions and projections and guiding actions to respond to potential effects, including information on drivers of climate variability (e.g., La Niña, El Niño, current drought/flood conditions); 4) determining seasonal outlooks such as rainfall, temperature; 5) giving climate change information (e.g., projections and scenarios information) for national adaptation to climate change; and 6) conduct of training on the use of climate products and services.

National entities acquiring data from global and regional centers face the challenge of ensuring compatibility of data across geographical and jurisdictional boundaries. Communication, exchange, and dissemination particularly routine data and products also covers their interpretation and relevance to users (WMO, 2014).

Related to this, the WMO identified three categories of users of climate information/services: 1) the internal users, e.g., national meteorological agencies, who generate products for external users; 2) the external users operating at strategic level, such as government, finance, and insurance, who develop better policies and conduct business more efficiently; and 3) the external end users for whom productivity of their business/enterprise is directly affected by climate variability and change, such as farmers.

The principal CIS operational entities are organizations that routinely produce and provide climate data; and monitoring analyses, prediction, and projection products. Climate data sets are the initial standard operational products at the global, regional, and national scales. To ensure future acceptability and reliability of predictions and projections, CIS coordinates with research institutions. Research is important in bridging climate prediction possibilities across timescales and providing reliable information products to various users (WMO, 2014).

The Philippines' CIS Policies and Institutions

In the Philippines, policies concerning CIS are based on various national laws, particularly those relating to climate change (Table 1). These policy instruments mandate specific institutions with certain functions to provide coordination, partnerships, or linkages among different stakeholders for the provision of CIS. These institutions include PAGASA under the Department of Science and Technology (DOST), which is likewise mandated to coordinate with relevant national organizations (Executive Order 128, Section 3) to ensure that various efforts related to CIS are harmonized to attain maximum possible societal benefit.

WMO and Tall et al. (2014) provided the following classification of CIS institutions: 1) information providers synonymous to internal users that generate the products; 2) intermediary users and/or co-producers of CIS receiving climate information from other sources and translating those information into climate advisories tailored to farmers' needs (e.g., extension agencies); and 3) the information end users such as the local planners and farming communities. Intermediary users often serve as link between the national information provider and the local-level end users. Figure 1 shows the various institutions in the Philippines involved in CIS based on the classification of the WMO and Tall et al. (2014) as cited in Elazegui, Luyun, and Anastacio (2017).

Table 1. Policy instruments on climate information service for the agriculture sector (Elazegui et al., 2017)

POLICY INSTRUMENT	INSTITUTION CONCERNED	MANDATE
Executive Order No.128, January 1987 - Reorganizing the National Science and Technology Authority	Department of Science and Technology - Philippine Atmospheric, Geophysical and Astronomical Services Administration (DOST-PAGASA)	Undertake activities relative to observation, collection, assessment, and processing of atmospheric and allied data for the benefit of agriculture, commerce, and industry
Republic Act No. 9729 or the Climate Change Act of 2009	Climate Change Commission (CCC)	Oversee the dissemination of information on climate change, local vulnerabilities and risks, relevant laws and protocols, and adaptation and mitigation measures
	Department of Environment and Natural Resources (DENR)	Oversee the establishment and maintenance of a climate change information management system and network
	Philippine Information Agency (PIA)	Disseminate information on climate change, local vulnerabilities and risk, relevant laws and protocols, and adaptation and mitigation measures
Republic Act No. 10121 or the Disaster Risk Reduction and Management (DRRM) Act of 2010	National Disaster Risk Reduction and Management Council (NDRRMC)	Establish a national early warning and emergency alert system through diverse media
	Office of Civil Defense	Establish standard operating procedures on the communication system for warning and alerting local DRRM councils

Table 1 Continued

POLICY INSTRUMENT	INSTITUTION CONCERNED	MANDATE
Republic Act No. 8435 or the Agriculture and Fisheries Modernization Act of 1997	Department of Agriculture; PAGASA, and other government agencies	In coordination with PAGASA and other appropriate government agencies, they shall devise a method of regularly monitoring and considering the effect of global climate changes, weather disturbances, and annual productivity cycles for the purpose of forecasting and formulating agriculture and fisheries production programs
Memorandum on “Mainstreaming Climate Change in the Department of Agriculture’s Programs, Plans, and Budget”	Department of Agriculture	Mainstreaming climate change in the Department of Agriculture’s programs including the climate information system to have a common database to generate timely and reliable data for disaster risk reduction planning and management; and establishment of Agromet stations in highly vulnerable areas
National Climate Change Action Plan 2011-2028	Multi-stakeholder partnership	Establish climate information system for agriculture and fisheries - food security strategic action plans
National Framework on Climate Change Strategy	Multi-stakeholder partnership	Establish information, education, and communication (IEC) campaigns and knowledge management as a cross-cutting strategy

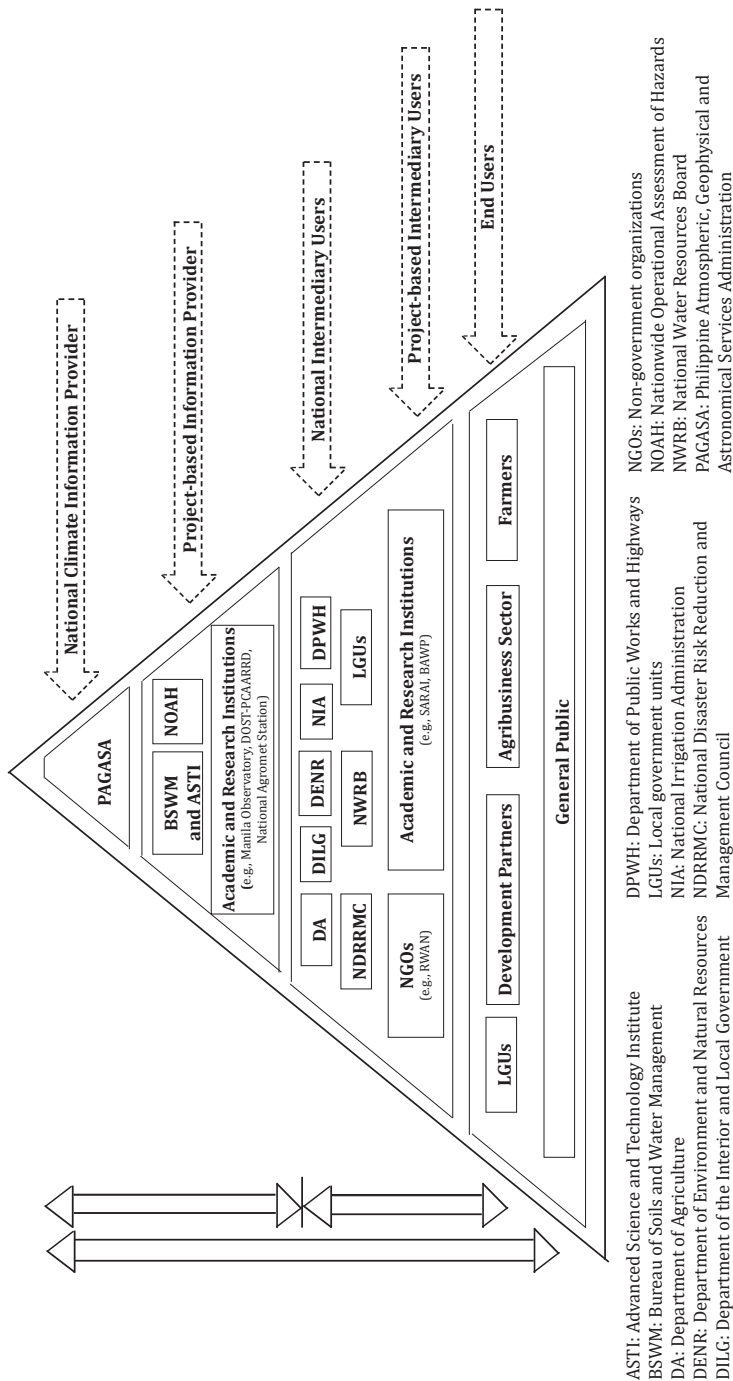


Figure 1. Institutions involved in climate information services for agriculture in the Philippines (Elazegui et al. 2017)

National Level Climate Information Provider

The main provider of hydro-meteorological services in the Philippines is PAGASA, an attached agency of the DOST. It performs activities from observation, collection, assessment, and processing of atmospheric and allied data, to distribution of CIS for the benefit of various sectors such as agriculture, commerce, and industry. PAGASA is a member of the WMO, thus, it has to comply with WMO guidelines in providing CIS.

PAGASA services include climate monitoring, climate predictions, climate outlook and advisories, and tailored products (Table 2). It also has satellite-receiving facilities for data from the US National Oceanic and Atmospheric Administration (NOAA), Moderate-resolution Imaging Spectroradiometer (MODIS) of the National Aeronautics and Space Administration (NASA), Multifunctional Transport Satellites (MTSAT) of the Japan Meteorological Agency (JMA), and aviation facilities served by the World Area Forecast System (WAFS) such as Weather and Flood Forecasting Center (WFFC).

To enhance its weather data generation capabilities, PAGASA has installed and upgraded equipment and facilities throughout the country. For example, radar stations were installed for rainfall detection and movement of tropical cyclone. Upper air stations were used for thunderstorm prediction and aviation, meteorological forecasts, and volcanic ashfall monitoring. Automatic Weather Stations (AWS) were established all over the country for continuous and automatic monitoring of selected weather elements (Porcil, 2009).

Pathways for PAGASA CIS Products

Climate information monitoring and prediction services. PAGASA established the Climate Information Monitoring and Prediction Services (CLIMPS), which originated from the National ENSO Early Warning and Monitoring System (NEEWMS) set up at the height of El Niño in 1986-1987. CLIMPS provides seasonal forecast and timely advisories to various end users, particularly policy makers, economic planners and emergency managers (Figure 2). Its purposes include early warning system and provision of monthly weather outlook to member agencies of the Inter-Agency Committee for Water Crisis Management (Subbiah, Kalsi, & Kok-Seng Yap, n.d.). Observations from a network of 50 surface synoptic weather monitoring stations and 40-year historical sets

Table 2. Climate products and services of the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA, n.d.-a)

ACTIVITY CATEGORY	PRODUCTS AND SERVICES
Climate monitoring	• Day-to-day rainfall and during tropical cyclone passage • Onset of rainy season • Dry/Wet spell • Northeast/Southwest monsoon monitoring • Temperature anomalies (sea surface temperature, local) • Monthly rainfall and temperature assessment
Climate prediction (sub-seasonal/seasonal climate forecast)	• Monthly/Seasonal/Six-month rainfall forecast • 10-day probabilistic forecast • Temperature forecast • Tropical cyclone frequency forecast • Dry/Wet day forecast • Drought outlook
Climate outlook and advisories	• Seasonal outlook (3-6 months) • Monthly weather situation and outlook • Dry/Wet spell situation and outlook • El Niño/La Niña Advisory • Dry spell/Drought advisory • Press statement
Tailored products and services	• Statistically downscaled climate projections • Watershed/Dam/River basin rainfall forecast • 10-day forecast for farm advisories • Climate briefing with non-government agencies and technical working group meetings • Information, education, and communication

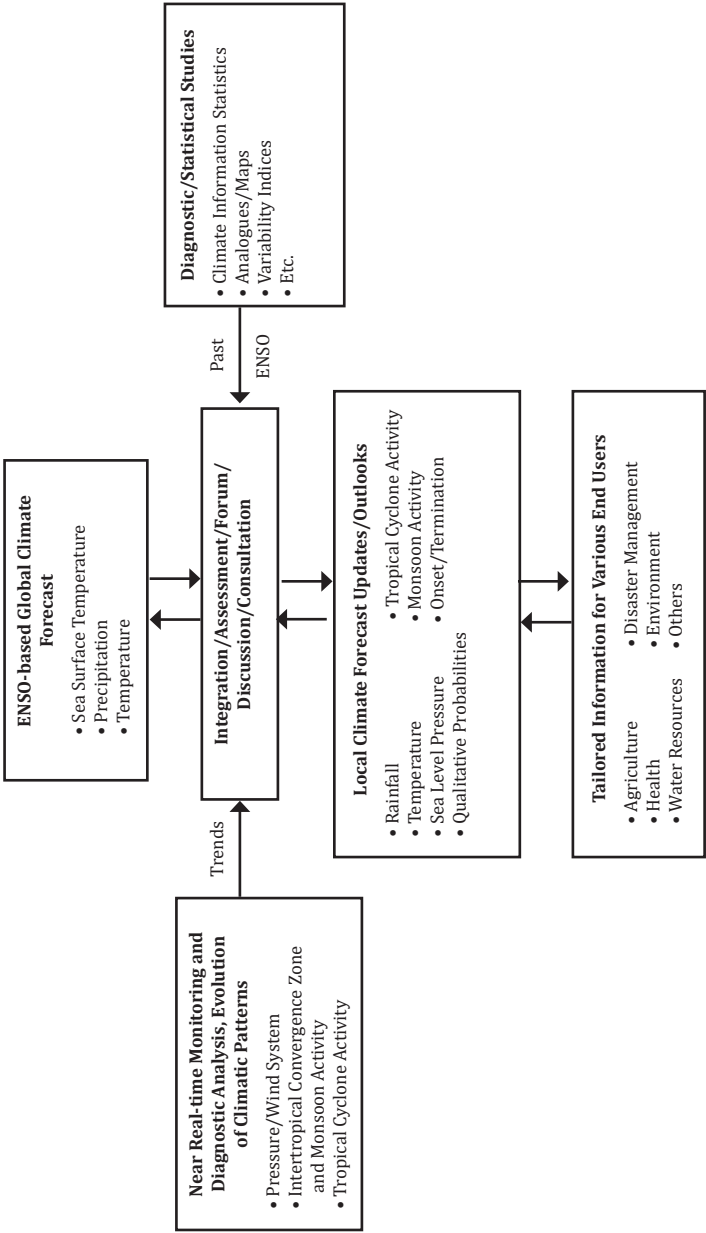


Figure 2. Translation of El Niño Southern Oscillation (ENSO)-based global climate forecasts into local climate forecasts (PAGASA, n.d.-b)

of 10-day and monthly rainfall were used by the NEEWMS. Government agencies requested information such as rainfall analysis, and 10-day, monthly, seasonal, and 12-month rainfall accumulation (Amadore, 2002 as cited by Subbiah, Kalsi, Kok-Seng, n.d.).

Weather forecast information. A weather forecast is a state of the atmosphere expressed through scientific estimate of future weather condition. PAGASA sees to it that different weather elements are observed, analyzed, and condensed to generate weather predictions, which are then transmitted through various means to different collection centers. Ultimately, from these collection centers, the coded weather observations are transmitted to the central forecasting station at WFFC. Furthermore, weather satellite pictures and radar observations are transmitted to different centers, and ground receiving stations via local communication system (Figure 3).

Farm weather services. PAGASA has a Farm Weather Services Section (FWSS) that prepares and disseminates information specifically for farmers to help them in farm planning and decision making. The products included farm weather forecast and 10-day regional agri-weather information. Weather parameters (e.g., temperature, rainfall) from 1981 to 2010 were used to establish an Agro-Climatic Zoning based on the potential/optimum use of agricultural land.

Based on the outlook and weather parameters, farming and fishing advisories were issued. The 10-day regional agri-weather information included the weather systems that affect the whole country for the next 10 days and the regional agrometeorological situations and prognosis as well as crop phenology, situations, and farm activities in the different regions of the country. These 10-day Regional Agri-Weather and Advisories were circulated through radio stations, agricultural schools and universities, Department of Agriculture, PAGASA field stations, LGUs, and researchers (Figure 4). Advisories were accessed through the PAGASA website and text/short messaging service. PAGASA personnel also served as resource speakers in different trainings, meetings, and fora organized by different institutions or organizations.

There were other activities done by PAGASA that intended to educate the members of the different LGUs. PAGASA conducted information, education, and communication campaigns and workshops with municipal agriculturists on translating data to layman's language,

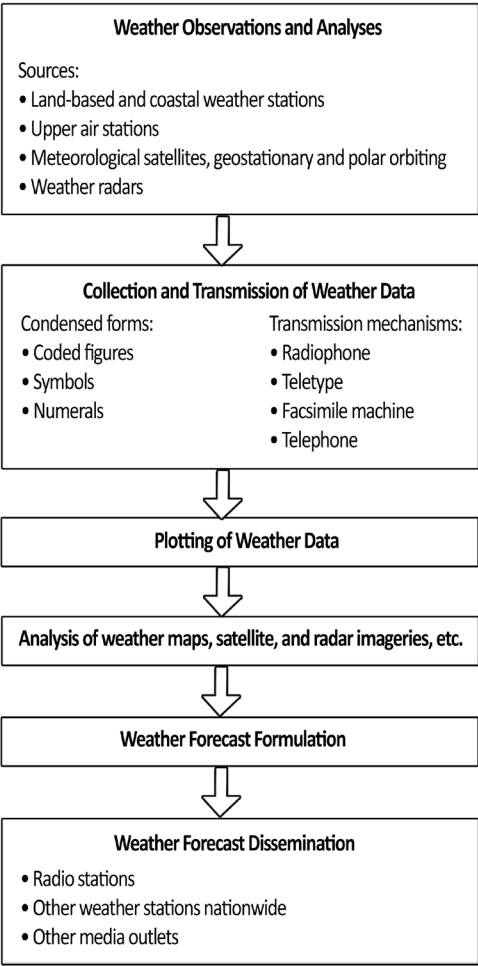


Figure 3. Steps in data generation to dissemination of weather forecast information by PAGASA (PAGASA, n.d.-c)

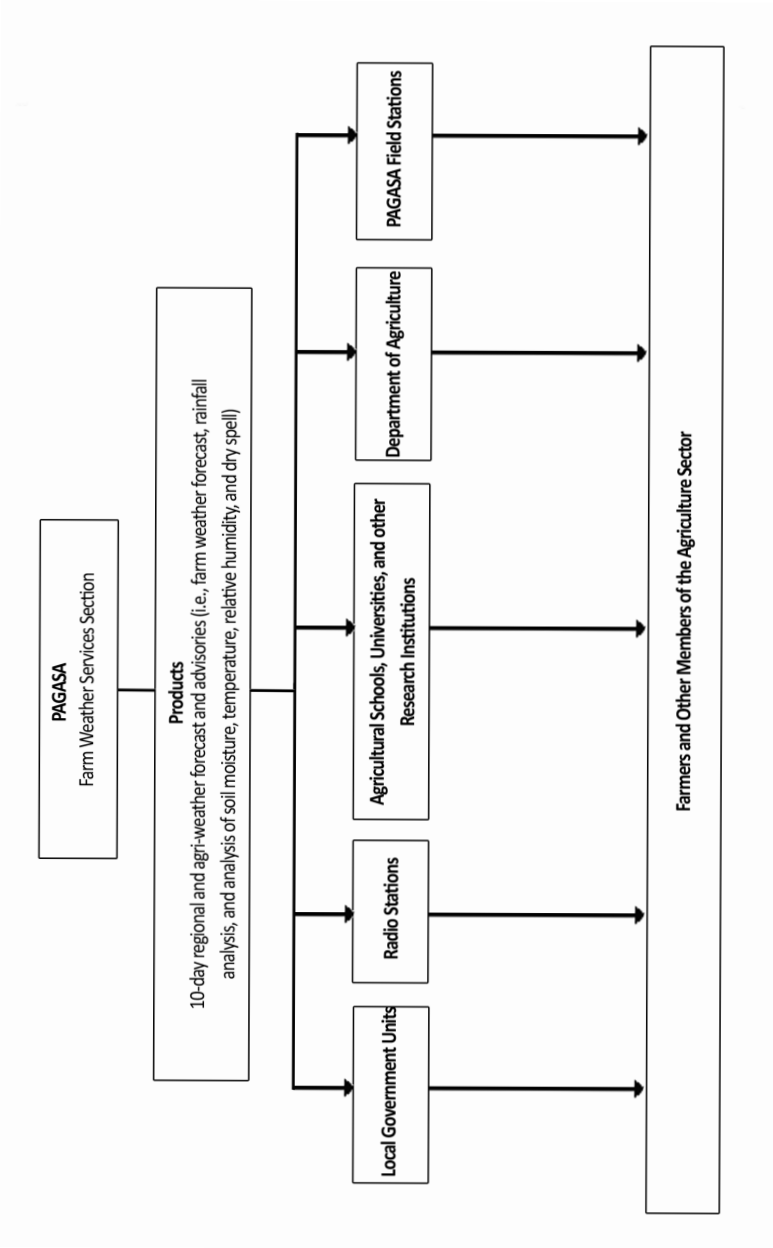


Figure 4. Information pathway from PAGASA's Farm Weather Services Section to farmers

using various visual aids in local dialect, and improving capacity to handle all local data. The municipal agriculturists and agricultural extension workers conducted trainings for farmers that enabled them to apply basic climate information in their different agricultural activities.

Climate trends and projections. Climate projections are necessary for climate change impact assessment and national planning. There are two methods of establishing climate projections: historical trend and climate modeling.

In producing climate projections in the Philippines, Daron, Jones, Scannel, Corbelli, and Cinco (2016), in a workshop report, revealed that there were several groups of climate modelers with different methods. For example, the Met Office Hadley Center in United Kingdom, in collaboration with PAGASA, generated a downscaled Coupled Model Intercomparison Project Phase 5 (CMIP5) simulations using Hadley Center Global Environment Model version 3 (HadGEM3-RA) with a horizontal resolution of 12 km. At the same time, PAGASA downscaled its own CMIP5 simulations using a range of Regional Climate Models (RCMs), including Providing Regional Climates for Impacts Studies (PRECIS), Conformal-Cubic Atmospheric Model (CCAM), and Regional Climate Model 4 (RegCM4). In addition, a cooperation project between PAGASA, FAO-PAGASA, and FAO-AMICAF previously provided statistically downscaled climate projections using CMIP3 Global Circulation Models (GCM). The process of downscaling enhances the scale of climate information from global scale (coarse resolution) to regional and local scale (finer resolution) either by nested-resolution RCM, also known as dynamical downscaling, or statistical methods. Other groups that provided climate projections in the Philippines were the Southeast Asia Climate Downscaling Experiment (SEACLID) and the Coordinated Regional Climate Downscaling Experiment (CORDEX) Southeast Asia project collaboration between University of Malaysia and Manila Observatory.

Intermediary Users of Climate Information

PAGASA established partnership with different government organizations and project-based intermediaries in order to capacitate different agriculture stakeholders (i.e., LGUs, farmers, and other members along the value chain) in managing their climate-related risks (Figure 5). These institutions generated and gathered climate data from various

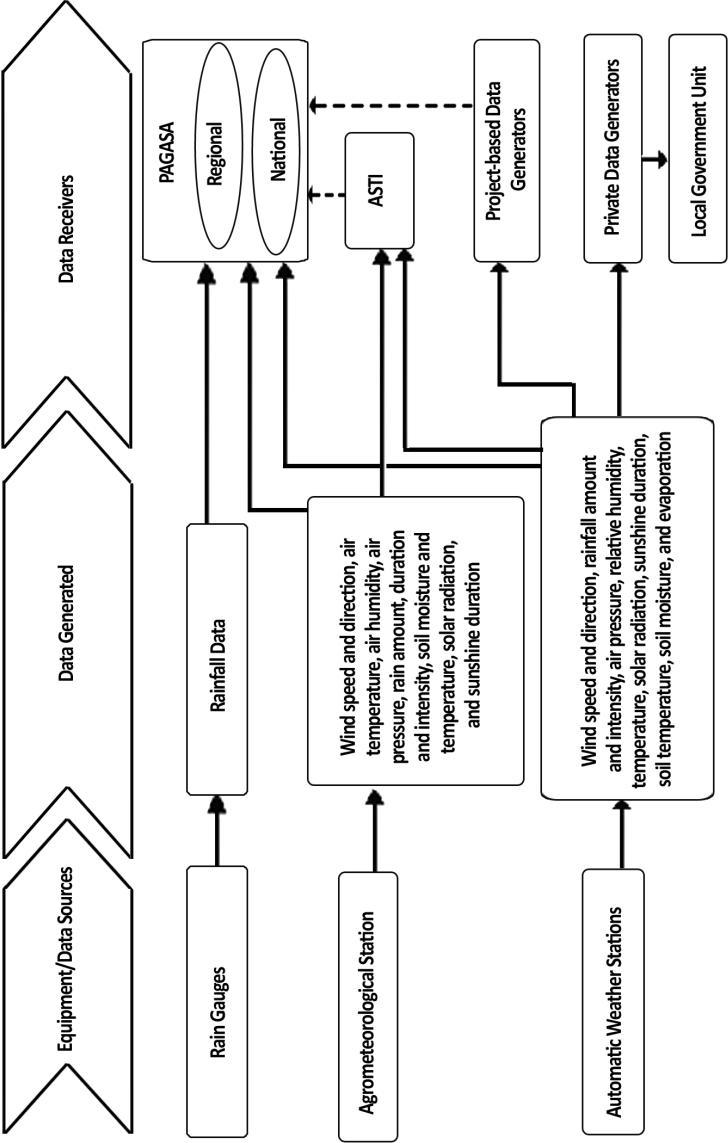


Figure 5. Summary of climate data flow

sources. In the case of PAGASA, the data sources included rain gauges, AWS, and AGROMET stations. However, although AGROMET stations and AWS generated almost the same climate data, PAGASA relied mostly on the AGROMET stations for more accurate and reliable data. The AWS also served as a primary source of climate data of different project-based data generators which were accessed from time-to-time by PAGASA through their respective databases. In the case of some LGUs, they accessed climate data through partnership with private climate data generators.

Prior to the generation of climate information and extension advisories, climate data were processed by different institutions and converted to useful forms by different intermediary climate information providers (e.g., 10-day weather forecast of PAGASA) before they were translated into extension advisories.

Local government institutions. There were local government units (LGUs) with initiatives to produce climate information for their constituents. For instance, the LGU of Dumangas disseminated farm weather advisories through the municipal agriculture office (MAO) (Figure 6). These advisories enumerated guidelines by which the farmers and fisherfolks could base their responses during various weather conditions. To communicate better these advisories, the LGU translated them into the local language, Hiligaynon. Aside from Dumangas in Iloilo, Guinayangan, Quezon; Tirona, Tarlac; and Irosin, Sorsogon also generated their own CIS and advisories.

Information end user. There were CIS end users both at the national and local levels. At the national level, end users widely ranged from development planners and policy makers to agro-industry suppliers, producers, and distributors. In the context of this study, the primary end user of the climate information was the agriculture sector, particularly farmers and other vulnerable communities. The use of CIS allowed the farmers to manage and cushion the impacts of changing climatic condition along different phases of agricultural production (i.e., land preparation, harvesting, and post harvesting).

To enhance commitment and better understanding of the roles and responsibilities of different institutions at the local level, PAGASA and the Department of Agriculture entered into a memorandum of understanding for a new user interface platform (UIP) (Selvaraju et al., 2013). This improved climate outlooks that catered to the needs of the

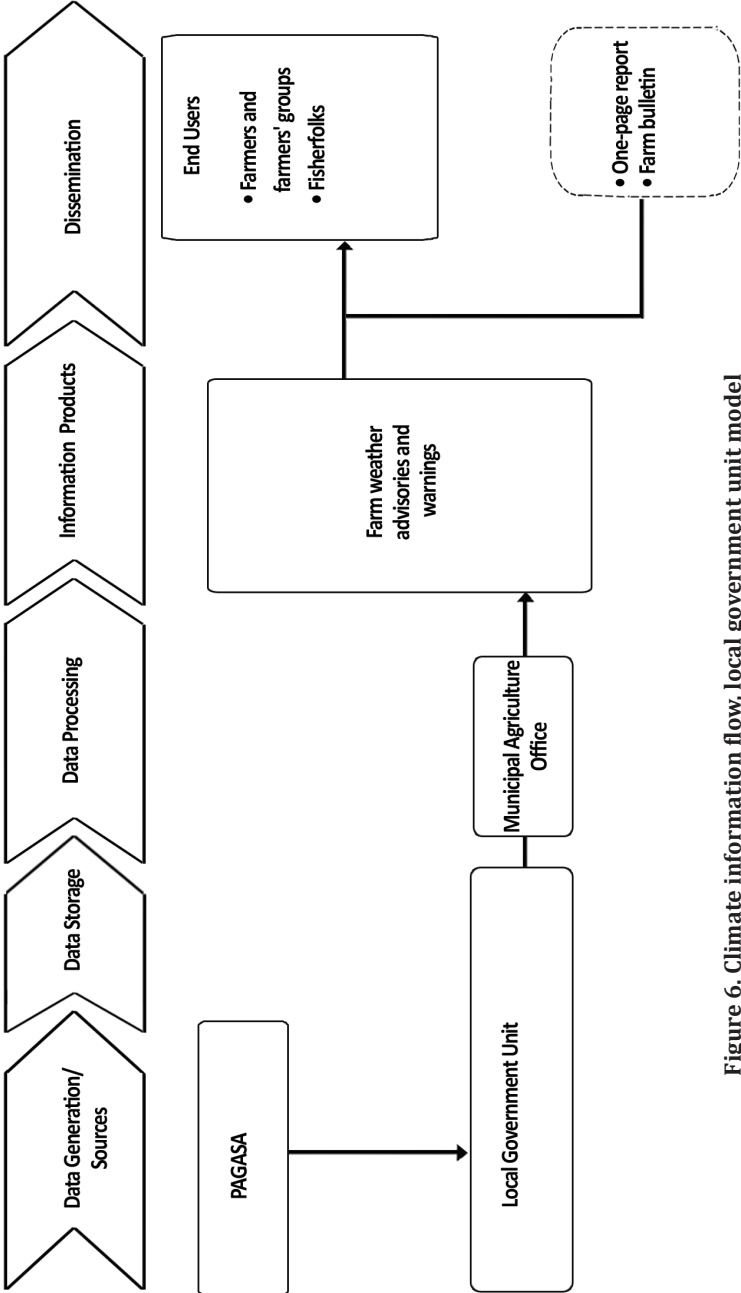


Figure 6. Climate information flow, local government unit model

users. The provincial and municipal agriculture staff were responsible for disseminating advisories to the barangay authorities and farmers. The barangay chairpersons were assigned to monitor and observe weather from newly installed weather data collection instruments and to send back data to the PAGASA regional services division.

Challenges and Opportunities of CIS Provisioning and its Sustainability in Philippine Agriculture

With key informant interviews, the authors sought insights of experts from the various agencies involved with the CIS regarding challenges that constrain effective delivery and sustainability. The experts' responses covered the following: 1) standards in the establishment and maintenance of the CIS equipment; 2) coping with global modern technologies; 3) meeting human capital requirements; 4) need for a paradigm shift within the Department of Agriculture and the LGUs in order to mainstream the climate forecast and extension advisories in the day-to-day activities; and 5) commitment of partners to institutionalize collaboration among CIS providers and users. This related to capacities of different institutions to support CIS.

Establishment and maintenance of the CIS equipment. This role was assigned to PAGASA. The Agency has beefed up its CIS collection equipment and has the protocol for maintenance of AWS. It was also recognized that many weather station network websites were providing CIS. PAGASA, in cooperation with different SUCs and LGUs, should conduct a national and regional climate network adequacy assessment to identify where to provide CIS. Priority should be given to areas planted to principal crops especially in regions without records or with poor historical records of weather data, or where parameter observations are very difficult, regions sensitive to change, and key measurements with inadequate spatial and temporal resolutions. According to climate monitoring principles of WMO, these identified areas should be assigned high priority in the installation of new weather observation station or AWS.

A major concern was the security and maintenance of the installed instruments against vandalism, theft, pest (ants) infestation, and natural wear-and-tear. The transfer of obligation from PAGASA to local constituents where the AWS was installed in order to safeguard the CIS facilities posed accountability problems in case of damage or loss.

Compounding the technical constraints was the high cost of weather instruments, which were more often procured from abroad. Replacement of damaged parts was expensive since there were no repair or after-sales facilities in the country for such equipment. Those maintaining the equipment also had poor access to institutions that provide them the technical knowledge on how to properly maintain these equipment. The problem was further complicated by the need to comply with Republic Act No. 9184, referred to as the Government Procurement Reform Act, which covered procurement of equipment and maintenance budget as well. The stringent procurement process often took a long time, and adding to the causes of delay in data collection was the period of time when the equipment needed servicing. Knowledge on the life span of sensors and spare parts was therefore essential in procurement planning. Linkage with suppliers of spare parts is necessary.

Weather stations and instruments were spread throughout the country. While the number of AWS installed increased, the archipelagic structure and mountainous terrain of the country determined the areas where they were needed most. There were areas covered by several project-based CIS providers, which resulted in the installation of several AWS in the same location. This indicated the need for institutional collaboration, e.g., consultation with provincial government units and PAGASA in identifying areas to be covered as project sites.

Technological challenges. Since access to data depended on subscription to telecommunication services such as text messaging, monitoring of real time data in weather stations was difficult in some areas because of poor or unstable signal as well as inadequate cellular phone load of observers and the users. In establishing historical climate trends based on ground measurements, one constraint was the limited length of data records. The limited number of AGROMET stations with complete set of weather instruments and with at least 30 years of records, restricted the hydrologic frequency analysis of weather parameters for effective forecasting. This resulted in the fragmented, irregular, or sporadic analysis, done only by research institutions for a particular area or project.

Furthermore, the homogeneity of climate data from ground measurements was usually affected by instrumental and environmental changes such as site relocation, instrument upgrades, and urban heat island effect (Willems, 2015). Satellite-based remote sensing is now being used as an alternative source of climate data to address this problem.

Requirements for human capital. The presence of intermediary users and co-providers opened opportunities for a more-localized CIS. Related to this is the retention of skills and interest of trained personnel, for instance, in CIS data collection and analysis. When the project-based intermediary user leaves the area, continuing the activity becomes a problem.

The data generated by these projects were useful in increasing appreciation of communities for science-based information, local early warning system, and even as backup data for PAGASA. A database of five-year series local climate data could be used for experiments, especially by research institutions. If the local database can be built up over the long term, with the proper management by PAGASA, these will be very useful to climate science in terms of localized or downscaled climate forecasting and projections. A 30-year time series data will be useful to both hindcasting and forecasting. Thus, the sustainability of data management and the providers or intermediaries should be ensured. PAGASA and the DA RFOs can partner with various SUCs and research institutions in the regions to help them transform local climate data into more useful regional or local farmer advisories.

In the use of climate models, there were several groups of climate modelers with different methods of producing climate projections in the Philippines. PAGASA, being the government agency mandated to provide climate projections, must find ways to compare, combine, and communicate effectively the different climate projections.

Institutionalizing partnerships among CIS providers and users. Political support and local governance were vital in the dissemination of climate information to different end users. There was difficulty when CIS, particularly those introduced by project-based intermediaries, got lower priority (i.e., manpower and budget allocation) from local chief executives. Moreover, hiring of personnel, such as observers assigned to weather facilities was subjected to political dynamics. As an example, a change in an administration (e.g., mayor) after an election resulted in the change in the data observer, and thus, requiring another retooling.

Communicating climate information that would be appreciated, understood, and utilized by target end users for guided or improved decision making was a big challenge to CIS providers. Raising awareness was needed to enable end users to understand better climate

information. Raw climate information such as rainfall and temperature must be clearly translated into impacts to agricultural systems and the accompanying components (e.g., crops, rangelands, pests, diseases) and farm management advisories (Tall et al., 2014). A key informant from PAGASA pointed out the challenge of communicating uncertainties embedded in the forecast and projections. With climate information expressed as forecast and projections, effective communication strategies entailed the translation of these projections into impacts on farmers' livelihood. Impact-based forecasting was promoted by WMO to make climate information more relevant to decision making. The PAGASA cannot do this alone, thus the participation of other agencies especially by the Department of Agriculture for the agriculture sector is crucial.

Other institutional constraint faced by CIS was the scarce budget considering the work volume and area of coverage as in the case of the Farm Weather Services Section (FWSS) of DOST. Despite the high demand for their services, shortage in manpower has restricted the work that could be rendered. This was also true to the case of the Advanced Science and Technology Institute (ASTI), particularly on the maintenance of the AWS and ground validation. PAGASA regional offices were not sufficient to monitor the different weather facilities nationwide.

CIS across different levels and scales has provided opportunities for institutional partnerships not only among government institutions and LGUs but with non-government entities as well. It has also served as an avenue for raising awareness and building capacities for community-based CIS. It has expanded linkage of a central agency such as PAGASA to various CIS providers in the delivery of climate information on a wider scope.

Aside from research-based weather monitoring systems, there were also many privately-owned systems with the potential for long-term climate monitoring, primarily because of their strategic location. The conversion of these weather stations for long-term operations can be pursued. Moreover, the practice of some project-based CIS intermediary users to turn over the system to the LGUs or farmers' associations is a vital move to sustain CIS once the project ends. Trainings provided by projects, e.g., rainfall data collection and analysis, stewardship of weather instruments/facilities, have strengthened commitment of local communities to sustain CIS. Tall et al. (2014) noted the importance of involving end users in institutional arrangements especially in the co-design and co-production of climate services. In this light, there is a need to institutionalize partnerships at the local level to sustain CIS data generation, information production, dissemination, and use.

CONCLUSIONS AND RECOMMENDATIONS

For farming communities to become resilient, climate information is important and necessary. Policies are existing for the provisioning of CIS in Philippine agriculture sector, and there is a clear pathway of service delivery. The Philippines has been investing in more climate data collection instruments to be able to generate more location-specific information. However, challenges toward having more stable institutional arrangements, and capacities and technologies for disseminating the information and especially translating these into agricultural extension advisories are stifling the effectiveness of such investments. To sustain CIS efforts, the study offers the following policy recommendations (Elazegui et al., 2017):

Come up with a protocol in the establishment and maintenance of the CIS equipment . Following a national and regional climate network adequacy assessment, PAGASA, in cooperation with regional SUCs and LGUs, should identify project sites where CIS should be provided. Priority should be given to: areas planted to principal crops, especially in regions with poor spatial resolution or with poorly observed parameters; regions sensitive to change; and key measurement with inadequate temporal resolutions. CIS providers should consult provincial government units to pinpoint these areas and consult PAGASA for validation of location of weather instruments.

Maintenance of CIS equipment should be regularly done. Proper care and maintenance of equipment are also very important. While calibration is done by the PAGASA; the number of personnel at this time may not be enough to perform the calibration of all the AWS. PAGASA has to train the regional offices to do this.

Invest in modern technologies for climate data collection. Technical infrastructure for observations and monitoring for quality control is also important to ensure reliability of data or information including those from non-traditional sources.

The issue of prohibitive costs of weather instruments can be addressed by developing low-cost instruments using open-source electronics platforms like Arduino and 3D printing of instrument casings. The technology is already available in the Philippines, in fact several students in the University of the Philippines Los Baños are already doing

this for their thesis. The important aspect in this development is proper testing and calibration, and these would require some government funding.

The PAGASA Modernization Roadmap has been crafted for implementation in 2018. Programs include enhancement of weather data collection and information dissemination services.

Build human capital to sustain the CIS. Building human capacity through community engagement should be continuous. This includes training in collecting inputs, coordinating use of information, and facilitating communication. Farmers should be involved in the design, production, and evaluation of CIS to foster trust and local relevance. Capacity building should include upgrading of technical skills in climate data management; promoting common standards in generating and packaging CIS products; and developing communication skills for disseminating tailored climate products and feedback. Capacity building should also include collaborative development of projects that engage both providers and users.

There is a need to build local capacities for forecast and climate crop modeling for the long term. Capacity building must also enhance the use of science-based decision support tools, which also stresses the importance of climate information in considering various options.

Institutionalize CIS. The conversion of private and research-based weather monitoring stations for long-term operations should be pursued, especially if these systems are located in high priority areas. There must be an established protocol to coordinate with PAGASA to officially validate data.

The Philippine Unified Information System (PUMIS) managed by PAGASA may be an opportunity for an integrated data banking. PUMIS works as an integrated database system where all the climate-related information generated by different institutions could be stored. This system follows the standards of the WMO, thus there are requirements to consider. PAGASA complies with the WMO standards based on Global Framework for Climate Services. Considering the different CIS intermediaries, establishment of an integrated database would require standardized data from various sources and single data format, quality

control, regular calibration of weather instruments, and consideration of different specifications of equipment used by the different CIS providers. With the proliferation of CIS providers and actors involved (e.g., government officials, researchers, development planners), the access, relevance, reliability, and usability of climate information are critical. Sustained partnerships should be established among CIS providers and users. Data management systems that facilitate access, use, and interpretation of data and products should be included as essential elements of climate monitoring systems. There should be an institutional mechanism to promote impact-based forecasting. This will improve understanding of climate information by users and decision makers and how to respond given the associated risks.

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LITERATURE CITED

- Campbell, B. M., Thornton, P., Zougmore, R., van Asten, P., & Lipper L. (2014). Sustainable intensification: What is its role in climate smart agriculture? *Current Opinion in Environmental Sustainability*, 8: 39-43. <http://dx.doi.org/10.1016/j.cosust.2014.07.002>.
- Cole, D. H. (2013). The varieties of comparative institutional analysis. Article by Maurer Faculty. Paper 834. Retrieved from <http://www.repository.law.indiana.edu/facpub/834> on 30 September 2019.
- Daron, J., Jones, R., Scannel, C., Corbelli, D., & Cinco, T. (2016). Workshop report on reviewing available methods and climate data for use in climate projections for the Philippines. Quezon City, Philippines: PAGASA. Retrieved from www.metoffice.gov.uk/media/pdf/6/8/Met_Office_PAGASA_February_workshop_report.pdf on 30 September 2018.
- Local Government Unit of Dumangas (2010). Dumangas on the go: The climate field school of Dumangas. (2010). Retrieved from https://www.preventionweb.net/files/section/230_Philippinesdumangascasestudy on 5 September 2019.
- Elazegui, D., Luyun, R. A. Jr., & Anastacio, N. J. C. (2017). Climate information services for agriculture: Analysis of the institutional landscape. Research report for the "Climate Information Services (CIS) – Provisioning in the agriculture sector." Department of Agriculture, Quezon City, Philippines.
- Hernandez, Y., Barbosa, P., Corral, S., & Rivas, S. (2018). An institutional analysis to address climate change adaptation in Tenerife (Canary Islands). *Environmental Science and Policy*, 89: 184–191. Retrieved from <https://doi.org/10.1016/j.envsci.2018.07.017> on 30 September 2018.
- Ogallo, L. A., Boulahya, M. S., & Keane, T. (2000). Applications of seasonal to interannual climate prediction in agricultural planning and operations. *Agricultural and Forest Meteorology*, 103: 159–166.
- PAGASA. (n.d.-a). Products and services. Retrieved from <http://bagong.pagasa.dost.gov.ph/products-and-services> on 30 September 2018.

- PAGASA (n.d.-b). Initiatives for locally tailored climate information services in the Philippines. Retrieved from https://www.wmo.int/pages/prog/dra/rap/documents/OnGoinginitiatives_Philippines.pdf on 30 September 2018.
- PAGASA (n.d.-c). How a weather forecast is made. Retrieved from <http://bagong.pagasa.dost.gov.ph/learning-tools/how-weather-forecast-made> on 30 September 2018.
- Porcil, J. T. (2009). Philippines' country profile. Country report – compilation, Asian Disaster Reduction Center. Retrieved from <https://www.adrc.asia/countryreport/PHL/2009/PHL2009.pdf> on 30 September 2019.
- Rola, A. C., De los Santos, E., Faderogao, F. F., & Faulmino, C. J. P. (Eds). (2017). Building Resilience of Farming Communities: Science, Technology and Governance Innovations in Bicol, Philippines. Pili, Camarines Sur: Department of Agriculture RFO 5; Quezon City, PAGASA; Los Baños, Laguna: UPLBFI.
- Roudier, P., Muller, B., d'Aquino, P., Roncoli, C., Soumare, M. A., Batte, L. & Sultan, B. (2014). The role of climate forecasts in smallholder agriculture: Lessons from participatory research in two communities in Senegal. *Climate Risk Management*, 2: 42-55. Retrieved from <http://dx.doi.org/10.1016/j.crm.2014.02.001> on 30 September 2019.
- Selvaraju, R., Khan, N. D., Dalida, L. U. Jr., Alvina, P., Chung, P., Tejada, E., Mendoza-Luzcuber, O. J., Mori, R., Madima, T., & Gautam, B. R. (2013). Localizing climate information services for agriculture, 62 (Special Issue), World Meteorological Organization. Retrieved from <http://public.wmo.int/en/bulletin/localizing-climate-information-services-agriculture> on 30 September 2018.
- Singh, C., Urquhart, P., & Kituyi, E. (2016). From pilots to systems: Barriers and enablers to scaling up the use of climate information services in smallholder farming communities. CARIAA Working Paper No. 3. Ottawa, Canada and UK Aid, London, United Kingdom: International Development Research Centre.

- Subbiah, A. R., Kalsi, S. R., & Kok-Seng Yap, K. S. n.d. Climate information application for enhancing resilience to climate risks. In C. P. Chang Bin Wang & G. L. Ngar-Cheung (Eds.) *The Global Monsoon System: Research and Forecast Report of the International Committee of the Third International Workshop on Monsoons (IWM-III)*, 2-6 November 2004, Hangzhou, China, Tropical Meteorology Research Programme Report No. 70. Geneva, Switzerland: World Meteorological Organization.
- Tall A., Hansen, J., Campbell, B., Kinyangi, J., Aggarwal, P. K. & Zougmore, R. (2014). Scaling up climate services for farmers: Mission possible. *Learning from Good Practice in Africa and South Asia*. CCAFS Report No. 13. Copenhagen: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).
- Vaughan, C., & Dessai, S. (2014). Climate services for society: Origins, institutional arrangements, and design elements for an evaluation framework. *WIREs Climate Change*, 5: 587–603. <https://doi.org/10.1002/wcc.290>.
- Vaughan, C. (2016). An institutional analysis of the IPCC task group on data and scenario support for impacts and climate analysis (TGICA), Columbia University. Report for the IPCC Expert Meeting on TGICA, 26-27 January 016, Geneva, Switzerland.
- Willems, P. (2015). Climate change and impacts on hydrological extremes. Retrieved from <http://slideshare.net/VMMeu/1-patrick-willems-camino2015> on 30 September 2019.
- World Meteorological Organization (WMO). (2014). Annex to the implementation plan of the global framework for climate services: Climate Services Information System Component, Geneva, Switzerland.

TQM/ISO 9001 Implementation in Northern and Central Luzon State Universities

¹PATRICK C. DE LEON

ABSTRACT. This case study was conducted to investigate why and how the TQM/ISO 9001 programs were adopted in state universities in the Philippines such as Pangasinan State University, Nueva Ecija University of Science and Technology, and Central Luzon State University; what TQM and ISO 9001 meant to them; and what factors affected TQM/ISO 9001 implementation in their universities. The study found that TQM/ISO 9001 programs were intended to streamline work processes and improve the quality of services. Implementation involved the hiring of a consultant, conducting trainings, preparing and using a QMS manual, organizing internal and external audits, and receiving ISO 9001 certification from an international body. TQM was regarded as a holistic approach to the continuous improvement of work processes while ISO 9001 was perceived as an international QMS standard and a quality assessment instrument. The factors that positively affected TQM/ISO 9001 implementation were senior management commitment and/or the presence of a TQM driver; funds to operate; employee understanding and internalization; conduct of control procedures; and implementation reinforcement or complementation by the citizen's charter. Factors with negative effect were the employees' lack of commitment and discipline, and their resistance or inability to adapt to change. The study recommends programs that minimize resistance to and promote internalization of TQM/ISO 9001 adoption; and the creation of a government certifying body that can serve as an alternative to the private international certifying bodies.

Keywords: *ISO 9001, quality management system standard, Total Quality Management*

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INTRODUCTION

In 2006, two executive issuances by the then President Gloria Macapagal-Arroyo have made the adoption of Total Quality Management (TQM) and ISO 9001 Quality Management System (QMS) standard imperative for governmental or public sector organizations. These executive issuances were Administrative Order (AO) No. 161 and Executive Order (EO) No. 605. AO No. 161 required national government agencies (NGAs), government-owned and controlled corporations (GOCCs), government financial institutions (GFIs), and local government units (LGUs) to have an ISO-aligned QMS. EO No. 605, meanwhile, mandated the adoption of ISO 9001 in NGAs, GOCCs, GFIs, LGUs, and state universities and colleges (SUCs).

A more compelling reason for TQM and ISO 9001 adoption in government has come through the issuance of Government Quality Management Committee (GQMC) Memorandum Circular (MC) Nos. 2016-1 and 2017-1. These MCs have made ISO 9001 certification or ISO-aligned QMS a requirement for the grant of a performance-based bonus (PBB) among government employees.

Viewed from a broader perspective, AO No. 161, EO No. 605, and GQMC MC Nos. 2016-1 and 2017-1 have become significant parts of the history of productivity and performance measurement and/or quality improvement programs of the Philippine Government. Arguably, this history started with the implementation of the Local Productivity and Performance Measurement System (LPPMS) in 1984 by the then Ministry of Local Government. It continued with the implementation of the Sort, Systematize, Sweep, Standardize, and Self-Discipline (5S) program of the Development Academy of the Philippines (DAP) in 1986; the Citizen's Satisfaction Index System (CSIS); the Local Development Watch (LDW); and the Local Governance Performance Management System (LGPMS) of the Department of the Interior and Local Government (DILG) in 2000, 2001, and 2004 respectively. These programs were followed by the passage and implementation of the Anti-Red Tape Act (ARTA) of 2007 (otherwise known as RA No. 9485), the Report Card Survey (RCS) and the ARTA Watch of the Civil Service Commission in 2008, and the Seal of Good Housekeeping (SGH) and the Seal of Good Local Governance (SGLG) of the DILG in 2011 and 2013, respectively. The latest addition to this history of productivity and performance measurement and/or quality improvement programs is the passage of the Ease of Doing Business and Efficient Government Service Delivery Act of 2018 (otherwise known as

RA No. 11032). These programs were used by NGAs, GOCCs, GFIs, LGUs, and SUCs in pursuing efficiency, effectiveness, and economy (3Es) in public service delivery (De Leon, 2017a, 2017b, 2018).

The objectives of this study were as follows: 1) to investigate why and how TQM and ISO 9001 were adopted in Northern and Central Luzon state universities; 2) to determine what TQM and ISO 9001 meant to them; and 3) to identify the factors that affected their TQM and ISO 9001 implementation.

This study would demonstrate that TQM and ISO 9001, despite their industrial origins, can be implemented in state universities. Thus, it can motivate SUCs and other public sector organizations to adopt TQM and ISO 9001. By documenting the experiences of three Northern and Central Luzon state universities, the study can guide other SUCs in the country in implementing TQM and ISO 9001, in complying with executive issuances and government policies on productivity and performance measurement and/or quality improvement programs, and in attaining the 3Es in public service delivery.

In the literature, TQM is defined as a comprehensive management methodology for ensuring that jobs and processes are carried out correctly, first time and every time (Morgan & Murgatroyd, 1994; Andres, 1996). It has been applied successfully by Japanese companies (Asao, 1992; Gemba Research, 2002), Indian and Iranian hospitals (Gorji & Farooque, 2011), and Philippine manufacturing firms (Perez, 1992; Zamora, 1993; Andres, 1996; Talavera, 2003, 2004, 2005, 2006), banks (Bank of the Philippine Islands, 1994), and schools (Calabon, 2000; Azanza, 2003). It has also been applied successfully by a Japanese prefectural government (Shizuoka Prefectural Government, 2013); by American school boards, police organizations, and state governments (Hunt, 1993); and by Philippine LGUs (Mariano, 1998), NGAs (Mangahas & Leyesa, 1998), GOCCs (Constantino, 2004), and educational institutions (Botuyan et al., 1993; Legaspi II, 2005).

Despite the documented successes of TQM adoption in foreign and local governmental organizations, some scholars remained skeptical about TQM's applicability in the public sector (Swiss, 1992; Morgan & Murgatroyd, 1994) and its staying power (Holzer, 1997). Some scholars saw the need to manage change in organizations (Hrebiniak, 2013; Diamante, 2014; De Guia, 2000), and to overcome resistance to changes such as those brought about by TQM implementation (Crosby, 1979; Deming, 1988; Juran, 1988; Carr & Littman, 1990; Cohen & Brand, 1993),

while some suggested that cultural change is required for a successful or sustained TQM implementation (Unson, 1992; Borja, 1993; Valdea, 1993; Prieto, 1993; Silva, 1993; Mirasol, 2004; Andres, 1996).

Standardization, a method for reducing system variance (Gitlow, Oppenheim, Oppenheim, & Levine, 2005), is another concept related to TQM. The International Organization for Standardization (ISO) is the primary international organization involved with standardization. ISO 9000 and ISO 14000 are two of the most important families of standards. ISO 9001 is used when an organization seeks to establish a QMS that provides confidence in the organization's ability to provide products that fulfill customer needs and expectations. ISO 14001, on the other hand, helps organizations to manage better the impact of their activities on the environment (ISO, 2009).

ISO certifications are usually issued by private ISO certifying bodies such as the Anglo Japanese American (AJA) Registrars Limited, Certification Europe (EC), Certification International Philippines, Incorporated (CIPI), Technischer Überwachungsverein (TUV SUD), and Business Requirement Specification (BRS). As of September 2017, a total of 52 Philippine public agencies have been certified by these ISO certifying bodies. Among them are 12 SUCs (DBM, 2017).

Perhaps one of the most important TQM scholars is Andres (1996). He gave the five phases of TQM implementation in an organization, namely: preparation, planning, assessment, implementation, and diversification. He discussed each of these phases in pages 93-327 of his book titled "Total Quality Management in the Philippine Industrial Setting," which was published in 1996. In the same book, he discussed the need to "positivize" negative Filipino values that could hinder TQM implementation such as *gaya-gaya* (copying from others) and *pagtatakip sa kakulangan* (hiding the shortcoming of others).

The United Nations (2001), meanwhile, discussed the nine implementation steps and the 20 elements of ISO 9001. The implementation steps are the following: 1) identifying goals, 2) identifying expectations, 3) identifying core activities, 4) assessing current status, 5) collecting information on ISO 9001, 6) applying ISO 9001, 7) demonstrating conformance, 8) independent audit and certification or registration, and 9) continuous review and improvement. The elements, on the other hand, are the following: 1) management

responsibility; 2) quality system; 3) contract review; 4) design control; 5) document and data control; 6) purchasing; 7) customer-supplied product; 8) identification and traceability; 9) process control; 10) inspection; 11) control of inspection, measuring, and test equipment; 12) test status; 13) control of non-conforming products; 14) corrective and preventive actions; 15) handling, storage, maintenance, and delivery of products; 16) quality records; 17) internal quality audit; 18) training; 19) servicing; and 20) statistical techniques.

Besterfield, Besterfield-Michna, Besterfield, & Besterfield-Sacre (2003), on the other hand, discussed the following key elements for TQM implementation in an organization: 1) senior management commitment and/or the presence of a TQM driver or champion; 2) quality council; 3) role of middle managers or supervisors; 4) communication; 5) training; and 6) customer, employee, and supplier surveys.

Finally, Morgan & Murgatroyd (1994) raised these objections and issues on TQM adoption in the public sector: 1) the nature of TQM being inimical to the public sector, 2) the nature of the public sector being inimical to TQM, 3) the work cultures of professional groups in the public sector being protective of their turf, 4) the more problematic customer concept in the public sector, and 5) the more complicated public service provisions. They discussed each of these objections and issues in pages 168-190 of their book titled "Total Quality Management in the Public Sector: An International Perspective," which was published in 1994.

This study's framework integrated the works of Andres (1996), Besterfield et al. (2003), and De Leon (2017a, 2017b, 2018). Andres (1996) was included in the framework because he enumerated and described the five phases of TQM implementation and argued that Filipino cultural values must be considered when implementing TQM. Besterfield et al. (2003), meanwhile, was included in the framework because they identified the six key elements for TQM implementation in an organization. Finally, De Leon (2017a, 2017b, 2018) was included in the framework because he found that the frequency and nature of leadership change affect TQM and ISO 9001 implementation, particularly in LGUs

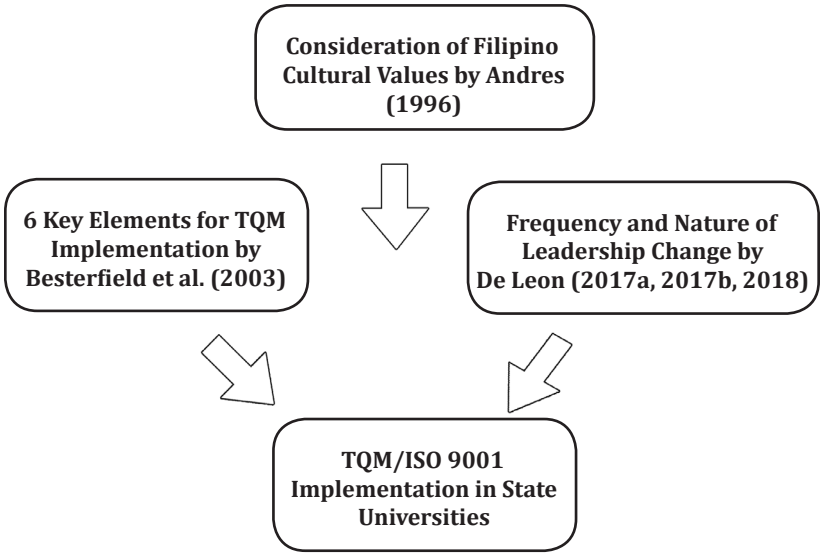


Figure 1. The framework for TQM/ISO 9001 implementation in state universities

METHODOLOGY

This research employed a case study design. The case study approach was considered because it allows an in-depth analysis of a program, event, activity, or process such as TQM/ISO 9001 implementation. A case study normally focuses on a particular organization or specific individuals (Bautista, 1998).

The unit of analysis was the state university. Three out of the 12 ISO 9001-certified SUCs in the country as of September 2017 (which were cited in the October 11, 2017 DBM report) were chosen as cases. They were the Pangasinan State University, the Nueva Ecija University of Science and Technology, and the Central Luzon State University.

Mixed methods of data collection were used in this study. Primary data on TQM/ISO 9001 implementation in the three state university cases were obtained through interviews, surveys, and field observations. Permission to conduct these data collection methods were sought from the university officials. These officials were asked to identify

the persons who can serve as interviewees or respondents (e.g., ISO Core Team members, Quality Circle members, or the officials and employees who were directly involved in the TQM/ISO 9001 implementation). The interviews and surveys were conducted with the use of a questionnaire. The checklist of the 20 ISO 9001 elements (Table 4) was used as a guide in constructing the questionnaire. Secondary data such as mission and vision statements and citizen's charters were also requested from the university officials.

Interviews and survey responses as well as field notes were encoded into a spreadsheet. Thereafter, descriptions and general themes were generated based on the reading of the qualitative data collected. These descriptions and general themes, in turn, were used in discussing the results of the study.

RESULTS AND DISCUSSION

Nueva Ecija University of Science and Technology

The Nueva Ecija University of Science and Technology (NEUST) originated from the Wright Institute in San Isidro, Nueva Ecija. The said institute offered vocational courses in woodwork and telegraphy from 1908 to 1928. The institute was renamed the Nueva Ecija Trade School in 1920, and transferred to Cabanatuan City in 1931. It was renamed the Central Luzon School of Arts and Trades in 1953 by virtue of Republic Act (RA) No. 845, and then Central Luzon Polytechnic College in 1964 by virtue of RA No. 3998. Finally, in 1998, it was renamed the Nueva Ecija University of Science and Technology by virtue of RA No. 8612 (NEUST, 2018). The main campus of the university is located in Sumacab, while the other five campuses are in General Tinio, San Isidro, Gabaldon, Atate, and Fort Magsaysay.

At the NEUST, two officials granted interviews and 11 people served as survey respondents. The two interviewees and nine of the 11 respondents are members of the TQM/ISO Core Team of the Extension Services Department and of the entire university, while the other two survey respondents are staff members of the said department. The interviews and surveys were conducted in July 2018.

The TQM/ISO 9001 program of NEUST was initiated by Dr. Rachel R. Moral. The TQM/ISO 9001 program of the NEUST was initiated

by Dr. Rachel R. Moralde, vice president for Research, Extension, and Training and formerly the Extension Services Department director. Her undergraduate, master's, and doctoral degrees are in community development, development communication, and rural development, respectively. She is considered by the study respondents as their TQM/ISO 9001 champion because she had written the operations manual for extension services long before University President Dr. Feliciano P. Jacoba ordered the adoption of TQM/ISO 9001 in her department.

The institution of NEUST's TQM/ISO 9001 program was ordered by Dr. Jacoba in 2015 to: 1) streamline the process of providing extension services to partner institutions such as LGUs and Catholic parishes, and 2) ensure the quality of their training, technical assistance, and consultancy services. Attainment of these objectives is a step closer to realizing the university's vision, mission, and core values.

The NEUST's vision is to become "a locally responsive and internationally relevant and recognized university of science and technology." Its mission is "to develop new knowledge and technologies and transform human resources into productive citizenry to bring about development impact to local and international communities." Its core values are nationalism, excellence, unity, spirituality, and transparency. The first letters of these values form the acronym of the university – NEUST. These vision and mission statements and core values are displayed on the walls of various offices and halls of the university.

According to the study respondents, their TQM/ISO 9001 implementation took six steps (Table 1) to complete and one year to acquire their ISO 9001:2015 certification from the W3 Solutionz Inc. Ltd. The certificate was issued on September 12, 2016, and it is valid for three years. The NEUST spent approximately PhP1 million to implement the program and get the certification (R. R. Moralde, personal communication, September 10, 2018).

The TQM/ISO implementation steps taken by the NEUST corresponded to Andres' phases of TQM implementation as well as the United Nation's implementation steps. Specifically, Step 1, commitment building among top university officials, corresponded to the first three TQM implementation phases (preparation, planning, and assessment) of Andres (1996). Meanwhile, Step 2, which refers to the capacity building of faculty and staff through briefings and trainings on TQM and ISO 9001, corresponded to Andres' implementation phase. They have not

Table 1. TQM/ISO 9001 implementation steps taken by the NEUST

STEP NO.	TASK
1	Commitment building among university officials (Board of Regents and Administrative Council)
2	Faculty and staff capacity building through briefings and trainings on TQM and ISO 9001
3	Preparation of forms and quality management system (QMS) manual
4	Use of forms and QMS manual
5	Conduct of internal and external audits
6	Receipt of ISO 9001:2015 certification from W3 Solutionz Inc. Ltd.

reached Andres' diversification phase yet because their TQM/ISO 9001 implementation was limited only to the Extension Services Department.

Likewise, their commitment building (Step 1) also corresponded to the steps on goals and expectations identification of the United Nations (2001). Their capacity building (Step 2) corresponded to the United Nations' step on the collection of information on ISO 9001. The preparation and use of forms and QMS manual (Steps 3 and 4) corresponded to the ISO 9001 application step of the United Nations. Finally, their conduct of internal and external audits (Step 5) and receipt of certification (Step 6) corresponded to the demonstrating conformance and independent audit and certification steps of the United Nations, respectively.

According to one of the two interviewees and nine survey respondents, utmost care was observed in the preparation and use of their QMS manual. Their QMS manual entitled "Extension Services Manual of Operations" was issued on November 22, 2016.

Aside from the manual, they also carefully designed and implemented forms for: 1) requesting extension services, 2) practical skills evaluation, 3) listing of trainees or participants, 4) terminal reporting, 5) conducting registration, 6) post activity reporting, 7) issuing certificate of appearance, 8) checking attendance, and 9) recording of an expert's profile.

For the two interviewees and 10 respondents, TQM is a holistic approach for improving the quality of services in the university. It

covers all teaching and non-teaching personnel. One survey respondent, however, did not really know what TQM means. He just knew that the acronym TQM stands for Total Quality Management.

Their concept of TQM as a holistic approach for improving service quality somewhat differs but is still consistent with Morgan and Murgatroyd's (1994) definition. For the said authors, TQM is a comprehensive management methodology for ensuring that jobs and processes are carried out correctly, first time and every time.

For the 11 respondents and one interviewee, meanwhile, ISO 9001 simply means an international QMS standard. It was Dr. Moralde – one of the two interviewees – who gave an ample explanation of ISO 9001. She said:

"ISO 9001 focuses on customer satisfaction. In our context, external customers are students and extension service beneficiaries. Internal customers, on the other hand, are the faculty and staff of the university. When implementing ISO 9001, all possible sources of complaints must be resolved. ISO 9001 is also a way to comply with all legal and statutory regulations affecting the operations of our department."

The said explanation dealt only with the NEUST Extension Services Department's contextualization and operationalization of ISO 9001. This study, however, considered ISO 9001 both as an international QMS standard and a quality assessment instrument. It was Löffler (2001) who classified ISO 9001, along with the Quality Excellence model and the citizen's charter, as a commonly used quality assessment instrument in the public sector.

Two interviewees and 11 respondents cited 1) top management commitment and 2) the understanding and internalization of all stakeholders of the university as the factors that positively affected their TQM/ISO 9001 implementation.

Besterfield et al. (2003) considered top or senior management commitment as one of the six key elements for TQM implementation in an organization. The other five were the presence of a TQM driver or champion; quality council; the role of middle managers or supervisors; communication; training; and customer, employee, and supplier surveys. Through site observations, this study found that the TQM/ISO 9001 program implementation of the NEUST's Extension Services Department

has the said six elements. Their TQM/ISO 9001 driver was Dr. Moralde. Their ISO Core Team members were the top two officials and the other nine officials and staff members of the Extension Services Department. The middle manager's role was performed primarily by Extension Services Director Marivic N. Villegas. The supervisory position was held by Consultancy Services Division Head Kenneth L. Armas.

They usually have face-to-face communication within their department. They communicate with the other departments of the university and their clients through electronic mails, letters, and memoranda. Their TQM/ISO 9001 trainings were provided by the consultant from W3 Solutionz Inc. Ltd.

They monitored the quality of their services by making their clients fill up a customer feedback form, and through the conduct of internal and external audits and management reviews. However, the study respondents did not provide data showing improvement in service quality from the time they implemented their TQM/ISO 9001 program in 2015.

Since 2015, they were able to benchmark with only one SUC – the Tarlac State University (TSU). The purpose of the said benchmarking activity was to compare their established processes with those of TSU and adopt some of TSU's best practices. Although ISO 9001 is an international QMS standard, they have not yet benchmarked with any other international QMS standard.

Respondents of the study identified lack of commitment and inability to adapt to change as the factors that negatively affected their TQM/ISO 9001 implementation. One of the two interviewees expounded:

"Some faculty and staff are neither receptive nor committed to the TQM/ISO 9001 implementation of the Extension Services Department. Some are also not adaptive to change. These things make TQM/ISO 9001 adoption difficult."

Despite the above hindrances, the respondents considered their TQM/ISO 9001 implementation successful. They attributed the success to the financial and human resources allocated by the university officials to the program. Funds for the program were appropriated yearly. These funds were augmented by LGUs and Catholic parishes that regularly availed of the NEUST's extension services. Most consistent among them is the Municipal Government of Bongabon (R. R. Moralde, personal

communication, July 2, 2018). From 2008 (seven years before its TQM/ISO 9001 adoption), the university has already been helping Bongabon in development planning, capability building, development of community associations, and management of community development.

Site observations at the Sumacab and General Tinio campuses of the NEUST showed that their TQM/ISO 9001 implementation was reinforced or complemented by their observance of the citizen's charter provisions. Their citizen's charter is posted on the wall nearest to the main gate or entrance of the school in compliance with the provisions of RA No. 9485, otherwise known as the Anti-Red Tape Act of 2007. Said law was superseded by RA No. 11032 or the Ease of Doing Business and Efficient Government Service Delivery Act of 2018. This finding indicates that citizen's charter implementation can contribute to the success of TQM/ISO 9001 implementation.

To ensure the continued success of their TQM/ISO 9001 program, one of the 11 respondents said that they would strictly monitor compliance with their established processes. They would also render further advocacy on the benefits of TQM/ISO 9001 in the hope that they can go beyond compliance and attain positive changes through its implementation.

Pangasinan State University

The Pangasinan State University (PSU) was established by virtue of Presidential Decree (PD) No. 1497 dated June 11, 1978. The PSU was formed by integrating the college-level courses of five educational institutions under the supervision of the then Department of Education Culture and Sports (DECS), and the programs of the Central Luzon Teachers College and the Western Pangasinan College of Agriculture. The five DECS-supervised institutions that became part of the PSU were the following: Asingan School of Arts and Trades, Eastern Pangasinan Agricultural College, Pangasinan College of Fisheries, Pangasinan School of Arts and Trades, and Speaker Eugenio Perez National Agricultural School (Pangasinan State University, 2018). The main campus of the PSU is located in Lingayen, while the other eight campuses are in Alaminos, Asingan, Bayambang, Binmaley, Infanta, San Carlos, Sta. Maria, and Urdaneta.

One official and three staff members of the Quality Assurance Office of the PSU Lingayen Campus granted interviews. In addition, at

least one person from the Office of the Campus Executive Director of each of the nine campuses of the university served as survey respondents. The interviews and surveys were conducted in September 2018.

The TQM/ISO 9001 program of the PSU was initiated by Dr. Dexter R. Buted. He holds a doctoral degree in business administration and is currently the University President. He is a former management executive of the Lyceum of the Philippines University (LPU) Batangas. He is considered by the study respondents as their TQM/ISO 9001 champion because he committed financial and human resources to the TQM/ISO 9001 program of the entire PSU System.

The PSU's TQM/ISO 9001 program started at the Lingayen campus in July 2016. The program's adoption was part of the implementation of their 5-year development plan. The objective of the program was to streamline the work processes in the said campus. Once the said objective is achieved, the university is expected to realize its vision, mission, and core values.

The PSU's vision is "to become an ASEAN premier state university in 2020." Its mission is "to develop highly principled, morally upright, innovative, and globally competent individuals capable of meeting the needs of industry, public service, and civil society." Its core values are as follows: accountability and transparency, credibility and integrity, competence and commitment to achieve, excellence in service delivery, social and environmental responsiveness, and spirituality. These core values are summarized by the acronym "access." These vision and mission statements and core values are displayed on the walls of various offices of the university.

According to the four interviewees and nine respondents, their TQM/ISO 9001 implementation took five steps to complete (Table 2). It took them only seven months to get their ISO 9001:2015 certification from the Anglo Japanese American (AJA) Registrars Ltd. The certification was issued on February 16, 2017 with a validity of three years. They spent around Php1 million to implement the program at the PSU Lingayen and to get the said campus ISO 9001:2015-certified. They spent Php300,000 more to cascade the program to the other eight campuses of the university and have them covered by the certification (E. M. Galas, personal communication, September 10, 2018).

The scope of their ISO 9001:2015 certification included the following: 1) tertiary education services in instruction, research,

Table 2. TQM/ISO 9001 implementation steps taken by the PSU

STEP NO.	TASK
1	Hiring of a consultant
2	Preparation
3	Implementation
4	Conduct of internal and external audits
5	Receipt of ISO 9001:2015 certification from AJA Registrars Ltd.

extension, and production; 2) university level management processes; 3) performance evaluation and improvement processes; and 4) campus support services.

Their steps 1 and 2 – hiring of a consultant and preparation – corresponded to the preparation, planning, and assessment phases of Andres (1996). Their steps 4 and 5, on the other hand, corresponded to Andres' implementation phase. According to the four interviewees and nine respondents, they had extended the program and certification to the other eight campuses of the PSU System. This implies that they followed Andres' diversification phase as well.

Likewise, their steps 1 and 2 corresponded to the first five ISO 9001 implementation steps of the United Nations (2001), namely: 1) identifying goals; 2) identifying expectations; 3) identifying core activities; 4) assessing current status; and 5) collecting information on ISO 9001. Their step 3, on the other hand, corresponded to the sixth and seventh steps of the United Nations, namely: applying ISO 9001 and demonstrating conformance, respectively. Their steps 4 and 5, meanwhile, corresponded to the United Nations' eighth step which is independent audit and certification or registration.

For all respondents, TQM pertains to the continuous improvement of processes. For them, ISO 9001 is a basic and integral part of TQM. One of the four interviewees, Quality Assurance Director Elbert M. Galas, explained further the difference between TQM and ISO 9001. He said:

“TQM is all about continuous improvement. ISO 9001 is a basic and an integral part of TQM. ISO 9001 is the initial step towards continuous improvement and covers the documentation of

all work processes. The next step is the attainment of quality excellence. That is why the PSU is now exerting efforts to qualify for the Philippine Quality Awards."

The four interviewees and nine respondents identified "the convincing power of University President Dexter R. Buted" and the funds he sought from the national government as the factors that positively affected their TQM/ISO 9001 implementation. Besterfield et al. (2003) referred to these factors as senior management commitment and/or the presence of a TQM driver. The latter is just one of Besterfield et al.'s six key elements of TQM implementation in an organization.

Site observations confirmed that the PSU's TQM/ISO 9001 program also possess Besterfield et al.'s other five key elements of TQM implementation, namely: quality council, role of middle managers or supervisors, communication, training, and surveys on internal and external customers.

Their quality council consists of the University President, the Vice President for Academic Affairs, the Vice President for Administration, the Vice President for Research and Extension, the Executive Directors of the nine campuses, the Quality Assurance Director, and the staff of the Quality Assurance Office. The middle manager or supervisor's role is performed by the Executive Directors of the nine campuses and the Quality Assurance Director.

Face-to-face communication is common within the same campus. Between and among the campuses of the PSU System, electronic mails, phone calls, text messaging, and memoranda are the usual modes of communication. The first training they had at the Lingayen campus on TQM/ISO 9001 was provided by the consultant from Rosehall Management Consultants, Inc. Subsequent trainings in the other eight campuses, meanwhile, were conducted by the Quality Assurance Office.

They were able to monitor and evaluate their performance through the conduct of internal quality audits and management reviews every end of the semester. Then, they drew and implemented action plans to correct nonconformities. Aside from internal audits and management reviews, they were also able to monitor and evaluate their performance by giving out and gathering customer feedback forms plus the conduct of external audits. The summary of the customer feedback forms, management reviews, and the audit reports, however, were not shown because these are controlled documents.

Four interviewees and six survey respondents claimed that the quality of their services improved from the time they implemented TQM/ISO 9001 in 2016. Among the tangible proofs presented are the following: 1) reduction of the time needed to complete the enrollment process from half a day to only 10 to 15 minutes per student; 2) inclusion in the list of top 10 performing SUCs of the Philippine Accrediting Association of Schools, Colleges, and Universities (PAASCU); 3) receipt of the Investors in People Award in 2017; and 4) increase in the number of institutions conducting benchmarking activities with the PSU from only two in 2015 and 2016 (before receipt of ISO 9001:2015 certification) to 25 in 2017 and 2018 (after receipt of ISO 9001:2015 certification).

In 2017, they benchmarked with the LPU Batangas because it had been ISO 9001-certified much earlier than the PSU. In 2017 and 2018, they also benchmarked with Vietnamese, Malaysian, and Thai universities.

Four interviewees and seven respondents identified culture, particularly, initial resistance, as a negative factor that affected TQM/ISO 9001 implementation. A staff of the Quality Assurance Office explained:

"When TQM/ISO 9001 was first implemented in our university, we resisted it because we knew it would entail a lot of work and adjustment on our part. Eventually, however, we have gotten used to it. I guess, we have internalized TQM/ISO 9001."

All respondents of the study considered their TQM/ISO 9001 implementation successful. They attributed the success to strong senior management commitment. They said that since 2016, the University President has not stopped committing funds and personnel to the program.

Site observations at the Lingayen campus showed that their TQM/ISO 9001 implementation is being reinforced or complemented by the compliance to their citizen's charter. Furthermore, this finding implies that citizen's charter implementation can contribute to the success of TQM/ISO 9001 implementation.

Central Luzon State University

The Central Luzon State University (CLSU) started on April 12, 1907 as a farm school named the Central Luzon Agricultural

School (CLSU, 2016). Farming methods, agricultural mechanics, and homemaking arts were taught in this farm school. On December 31, 1950, it reached college status and offered a four-year curriculum on vocational agriculture. Finally, by virtue of Republic Act No. 4067 dated June 18, 1964, it attained university status.

At the CLSU's Internal Quality Audit (IQA) Office, one official and one staff granted interviews. Four officials and 26 staff members, meanwhile, served as survey respondents. The interviews and surveys were held in October 2018.

The TQM/ISO 9001 program of CLSU was initiated in 2015 by University President Dr. Tereso A. Abella through the four vice presidents and the Internal Quality Audit (IQA) Team. Among the four vice presidents, it was Vice President for Administration Dr. Cheryl G. Ramos who did the ground work for the TQM/ISO 9001 program. Dr. Ramos obtained her BS in Biology degree from the University of Santo Tomas. She wanted to be a medical doctor but an illness prevented her from pursuing medical studies. Upon recovery from illness, she worked for the Human Resources Management Office of the Municipality of Sto. Domingo, Nueva Ecija. After a few years, she felt stagnation in her career and decided to transfer to the CLSU. At the CLSU, she has performed administrative, internal audit, planning, and teaching functions. She pursued Master's and PhD degrees in Management at the NEUST. She taught TQM to undergraduate students of the CLSU.

TQM/ISO 9001 was implemented at CLSU in order to continuously improve customer service and management, and comply with one of the requirements of the Commission on Higher Education (CHED). The requirement is to obtain ISO 9001 certification or to adopt an ISO-aligned QMS before the grant of the performance-based bonus (PBB), which is pursuant to the QPMC MC Nos. 2016-1 and 2017-1.

It was relatively easy for Dr. Abella and Dr. Ramos to convince their fellow top management officials and middle managers to adopt TQM/ISO 9001. They, however, had difficulty convincing the faculty and staff to support the program. The initial resistance from these people stemmed from their fear of the required changes in work processes. They associated TQM/ISO 9001 to a lot of adjustments and departure from their established work routines (C. G. Ramos, personal communication, October 9, 2018).

Through TQM/ISO 9001 implementation, CLSU hopes to realize its vision and fulfill its mission. Its vision is to become a world-class research university for science and technology in agriculture and allied fields. Its mission is two-fold: 1) to develop globally competitive, work-ready, socially responsible, and empowered human resources who value life-long learning; and 2) to generate, disseminate, and apply knowledge and technologies for poverty alleviation, environmental protection, and sustainable development. These vision and mission statements, together with quality policy statements, are posted on bulletin boards at the main entrance gate of the university campus and on the walls and flat screen monitor of the CLSU Administration Building.

According to the study-respondents, their TQM/ISO 9001 program took five steps to implement (Table 3), two years to get their ISO 9001:2008 certification, and another year to obtain their ISO 9001:2015 certification. They spent about PhP1 million for the program, PhP700,000 of which were paid to the consultant/trainer.

Step 1 or the creation of their QMS Core Team and IQA Office was part of Andres’ (1996) preparation, planning, and assessment phases of TQM implementation. On the other hand, steps 2-5 such as training of IQAs by the consultant/trainer from the AJA Registrars Ltd., conduct of internal and external audits, and receipt of ISO 9001 certification corresponded to Andres’ implementation phase.

Table 3. TQM/ISO 9001 implementation steps taken by CLSU

STEP NO.	TASK
1	Creation of a Quality Management System (QMS) Core Team and an Internal Quality Audit (IQA) Office
2	Training of internal quality auditors (IQAs) by a consultant/trainer from the Development Academy of the Philippines (DAP)
3	Conduct of internal audit by IQAs
4	Conduct of external audit by the auditors of the Anglo Japanese American (AJA) Registrars Ltd.
5	Receipt of ISO 9001:2008 certification on May 19, 2017 and ISO 9001:2015 certification on May 19, 2018 from the AJA Registrars Ltd.

Furthermore, the creation of their QMS Core Team and IQA Office was immediately followed by the setting of their vision, mission, and quality policy statements. The latter corresponded to the United Nations' (2001) ISO 9001 implementation steps 1-4 (identification of goals, expectations, and core activities, and the assessment of current status).

The conduct of training by the consultant/trainer from the Development Academy of the Philippines corresponded to step 5 of the United Nations (2001) – collecting information on ISO 9001. The conduct of internal and external audits as well as the receipt of ISO 9001 certification from the AJA Registrars Ltd, meanwhile, corresponded to United Nations' steps 6-9 – applying ISO 9001, demonstrating conformance, independent audit and certification, and continuous review and improvement.

For the two interviewees and 30 respondents from CLSU, TQM means "continuous and sustainable improvement of the QMS, which is based on customer feedback." This TQM definition slightly differs but is still consistent with Morgan and Murgatroyd's (1994) TQM concept of a "comprehensive management methodology for ensuring that jobs and processes are carried out correctly, first time and every time."

For the 32 participants from CLSU, ISO 9001 means "an international accreditation to elevate globally an organization's standard." In this study, however, ISO 9001 is both an international QMS standard and a quality assessment instrument.

Control of documents, standardized procedures, and assessment of risks were identified by the 32 CLSU participants as the factors that positively affected TQM/ISO 9001 implementation. All three factors are the function of middle managers or supervisors. This role of middle managers or supervisors, in turn, is one of the six key elements of TQM implementation which were identified by Besterfield et al. (2003). The other five elements are senior management commitment and/or the presence of a TQM driver; quality council; communication; training; and the conduct of customer, employee, and supplier surveys.

Site observations showed that CLSU also possesses the other five elements of TQM implementation. Senior management commitment is provided by the University President, Dr. Tereso A. Abella, as well as by Vice President for Research, Extension, and Training, Dr. Fe L. Porciuncula; Vice President for Academic Affairs, Dr. Melissa E. Agulto; Vice President for Business Affairs, Dr. Edgar A. Orden; and Vice President

for Administration, Dr. Cheryl G. Ramos. It was mentioned earlier that Dr. Ramos was responsible for much of the ground work for CLSU's TQM/ISO 9001 implementation. Because of her initiatives, she was considered by 31 participants as their TQM/ISO 9001 champion.

Communication among the members of the QMS Core Team and the IQA Office was mainly in written form disseminated through electronic mails and office memoranda. Training has been continuous. Every year, the IQA Office spent about PhP 45,000.00 on training (A. F. Domingo, personal communication, October 9, 2018). Service quality was monitored through the use of customer feedback forms and the conduct of internal and external audits and management reviews. Due to their confidential nature, the summary of the customer feedback forms, management reviews, and audit reports were not shown to this study's author.

The 32 CLSU study participants, meanwhile, identified 1) the enormous time and effort that the TQM/ISO 9001 program requires and 2) the lack of discipline among the staff as the factors that can negatively affect TQM/ISO 9001 implementation. They explained that the enormous time and effort devoted to TQM/ISO 9001 implementation may hinder the normal service functions of the university. They cited violation of ISO 9001 clauses by some offices as an example of lack of discipline.

The respondents consider their TQM/ISO 9001 program successful because of the support of top management and the IQAs who assessed the status of their implementation. All 32 respondents are internal customers of the university. They regularly avail of financial support for infrastructure development and job-related trainings and seminars. Because of the use of standards, which are contained in ISO 9001 clauses, the respondents perceived that their service quality has improved from the time they had implemented TQM/ISO 9001 in 2015.

The CLSU conducted benchmarking activities with local or national institutions such as the Philippine Carabao Center in Muñoz, Nueva Ecija and the Southern Luzon State University in Lucban, Quezon. It also benchmarked with universities in Southeast Asia.

During the visits to CLSU in October 2018, observations indicated that TQM/ISO 9001 implementation was reinforced or complemented by the implementation of the citizen's charter. The University Health Service, the University Library, and the Office of Admissions are just three of the offices that exhibited their citizen's charters prominently.

CONCLUSIONS AND RECOMMENDATIONS

In Northern and Central Luzon state universities, TQM/ISO 9001 programs were initiated by university presidents or vice presidents in order to streamline work processes and improve the quality of services. Implementation of the program involved the hiring of a consultant who also served as trainer; training; preparation and use of a QMS manual; conduct of internal and external audits; and receipt of ISO 9001 certification from an international body. These implementation steps generally corresponded to Andres' (1996) five phases of TQM implementation and the United Nations' (2001) nine steps of ISO 9001 implementation. TQM/ISO 9001 adoption was costly. They spent around PHP1 million to implement the program and get an ISO 9001 certification.

TQM is defined by the state university cases in Northern and Central Luzon as a holistic approach to the continuous improvement of work processes. The definition somewhat differs but is still consistent with Morgan and Murgatroyd's (1994) TQM definition which is "a comprehensive management methodology for ensuring that jobs and processes are carried out correctly, first time and every time."

ISO 9001, on the other hand, was conceptualized in the Northern and Central Luzon state universities either as an international QMS standard or a documentation of work processes. ISO 9001, however, is not only an international QMS standard. Just like the Quality Excellence model and the citizen's charter, it is also one of the three commonly used quality assessment instruments in the public sector (Löffler, 2001).

Among the six key elements for TQM implementation given by Besterfield et al. (2003), senior management commitment and/or the presence of a TQM driver was primarily identified as a factor that positively affected TQM/ISO 9001 implementation. Commitment of funds, employee understanding and internalization of TQM/ISO 9001, conduct of control procedures and risk assessment, and reinforcement or complementation by citizen's charter implementation were the other positive factors identified in the study. Among these additional positive factors, commitment of funds was identified as the most crucial. In the case of Northern and Central Luzon state universities, funds were appropriated for the program every year. National appropriations were augmented by LGUs, parishes, and other external customers of the universities.

Lack of commitment, inability to adapt to change, resistance, and lack of discipline among the staff were identified as the factors having negative effect on TQM/ISO 9001 implementation. All four factors are related to culture which supports Andres' (1996) assertion that Filipino cultural values have to be considered when implementing TQM/ISO 9001.

In Philippine local government units, the frequency and nature of leadership change was found by De Leon (2017a, 2017b, 2018) to be a significant factor affecting TQM/ISO 9001 implementation. The same could not be said about state universities in Northern and Central Luzon. This is because their TQM/ISO 9001 drivers – the university presidents and vice presidents – have much longer and more stable tenures of office than local chief executives.

Lack of commitment, inability to adapt to change, resistance, and lack of discipline among the staff were identified in this study as negative factors affecting TQM/ISO 9001 implementation; thus, university officials should work for the elimination of these adverse factors. For instance, they should implement programs that seek to minimize faculty and staff resistance to TQM/ISO 9001 and promote its adoption and/or internalization. The essence of these programs are as follows: 1) giving autonomy to quality circle members in identifying and solving their workplace problems; 2) encouraging them to express their concerns; 3) giving them the time they need to realize the value of their participation in TQM/ISO 9001 implementation; and 4) recognizing their efforts and contributions to their organizations. It has been proven by the Shizuoka Prefectural Government (2013) that giving awards or recognition is an effective tool in making employees internalize the concepts and the value of TQM/ISO 9001. ISO 9001:2008-certified LGUs (De Leon, 2017a, 2017b, 2018) have also shown that as long as autonomy, opportunity to express problems and concerns, time to realize the value of participation, and recognition are given to employees, they would go beyond compliance and begin to internalize TQM/ISO 9001.

Finally, state universities were found to be spending about a million pesos for TQM/ISO 9001 implementation and ISO 9001 certification. This huge cost can be reduced substantially if only Section 2 of EO No. 605 was enforced. The said executive issuance calls for the development of an institutional infrastructure that shall provide an internationally accredited certification. Hence, this study recommends the creation of a government certifying body that will serve as an alternative to the private certifying bodies. This government certifying

body would function well given the mandate and resources that it needs as demonstrated by the Philippine Quality Award (PQA) Program. The PQA Program was institutionalized through RA No. 9013 and has the Department of Trade and Industry and the Development Academy of the Philippines as its lead agencies (Philippine Quality Award, 2012). The PQA Program, however, caters to public and private organizations that use the Quality Excellence TQM Model. The government certifying body that this study is proposing would exclusively cater to organizations that have adopted the ISO family of standards.

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LITERATURE CITED

- Andres, T. Q. D. (1996). *Total quality management in the Philippine industrial setting*. Quezon City, Philippines: Giraffe Books, pp. 93-327.
- Asao, M. (1992). CWQC – Philosophy and implementation. In *Selected Papers and Proceedings, National Quality Fora, 1989-1992*. Manila: Philippine Society for Quality Control.
- Azanza, P. A. (2003). *Determinants of quality plan implementation in Maritime School Administration*. Quezon City, Philippines: College of Education, University of the Philippines Diliman.
- Bautista, V. A. (1998). *Research and public management*. Quezon City, Philippines: Office of Academic Support and Instructional Services, UP Open University. pp. 144-145.
- Besterfield, D. H., Besterfield-Michna, C., Besterfield, G. & Besterfield-Sacre, M. (2003). *Total quality management (3rd Edition)*. Columbus, Ohio and Upper Saddle River, New Jersey: Prentice Hall, pp. 32-34.
- Bank of the Philippine Islands. (1994). *Time and motion studies of OTP Batch No. 28 Trainees*. Makati City, Philippines: Training and Development Center, Bank of the Philippine Islands.

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- Borja, M. L. Z. (1993). *Management by Filipino values*. Makati City, Philippines: Ateneo Graduate School of Business.
- Botuyan, M. J. E. et al. (1993). *A Total Quality Management study at the University of the Philippines Institute for Small Scale Industries*. Quezon City, Philippines: Department of Industrial Engineering and Operations Research, College of Engineering, University of the Philippines Diliman.
- Calabon, U. C. (2000). *Service quality and client satisfaction in selected University Libraries in Metro Manila*. Quezon City, Philippines: Institute of Library Science, University of the Philippines Diliman.
- Carr, D. K. & Littman, I. D. (1990). *Excellence in government: Total Quality Management in the 1990s*. Arlington, VA: Coopers and Lybrand.
- CLSU. (2016). About the Central Luzon State University. Retrieved from <https://clsu.edu.ph/about/index.php> on 6 October 2018.
- Cohen, S. & Brand, R. (1993). *Total Quality Management in government: A practical guide for the real world*. San Francisco, California: Jossey-Bass Publishers.
- Constantino, V. M. (2004). *An evaluation of the impact of moving customer service online: The e-GSIS experience*. Quezon City, Philippines: Technology Management Center, University of the Philippines Diliman.
- Crosby, P. B. (1979). *Quality is free*. New York, US: McGraw-Hill.
- DBM. (2017). GQMC honors ISO-certified government organizations today. Retrieved from http://www.dbm.gov.ph/?page_id=22096 on 27 October 2017.
- De Guia, F. (2000). *Culture change: Key to organizational development*. Makati City, Philippines: Florence De Guia and Associates.
- De Leon, P. C. (2017a). Sustaining Total Quality Management (TQM) in the Philippine public sector: The cases of ISO 9001:2008-certified local government units. Quezon City, Philippines: Doctoral Dissertation, National College of Public Administration and Governance, University of the Philippines Diliman.
- De Leon, P. C. (2017b). Sustaining TQM in an ISO 9001:2008-certified Philippine LGU: The Case of Calapan City. *Journal of Management and Development Studies*, 6(1): 23-42.
- De Leon, P. C. (2018). Sustaining TQM in an ISO 9001:2008-certified Philippine local government unit: The case of San Fernando City, La Union. *The Antoninus Journal: A Multidisciplinary Journal of the UST Graduate School*, March 2018, 1-20.
- Deming, W. E. (1988). *Out of crisis*. Cambridge, United Kingdom: Cambridge University Press.

- Diamante, M. M. (2014). Organizational Culture. In M. R. M. Hechanova, M. Teng-Calleja, & V. C. Villaluz. (Eds.). *Understanding the Filipino Worker and Organization*. Quezon City, Philippines: Ateneo de Manila University Press.
- Department of the Interior and Local Government. (2011). Memorandum Circular No. 2011-95. Seal of Good Housekeeping for Local Governments, CY 2011 Implementation. Quezon City, Philippines: Department of the Interior and Local Government.
- Gemba Research. (2002). *The seven wastes of production*. Tokyo, Japan: Gemba Research.
- Gitlow, H. S., Oppenheim, A. J., Oppenheim, R., & Levine, D. M. (2005). *Quality management* (3rd ed). New York, United States: McGraw-Hill Co., Inc., p. 400.
- Gorji, A. M. H. & Farooque, J. A. (2011). A comparative study of total quality management of health care system in India and Iran. Retrieved from <http://www.biomedcentral.com> on 22 August 2015.
- Holzer, M. (1997). Productivity and quality management. In J. M. Shafritz & A. C. Hyde. *Classics of public administration* (4th ed). Fort Worth, Texas: Harcourt Brace College Publishers, pp. 558-566.
- Hrebiniak, L. G. (2013). *Making strategy work: Leading effective execution and change* (2nd ed). Upper Saddle, New Jersey: Pearson Education, Inc.
- Hunt, V. D. (1993). *Quality management for government: A guide to federal, state, and local implementation*. Milwaukee, Wisconsin: ASQC Quality Press.
- ISO. (2009). Environmental management: The ISO 14000 family of international standards. Geneva: ISO. Retrieved from www.iso.org and theiso14000family_2009 on 2 October 2015.
- Juran, J. M. (1988). *Juran on planning for quality*. New York: Free Press.
- Legaspi II, J. B. (2005). An Organizational Audit of Philippine Science High School Diliman Campus using the Baldrige Education Criteria for Performance Excellence. Quezon City: Technology Management Center, University of the Philippines.
- Löffler, E. (2001). Defining quality in public administration. Riga: NISPAcee Conference (May 10-13). Retrieved from <http://upan1.un.org> on 22 August 2015.
- Mangahas, J. V. & Leyesa, M. D. L. (1998). Improving government administration through TQM. In V. A. Bautista. *Introduction to public administration in the Philippines: A reader*. Quezon City, Philippines: National College of Public Administration and Governance, University of the Philippines Diliman.

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- Mariano, V. D. (1998). Total Quality Management and Philippine Local Government Units. In Bautista, V.A. et al. 2003. Introduction to Public Administration in the Philippines: A Reader. Quezon City: National College of Public Administration and Governance, University of the Philippines Diliman.
- Mirasol, R. M. (2004). Quality Matters: Creating a Culture of Quality. Manila: De La Salle University Press, Inc.
- Morgan, C. & Murgatroyd, S. (1994). *Total Quality Management in the Public Sector: An International Perspective*. Buckingham and Philadelphia: Open University Press, pp. 168-190.
- NEUST. (2018). Nueva Ecija University of Science and Technology Historical Background. Retrieved from <https://neust.edu.ph/index.php/administration/about-neust> on 3 July 2018.
- Office of the President of the Philippines. (2018). Republic Act No. 11032 or the Ease of Doing Business and Efficient Government Service Delivery Act of 2018. Manila: Malacañang Records Office, Office of the President of the Philippines (May 28).
- Pangasinan State University. (2018). History of the Pangasinan State University. Retrieved from <https://psu.edu.ph/history/> on 9 September 2018.
- Perez, E. V. (1992). Profitability and the cost of quality. In *Selected Papers and Proceedings, National Quality Fora, 1989-1992*. Manila, Philippines: Philippine Society for Quality Control.
- Philippine Quality Award. (2012). Philippine Quality Award brochure. Retrieved from <http://www.pqa.org.ph> on 31 August 2015.
- Prieto, M. L. J. (1993). *Management of TQM by Filipino values*. Makati City, Philippines: Ateneo Graduate School of Business.
- Shizuoka Prefectural Government. (2013). *One-for-one reform action*. Shizuoka City, Japan: Administrative Reform Division, Shizuoka Prefectural Government.
- Silva, J. A. L. (1993). *Management by Filipino values*. Makati City, Philippines: Ateneo Graduate School of Business.
- Swiss, J. E. (1992). Adapting Total Quality Management to government. *Public Administration Review*, 52(4): 356-362. Retrieved from <http://www.jstor.org> on 22 August 2015.
- Talavera, M. G. V. (2003). *Development and validation of TQM constructs: The Philippine experience*. Quezon City, Philippines: College of Business Administration, University of the Philippines Diliman.
- Talavera, M. G. V. (2004). *TQM adoption and firm performance: An empirical evaluation of selected Philippine companies*. Quezon City, Philippines: College of Business Administration, University of the Philippines Diliman.

- Talavera, M. G. V. (2005). *The TQM – Performance Link: An Exploratory Study of Selected Philippine Manufacturing Companies*. Quezon City, Philippines: College of Business Administration, University of the Philippines Diliman.
- Talavera, M. G. V. (2006). *The impact of TQM practices on the quality performance of selected Philippine manufacturing companies*. Quezon City, Philippines: College of Business Administration, University of the Philippines Diliman.
- United Nations. (2001). *Application of ISO 9000 Standards in Local Governments and Other Public Sector Organizations*. New York, United States: United Nations, pp. 34-39.
- Unson, M. R. (1992). Total Quality Management in the Philippines. In *Selected Papers and Proceedings, National Quality Fora, 1989-1992*. Manila, Philippines: Philippine Society for Quality Control.
- Valdea, M. R. E. (1993). Filipinizing a foreign management system. Makati City, Philippines: Ateneo Graduate School of Business.
- Zamora, E. A. (1993). Quality management in practice. *The Philippine Management Review*, 4(1): 21-31.

Decentralization, the Internal Revenue Allotment, and Shared Growth: An Examination of Correlations

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ABSTRACT. This is a macro study on the role of internal revenue allotments in decentralization to help the Philippines achieve shared growth. The research attempted to answer two interrelated development policy questions: 1) has the Philippines achieved shared growth; and 2) does the Internal Revenue Allotment (IRA) have the potential of contributing to shared growth? Patterns of correlation were distilled from available provincial as well as national data on average income, poverty incidence, income distribution, and IRA. Correlation analysis for the second question was supplemented with an analysis of the IRA formula. Results showed that growth in the Philippines has been more of the inclusive than the shared growth type. Moreover, research article tendered arguments against two criticisms of the IRA formula, thereby effectively revealing the potential of the IRA to contribute to shared growth. Recommendations were given for future research on crucial causalities, for example, among IRA, per capita income, population growth through internal migration, as well as the causalities underlying the dynamics among average income, poverty incidence, and income distribution.

Keywords: *inclusive growth, shared growth, internal revenue allotment, decentralization*

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INTRODUCTION

Decentralization has been the intrinsic policy of the Philippine government since the institution of the Local Government Code of 1991 or Republic Act 7160. One important component of decentralization is the internal revenue allotment (IRA), which is a transfer of share in revenues from the central national government to the local government units (LGUs).

While various studies on decentralization have been conducted in the Philippines, review of literature suggests that these were mostly case studies that focused on specific LGUs or government services.

This research sought to provide a macro study on the role of IRA in decentralization to help the Philippines achieve shared growth, which this study defines as growth in income accompanied by improvements in income distribution. It should be noted that the IRA came about because of decentralization. It is the share of LGUs from the national government revenues, as defined by a formula given in Section 284 of the Local Government Code of the Philippines¹. This study ascertained whether the IRA could be part of an incentive mechanism that affects the behavior of LGU decision-makers, irrespective of whether using the IRA as an incentive mechanism was the intention of the national government or not. The study examined whether the IRA could be considered as a performance-based transfer, where performance is defined as shared growth².

Essentially, the paper attempted to answer two questions: "Has the Philippines achieved shared growth," and "Does the IRA have the potential of contributing to shared growth?" These questions were raised in reviewing the country's decentralization policy³.

¹The IRA is such an intrinsic part of the fiscal autonomy of LGUs that even the Supreme Court had to rule against two Presidents, Fidel V. Ramos and Joseph E. Estrada, who ordered the withholding of the allocation of the IRA (Gatmaytan, 2001).

²The study is part of an on-going search for mechanisms that could contribute to shared growth. It is based on the premise that there is no single mechanism.

³The glaring need to review the LGC has been raised by Dr. Alex B. Brillantes, Jr., one of the resource speakers of the seminar on "Federalism: A Leap of Faith towards Community Development" held on 8 May 2018 at the College of Public Affairs and Development (CPAf), University of the Philippines Los Baños (UPLB) and former Department of the Interior and Local Government Secretary Rafael M. Alunan III as keynote speaker of CPAf's 1st International Conference on Governance and Development held on 20-21 November 2018 at the Acacia Hotel Manila, Alabang, Muntinlupa City, Philippines.

The Philippines is in critical stage of achieving shared growth, the term used by the World Bank in their 1993 East Asian Miracle report to describe the developmental experience of eight highly performing East Asian economies over a period of three decades after the war (The World Bank, 1993). Sadly, the Philippines was not one of the highly performing East Asian economies. Even if the report was updated today, it would still be hard to sell the Philippines as a case of shared growth. Its gross domestic product (GDP) per capita is now nearer to the Indo-China countries than to its cohorts in ASEAN specifically, Thailand, Indonesia, and Malaysia. It is also closer to the younger members of ASEAN than to the older members, indicating that the Philippine growth had been generally slower than its former cohorts Thailand, Indonesia, Malaysia, and Singapore (Table 1).

Table 1. GDP of ASEAN countries estimates as of 2018

COUNTRY	POPULATION IN MILLION	GDP NOMINAL MILLIONS OF USD	GDP NOMINAL PER CAPITA USD	GDP (PPP) MILLIONS OF USD	GDP (PPP) PER CAPITA USD
ASEAN	650.494	2,891,020	4,444	8,555,573	13,155
Indonesia	265.316	1,005,268	3,788	3,495,920	13,176
Thailand	69.182	490,120	7,084	1,323,209	19,126
Malaysia	32.446	347,290	10,703	999,835	30,815
Singapore	5.661	346,621	61,230	556,219	98,255
Philippines	107.018	331,678	3,099	956,030	8,933
Vietnam	94.575	241,434	2,552	707,620	7,482
Myanmar	52.832	71,543	1,354	359,107	6,797
Cambodia	16.253	24,141	1,485	70,265	4,323
Laos	6.777	18,230	2,690	53,912	7,955
Brunei	0.434	14,695	33,824	35,456	81,612

Source: International Monetary Fund (2018)

Table 2 shows the Philippine Gini coefficient compared to other ASEAN countries, which could be considered as the new set of cohorts of the Philippines.

Table 2. Gini coefficients for various East Asian countries

COUNTRY	RANK	DISTRIBUTION OF FAMILY INCOME - GINI INDEX	DATE OF INFORMATION
Philippines	44	44.4	2015 EST.
Cambodia	77	37.9	2008 EST
Laos	86	36.7	2008
Vietnam	98	34.8	2014

Source: Central Intelligence Agency (2018)

Decentralization Studies in the Philippines

Most studies of decentralization in the Philippines were micro studies focused on a specific region and/or a specific government service. One study undertook a regression analysis of survey data of numerous innovations introduced in various cities and municipalities from June 2004 to June 2008 (Capuno, 2011). Another study conducted in 2001-2003 in several selected LGUs in two Philippine provinces found that the knowledge of an index of local government performance had effects on the likelihood of being active in local activities (Capuno & Garcia, 2010). A case on the Mt. Pulag National Park found that decentralization enabled co-management but also rewarded strategic behavior that weakened collaboration (Pinel, 2009). A Metro Manila case study argued that decentralization was influenced by a variety of politically powerful social groups, including civil society organizations, local political families, and international and domestic businesses (Shatkin, 2000). Eaton (2001) showed how legislators in the Philippines attempted to reverse and then circumvent decentralization because it threatened their status as brokers for negotiating fiscal transfers from the central government. A case study in Palawan argued that decentralization may empower when upper-level policies and political networks matched with the concerns of organized institutions at the local level (Dressler, Kull, & Meredith, 2006). A study presented a case of two Philippine cities with different levels of participatory governance but having equally successful pro-poor policies (Ishii, 2007). Another study argued that provincial gubernatorial elections could be an effective mechanism for inducing provincial developmental financing under decentralization (Solon, Fabella, & Capuno, 2009).

A group of studies focused on the aspect of government services. One study investigated the relationship between decentralization and mineral resource conflict in Mindanao (Verbrügge, 2015). There was a study of the differences in human resource management policy arrangements between the central and local government from four case cities (Ishii, Rohitarachoon, & Hossain, 2013). A case in Marikina City studied local government performance (i.e., economic development services, administrative procedures, governance transparency, and social services) in relation to economic concentration with control variables (i.e., regional income, poverty levels, adult literacy, and population density) and confirmed that in three out of four controlled models, a quadratic relationship between economic concentration and government performance existed (Von Lubke, 2012). Davao City study focused on the decentralization of diabetes care (Pilleron et al., 2014). Case studies of the Pasig Green City Program and the Land and Housing Program in Las Piñas City in Metro Manila concluded that decentralization promoted democratization while strengthening ‘selectively’ traditional political élites and allied power bases in civil society and the business sector (Porio, 2012). One study revealed how decentralization has weakened local commitment to priority health issues and decreased the efficiency and effectiveness of service delivery (Lakshminarayanan, 2003). A case study in Tarlac argued that the province is well poised to take advantage of decentralization with its entrepreneurial leaders (Gomez & Buenaventura, 2012). Furtado (2001) “looked at how efforts to decentralize key social services had been detrimental to the delivery of health care in three moderately poor to very poor municipalities.” A case study on two cities, Cebu and Leyte, argued how “the emergence of different elite structures resulted in different path-dependent patterns of economic specialization” (Lange, 2010). Pulhin (2009) showed a paradoxical recentralization in the community-based forest management of Mindanao. These past researches showed the generally mixed results of decentralization studies.

Two studies on the IRA using a wide set of LGUs were reviewed. Manasan (2007) identified and discussed four issues: vertical imbalances leading to the inadequacy of the IRA to fund the devolved expenditure functions; lack of an equalizing feature because some LGUs have positive net transfers while others have negative (horizontal gap); lack of incentive to generate LGU taxes; and poor predictability of IRA making LGU planning very difficult (Manasan, 2007). Another study confirmed the possibility of a negative effect of the IRA on the LGUs, and that the IRA may have exacerbated the horizontal gap (Diana, 2008). In studying the relation between per capita and average family income,

the study also found a counter-equalizing effect across provinces: "IRA somehow increased the level of economic development of provinces during those years" (2002 -2005), where development was measured in the rise in taxable assessed value of properties. A third study on the IRA by Uchimura and Suzuki (2009) clarified the interlinkages among the four IRA issues cited by Manasan (2007), using the fiscal capacity of the LGUs. Unlike Manasan (2007) and this study, however, Uchimura and Suzuki (2009) focused on the differences in fiscal capacity among different types of LGUs, instead of comparing different provinces.

These studies on IRA cited previously proposed a reconsideration of the IRA formula. This paper, therefore, examined this proposal, particularly the issues of horizontal gap and tax generation⁴ in the context of a macro evaluation of decentralization and shared growth by looking at the current IRA formula. However, recommendation to change the IRA formula is left for future work where causalities will be examined.

Other studies on the IRA were considered to cast in sharper relief the focus of this current study. Uchimura and Suzuki (2009) clarified the interlinkages among the four IRA issues cited by Manasan (2007) using the fiscal capacity of the LGUs. Unlike Manasan (2007) and the current study, however, Uchimura and Suzuki (2009) focused on the differences in fiscal capacity among different types of LGUs instead of comparing different provinces. Canare (2016) looked at the relationship between IRA and LGU expenditure albeit at a city level. This current study focused on taxes in the provincial level. Martinez-Vazquez and Liu (2011) proposed a formula on the proposed 10-percent addition to the current IRA: the Local Government Enhancement Fund. The disbursement of this fund will depend ex-ante on the fiscal capacity, and ex-post on certain performance indicators. This current study focused on the existing IRA formula. In a project report commissioned by the Population Commission, Florano (2013) recommended further study on the role of IRA with respect to population and development, while reporting that there is disagreement on the need to changing the population weight in the IRA formula. This current study provides an assessment of the importance of population in the IRA formula.

⁴The Japan International Cooperation Agency (2009) also proposed several ways of redefining the IRA formula addressing both vertical and horizontal concerns.

Conceptual Framework

Decentralization, theoretically, can contribute to shared growth. It brings stronger incentives to grow at the local level because the effect of major policy decisions materialize right at one's backyard. With decentralization, local decision makers also have access to more local information, which ordinarily might be lost at the national level decision making. Such incentive and information can contribute to better policies and, hence, higher level of local development, which ordinarily translates to higher local income. Moreover, such income growth, by definition, occurs at points outside of traditional growth centers, when local decision-makers are also more sensitive to inequalities in income distribution among their constituents. This results in better income distribution among LGUs as well as within LGUs.

The two questions addressed by this paper are, therefore, interrelated. A negative answer to the first one indicates that decentralization has not achieved its full potential of contributing to shared growth. In which case, a review of an important component of decentralization, the IRA, would be necessary. Moreover, any evaluation of the IRA (the second question of this study) should be based on clear criteria, which in this study is shared growth (hence, the first question of this study). Clear criteria is needed prior to the evaluation. Answering the first question contributes to this clarification. In the next discussions, major criticisms of the IRA tend to be inconsistent with their criteria.

The distinction made between shared growth and inclusive growth was based on this author's question to the panel of ADB economists in the 14th Annual Global Development Conference held at the ADB Headquarters in Manila on June 2013 on "how different is the newer and current policy thrust of inclusive growth from the older (circa early 1990s) concept of shared growth?" The answer given was "shared growth referred to the equality of outcomes (e.g., income, wealth) while inclusive growth referred to the equality of opportunities."

The reply confirmed this author's suspicions that the two concepts of growth, while at first glance may appear similar, are in fact different. The definition of shared growth was consistent with that given in the East Asian Miracle report of The World Bank, which stressed growth accompanied by improvements in income distribution. The definition of inclusive growth would be the logically appropriate alternate. This is consistent with the Philippine government's thrust of growing the economy while reducing poverty.

METHODOLOGY

This study serves as a prelude to a more in-depth analysis of the IRA toward a macro evaluation of decentralization and shared growth. For this purpose, the analysis was limited to correlation to identify patterns that could propose answers to the two basic questions posed. Admittedly, the answers would not, at this juncture, be able to support any policy recommendation with regards to the IRA formula itself, but these answers would be very helpful in distilling patterns usable in an examination of causalities in future research, from which policy recommendations will be extracted. Sound policy recommendations are based on properly established causalities between proposed policy interventions and outcomes. Correlation is a necessary, but insufficient condition for establishing causality. Although limited, this study is an unavoidable first step in reaching sound policy recommendations. As such, this study could be considered more as inductive rather than deductive in approach. The focus, therefore, is more on theory creation or explanation rather than in theory testing or prediction.

Given this, the interest in this study is not to establish causality but to basically assess the strength of relationships, and correlation analysis is deemed here as an appropriate tool for analysis. The ability of this tool to identify statistically significant correlations from an ex-post perspective also makes it an appropriate tool.

Multivariate regression would be the main methodology of future research involving an analysis of causality. Such analysis is expected to go beyond simply including all possible explanatory variables. It will require the formulation of a theoretical framework that identifies possible instrumental variables. An inductive analysis such as the one carried out in this study is indispensable to the future analysis of causality.

Regression of y on x and controlling for an additional variable set z does not necessarily mean x causes y even with good statistical results because a proper screening of z is necessary to establish causality. A more nuanced regression analysis is generally required to establish causality, such as Propensity Score Matching, Regression Discontinuity Design, Difference-in-Differences, and Instrumental Variables⁵.

⁵For example, see Brewer and McEwan (2010) and de Janvry and Sadoulet (2015)

To answer the first question of this study on the achievement of shared growth in the country, correlation patterns, based on Pearson product-moment correlation coefficient, of available macro performance indicators on income per unit, poverty incidence, and income distribution on both national and provincial levels were looked into. Due to difficulties in acquiring the necessary data, the database of Kurita and Kurosaki (2011) was used to discern the patterns in the performance metrics. The database covered the years 1985, 1988, 1991, 1994, 1997, 2000, and 2003. These years were common to all of the 77 provinces covered in this study. The database included data on per capita household income, Gini coefficient, and poverty incidence for 77 provinces, which are all considered as acceptable measures for average income, income distribution, and poverty headcount, respectively.

For a broad coverage, four per unit income variables were selected: household expenditure (HHEXP); per capita expenditure (PCEXP); household income (HHINC); and per capita income (PCINC). For poverty incidence, the poverty gap index or the Foster-Greer-Thorbecke index of degree zero (FGT0) was used, which is defined as the ratio of the number of people living below the poverty line to the total population. Two measures of the Gini coefficient were also used: one based on household income (HI_GINI), and another on household expenditures (HE_GINI).

Table 3 tabulates the indicators of shared and inclusive growth. The four income indicators were used to measure growth, as higher income over time or province, for both shared and inclusive growth. Sharing in shared growth was measured by the two Gini coefficients, while inclusivity in inclusive growth was measured by the poverty gap index.

For the second question, correlation patterns in available data on IRA and poverty incidence on a provincial level were looked at. Having no provincial IRA and related data, the Kurita and Kurosaki database used in discerning the patterns of correlation analysis in the performance metrics could not be used for discerning the patterns of correlation between IRA and performance metrics. Instead, the countryside in figures database of the Philippine Statistics Authority for the IRA-Performance Metrics patterns of correlation was used. Data availability would vary from one statistic to another, but eventually the annual data from 2004 to 2012 for 78 provinces were considered. The resulting patterns were observed.

Table 3. Indicators for shared and inclusive growth

	SHARED GROWTH	INCLUSIVE GROWTH
Growth	Household expenditure (HHEXP)	Household expenditure (HHEXP)
	Per capita expenditure (PCEXP)	Per capita expenditure (PCEXP)
	Household income (HHINC)	Household income (HHINC)
	Per capita income (PCINC)	Per capita income (PCINC)
Sharing/ Inclusivity	Gini coefficient based on household income (HI_GINI)	Poverty gap index (a.k.a. Foster-Greer-Thorbecke index of degree zero)
	Gini coefficient based on household expenditures (HE_GINI)	

Source: Central Intelligence Agency (2018)

Analysis was augmented with an assessment of two criticisms of the IRA formula, that it: tends to widen the income gap between provinces (Criticism 1); and tends to increase dependency of provinces on the IRA as a source of revenue (Criticism 2).

Both criticisms of the IRA formula essentially reject the hypothesis that the IRA formula could contribute to shared growth. Criticism 1 states that there is no sharing of growth among the provinces, while Criticism 2 implies that the growing dependency on the central government effectively reduces incentives of the LGU for self-improvement.

Both criticisms appear to have inconsistent criteria. Criticism 1 uses the yardstick of equity, while Criticism 2 uses efficiency. Criticism 2 laments the possible lack of self-improvement efforts on the part of the provinces, but Criticism1 is wary of self-improving growth that leads to the possible widening of the gap among the provinces.

The research strategy was to assess the validity of these two criticisms. If such validity is found questionable, a case could be made for the opposite assertion that the IRA formula could contribute to shared growth. Casting doubt on the validity of Criticism 1 would imply validity of the opposite assertion that the IRA contributes to the sharing of growth among provinces. Casting doubt on the validity of Criticism 2 would imply validity of the opposite assertion that the IRA provides incentives for LGUs to actively promote their growth.

Representatives of the provincial heads of Laguna and Benguet were consulted. Since IRA is viewed as an incentive mechanism that could aid or obstruct decentralization, the exploratory analysis will indicate the correlations of IRA with the different measures of shared growth. Based on this indication, the author could tentatively consider any province, such as Laguna, as to whether the IRA could be associated with shared growth. This indication could then be cross-checked with the provincial leaders of Laguna.

Laguna was chosen due to its proximity to UPLB and budgetary constraints. Benguet was chosen as the other province, based on the pattern of correlation observed for provinces (Appendix 3).

RESULTS AND DISCUSSION

Has the Philippines achieved shared growth?

Using pooled and annual data, this study scrutinized the correlation of the provincial performance metrics for average income, poverty incidence, and income distribution; and found patterns (1, 2, and 3) in support of an inclusive type of growth vis-à-vis shared growth. Looking at the correlation of IRA and performance metrics (average income and poverty incidence), a positive correlation was found between IRA and average income (Pattern #4), but no significant correlation between IRA and poverty incidence (Pattern #5).

Patterns of Correlation in Provincial Performance Metrics

Pooled Data. The pooled data basically ignored differences across years and provinces, hence providing one long series of data for each variable. From Appendix 4a, the following patterns were observed in the performance indicators.

Pattern 1: No significant correlation between the levels of average income and the Gini coefficient. The absence of correlation was robust across the different definitions of average income and of Gini coefficient. It implies that higher levels of average income were associated with no significant changes in income distribution.

Pattern 2: A significantly negative correlation between the levels of average income and poverty incidence. This correlation was robust across the different definitions of average income. It implies that higher levels of average income were associated with significant reductions in poverty incidence.

Pattern 3: There was a weak positive to no correlation between levels of poverty incidence and the Gini coefficient. Poverty incidence had a positive correlation with the Gini coefficient based on household income, at 10 percent level of significance, but none between poverty incidence and the Gini coefficient based on household expenditure.

Data by Year. Except for 1997 and 2000 during the Ramos Administration, the correlation matrices for individual years with data (1985, 1988, 1991, 1994, and 2003) corroborated the patterns found in the pooled data. Appendix 4b shows that the average income indicators had a significant negative correlation with poverty incidence and the Gini coefficients for 1997. Similar patterns were indicated for 2000 as shown in Appendix 4c.

Patterns of Correlation Between IRA and Performance Metrics

Pattern 4: There was a significant positive correlation between IRA per capita and average annual family income. The coefficient of correlation between IRA per capita and the average annual family income was 0.22598699. For which, the computed t-statistic was 2.803127193. The two-tailed t-test yielded 0.005749055547, indicating that the coefficient of correlation was statistically significant at the 1-percent level. A total of 148 observations across years and provinces were used in the above computations.

Pattern 5: There was no significant correlation between the IRA per capita and poverty incidence. The coefficient of correlation between IRA per capita and the poverty incidence was -0.002133762042. For which, the computed t-statistic was -0.02595839469. The two-tailed t-test yielded 0.9793254916, indicating that the coefficient of correlation was not statistically significant even at the 10-percent level. A total of 150 observations across years and provinces were used in the above computations.

Patterns of Correlation in National Performance Metrics

To place the above provincial correlations to the national context, the correlation among the national performance metrics was also investigated: Gini coefficient (Gini); poverty incidence (PI); and real GDP per capita (RGDPPC). However, due to limited data, the correlations of IRA with the performance metrics were not investigated. As for the correlations among the national performance metrics, the study was limited to the following years, where data were available: 1985, 1988, 1991, 1994, 1997, 2000, 2003, 2006, 2009, 2012, and 2015.

The correlation matrix analysis in Appendix 4d essentially corroborated the findings at the provincial level. There was no significant correlation between real per capita GDP and the Gini coefficient while a significant negative correlation resulted between real per capita income and the poverty incidence.

Does IRA have the potential of contributing to shared growth?

Overall, Patterns 1 and 2 suggested that growth of per capita income was more of the inclusive type rather than the shared type. In short, provincial performance was more inclusive growth than shared growth. This type of growth was associated more with a reduction in poverty incidence but with no significant change in income distribution. The correlations for national performance metrics appeared to support Patterns 1 and 2, albeit on a real-basis only.

A reduction in poverty incidence is theoretically compatible with no change in the Gini coefficient. There could be fewer people in poverty with no improvement in the distribution of income. Theoretically, one way that this could happen is when the income of the upper income percentiles grow faster than that of the lower income percentiles. The correlation matrix analysis for the performance indicators revealed no significant correlation between poverty incidence and the Gini coefficient indicators.

The following section discusses the above correlation results in relation to the two criticisms of the IRA formula after presenting the definition of the current IRA formula.

Definition of IRA Formula

Figure 1 is a flowchart of the current IRA Formula. The IRA is 40 percent of the gross internal revenue of the national government on the third preceding fiscal year. This amount is vertically distributed among the LGUs as follows: 23 percent to provinces, 23 percent to cities, 34 percent to municipalities, and 20 percent to *barangays*. The amount each type of LGU has received is horizontally distributed among its components generally based on population, land area, and equal sharing. For provinces, cities, and municipalities:

- 1. 50 percent of the total amount allocated to their LGU type will be allocated to each of their respective components in proportion to their population;
- 2. 25 percent of the total amount allocated to their LGU type will be allocated to each of their respective components in proportion to their land area; and
- 3. the remaining 25 percent of the total amount allocated to their LGU type will be shared equally among their respective components.

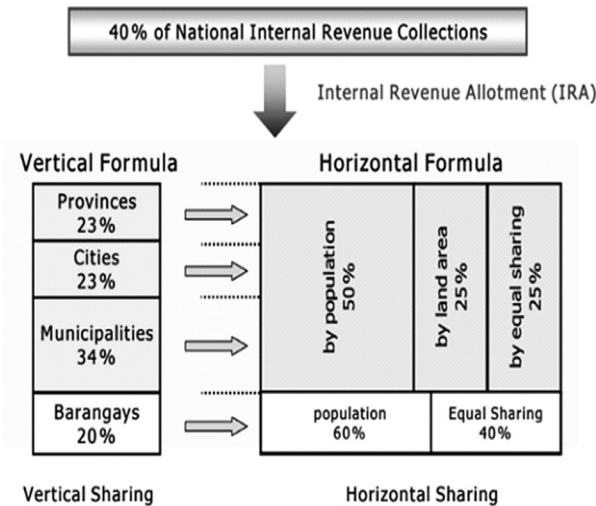


Figure 1. IRA Definition
(Adapted from JICA, 2009)

The horizontal distribution among *barangays* is based only on population and equal sharing:

1. 60 percent of the total amount allocated to *barangays* will be allocated to each *barangay* in proportion to its population; and
2. 40 percent of the total amount allocated to *barangays* will be shared equally among all *barangays*.

It could be noted, for all LGU types, population gets the biggest weight in the horizontal distribution.

Criticism 1 of the IRA Formula

The IRA is not horizontally equitable. This is based on the observation that IRA is correlated with income per capita. This observation is taken to imply that the IRA contributes to the widening of the gap among the provinces. Such a criticism was aired by Manasan (2007), p. 4:

“At the same time, when all LGUs are aggregated at the provincial level, their combined per capita IRA is found to be positively related to per capita household income in 1995–1999, suggesting that the IRA distribution formula has been counter-equalizing with respect to the fiscal capacities of LGUs.”

Criticism 1 is essentially founded on the observation that there is a positive correlation between IRA per capita and income per capita. It was confirmed that a similar correlation is present in the positive correlation between IRA per capita and average annual family income, on a provincial level.

This criticism has a problem and it seems to assume causality between the two variables. However, correlation does not necessarily establish causality. Correlation results do not distinguish between which variable is the cause and which is the effect. Neither does regression, bivariate or multivariate⁶. Manasan (2007) was not clear as to how the correlation gave light to these limitations of the regression analysis. Moreover, it is not obvious which kind of causality was being assumed.

⁶*Regression of y on x does not necessarily mean x causes y even though the regression results are significant, since regressing x on y will yield similarly significant regression results. Regression of y on x and controlling for an additional variable set z does not necessarily mean x causes y even with good statistical results, since a proper screening of z is necessary to establish causality (see De Janvry and Sadoulet (2015), for example).*

There are at least two relevant causalities:

Causality 1: higher IRA per capita causes higher income per capita

Causality 2: higher income per capita causes higher IRA per capita

Given the negative tone of the Criticism 1, it could be inferred that Causality 1 is being assumed, since it is compatible with the “rich-are-getting-richer” tone of the criticism. Causality 2 gives a more positive nuance, since it would imply that IRA allocation promotes income per capita growth. In fact, Causality 2 is compatible with a performance-based allocation of IRA, wherein higher income per capita is rewarded with higher IRA per capita.

Though establishing causality is not within the scope of this study, IRA formula can be examined to elaborate on the above causalities. Based on an inspection of the IRA formula, there are at least two possibilities where the positive correlation between income per capita and IRA per capita could occur.

Possibility 1 (Appendix 1):

- 1. IRA per capita would be negatively correlated with population through the IRA formula.
- 2. Population would be negatively correlated with income per capita, assuming a production function with population and land as inputs to production.

These two parts of Possibility 1 are illustrated in Figure 2 below:

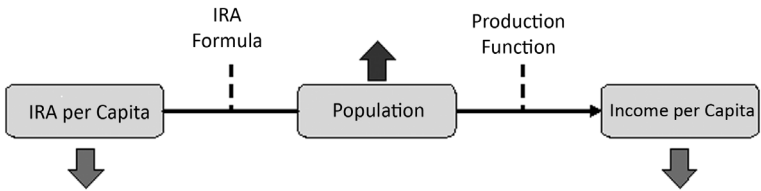


Figure 2. Possibility 1 where positive correlation between income per capita and IRA per capita could occur

An increase in population is associated with a decrease in both IRA per capita via the IRA formula, and income per capita via the production function. The arrowhead between population and income per capita indicates population causes income per capita, under the assumption that population is an input to production. The line between

IRA per capita and population does not have an arrowhead indicating no causality. This follows from the accounting identity underlying the relationship between IRA per capita and population.

Possibility 2 (Appendix 2):

1. IRA would be positively correlated with population through the IRA formula.
2. Population would be positively correlated with higher income through dynamics of an inter-province migration. Treating income per capita as a proxy for wage, a province with a higher income per capita induces immigration.

The two parts of Possibility 2 are illustrated in Figure 3 below.



Figure 3. Possibility 2 where positive correlation between income per capita and IRA per capita could occur

An increase in population is associated with an increase in IRA, via the IRA formula; and income, via the two-sector migration hypothesis. The arrowhead between population and income indicates that income causes population increase, as implied by an inter-province migration driven by higher income at the destination province.

While the two possibilities support the income-IRA positive correlation, it is Possibility 2 that is more compatible with a performance-based IRA allocation. The causality implied between population and income in Possibility 2 is very similar to Causality 2, wherein higher income per capita causes higher IRA per capita.

Some evidence that weakened the case for the existence of a Causality 1 was found. There were indications of unconditional beta-convergence in the average annual family income of the provinces, through an OLS estimation of the following relationship:

$$\%GR = \text{ALPHA} + \text{BETA} * \text{TZERO}$$

where:
%GR is the average growth rate of average annual family income (in pesos), over the period 2006 - 2012
ALPHA is a constant
BETA is the measure for beta convergence
TZERO is the average annual family income (in pesos) in the initial year in the period being studied, in this case 2006.

The following OLS estimates were obtained:

Table 4. Unconditional Beta convergence estimates (n=75)

MODEL	B	STD ERROR	t	SIG.
Alpha	0.30671647652	0.1008644329	3.040878412	0.00
Beta	-0.00000284022	0.00000068637	-4.138040881	0

The significantly negative sign of the beta estimate indicated unconditional beta convergence, wherein poorer provinces were growing faster than richer provinces, hence, suggesting convergence of average annual income per family among the provinces, as the poorer provinces drew nearer to the richer ones. As to whether this convergence was attributable or not to the IRA allocation, however, is beyond the scope of this study.

Criticism 2 of the IRA Formula

IRA weakens efforts of LGUs to generate their own revenues. This was also observed from the increasing dependence on IRA by the LGUs.

Manasan (2007, p.5) raised this criticism:
“While intergovernmental transfers had a neutral effect on local revenue performance in 1985 (prior to the [Local Government] Code), there is some evidence that the IRA tended to substitute for local tax revenues of provinces and cities in the post-Code period (1992–2000). The analysis suggests that LGUs which received higher IRA (whether in absolute terms or relative to their expenditure responsibilities) tended to be lax in their tax effort. Thus, the need to alter the IRA distribution formula emerges to provide incentives for local tax effort.”

Criticism 2 is largely based on the observation that LGUs have growing dependence on IRA as a source of revenue for expenditures. This criticism, however, borders on being misleading given the observed positive correlation between IRA and BIR provincial collections. This type of correlation was found from a correlation analysis of the two variables.

The coefficient of correlation between IRA and the BIR provincial was 0.9637379471. For which, the computed t-statistic was 46.1089043. The two-tailed t-test yielded 0.000000000, indicating that the coefficient of correlation was statistically significant at 1 percent level. A total of 165 observations across years and provinces were used in the above computations. In fact, Capuno (2001) found BIR collection to be elastic.

Referring again to the IRA formula, a plausible explanation was readily found for the positive correlation between IRA and BIR collection. An increase in population was accompanied by an increase in IRA allocation, based on the IRA formula. An increase in population could also be associated with an increase in BIR collections, due to an increase in the tax paying base. Both led to a positive correlation between IRA and BIR collection, due to changes in population.

Evaluation of IRA Formula Criticisms

The arguments presented are stacked against Criticism 1 and Criticism 2. A recent study (Balisacan, 2016) basically reached similar conclusions.

In sum, based on all the statistical tests performed in this study, the evidence appears to be in favor of the “stimulative effect”, rather than the “substitutive effect” hypothesis. It also appears that there is a statistically significant positive correlation between IRA and local income, such that an increase in IRA can be correlated with or associated to an increase in an LGU’s locally-generated income (Balisacan, 2016).

The failure of the correlation analysis to support Criticism 1 and Criticism 2 of the IRA formula led to the surprising but interesting conclusion that the IRA formula may be performance-based in terms of promoting growth of average annual family income and BIR collection, on a provincial level.

This conclusion is very remarkable considering that the IRA formula was not really meant to be performance-based. On the contrary, the IRA formula was primarily meant to support the devolution of government functions. The emphasis was more toward dividing the internal revenues as equally as possible among the LGUs. Anticipating, however, that implementation of devolved functions would be more difficult for LGUs with larger populations or land areas, the IRA formula explicitly included adjustments for these factors. It was quite unexpected then that the IRA appeared to be performance-based.

The crucial element in this startling conclusion appears to be the population. Below is the discussion on how population theoretically contributes to this conclusion.

Related to Criticism 1, population served as a mechanism for people to “vote with their feet” (Tiebout, 1956). People migrate toward provinces, which have higher average annual family income. Mobility of Filipinos is an important principle that promotes decentralization in the Philippines. It provides an incentive for the governance of LGUs to formulate and implement policies that would improve family incomes. The inability to do so risks emigration of a province’s constituents.

Referring to Criticism 2, population served as a mechanism for people to “vote with their pockets” through their taxes. This complemented the incentives for good governance arising from the voting-with-feet. This is particularly true in the case of local taxes, which are directly under the control of LGUs.

Benchmarking with the SGLG

The Seal of Good Local Governance (SGLG) discussion was included to add more depth to the preceding scrutiny on IRA, as well as to the key informant interviews.

Although much appreciated, the IRA was considered by both Laguna and Benguet cases as not being performance-based, and as such does little to really motivate developmental efforts in their provinces. This stems from the IRA formula itself which is not directly related to development efforts of the LGUs.

Laguna shared that the Supreme Court recently ruled the inclusion of customs collections in the internal revenue amount that is used to compute the 40 percent that forms the basic source of the IRA. Implementation of the ruling, however, is a different issue and will depend on the government's financial situation.

Benguet, on the other hand, looks keener on adjusting the land area and population components of the IRA formula. It raised the issue of discrepancies in the estimation of provincial population by the Philippine Statistics Authority, which forms the basis for the IRA computation and the BMPS estimates. The latter estimate was claimed to be larger. Benguet also pointed to the issue of including the disputed areas of the province in computing the IRA.

Laguna mentioned that to be fairer, the IRA should be based on a formula that is primarily determined by the LGUs. Benguet province bemoaned that the projects funded by the IRA lacked flexibility in terms of really addressing the developmental needs of the LGU. Laguna also proposed an SGLG-augmented IRA formula, wherein the LGUs that were awarded the SGLG would get a significantly larger IRA.

Both cases assessed the SGLG as generally fair but tended to come across as discretionary since the criteria seems to be changing. It started out as a 3+1 scheme, then became 4+1. Now, it is awarded to provinces if all the seven criteria are satisfied, and at least 10 percent of its municipalities are SGLG awardees. According to a DILG representative, the continuous raising of the bar was intentional to push the upgrading of LGU governance and enhance the motivational effects of the SGLG. Lesser number of awardees tended to increase the monetary incentive for the award.

Laguna placed more emphasis in the reduction of poverty incidence in line with the national thrust toward inclusive growth. Interestingly, Benguet gave more emphasis on reduction of the Gini coefficient. Improvement of the distribution of income was considered to contribute more to the entrepreneurial drive of the LGU.

CONCLUSIONS

Based on the statistical patterns, this study established that: 1) growth of per capita income in the provinces has been more of the inclusive rather than the shared variety; and 2) the IRA could potentially contribute to shared growth. Higher levels of per capita income was accompanied by reductions in poverty incidence with no significant change in the gap between the rich and the poor. Counter arguments to two major criticisms of the IRA were formulated.

The correlation analysis unearthed one surprising result. Unlike the SGLG, the IRA appeared at first glance as a government transfer device that was not performance-based. Interviews with the two LGUs generally confirmed this observation. The patterns of correlation, however, appeared to suggest a different story, wherein the IRA may be a potent force for development-driven decentralization through the principles of “voting with feet” and “voting with pockets”. Though LGUs are not fully aware, this possibility indicates the potential of using the IRA more effectively for local development. On a national level, policy should provide maximum mobility of people to allow them most fully to exercise their right to “vote with their feet”, as well as to ensure that the positive correlation between population, internal revenue collections, and IRA remains strongly positive.

The said two principles or rights should greatly contribute to the ability of decentralization to promote shared growth. Provincial LGUs are spurred to exert genuine efforts to develop. Doing otherwise would set off a chain of out-migration and reduced internal revenue collections that would eventually lead to getting lower IRA. However, development efforts should be keen in avoiding congestion that diminishes the efficiency gains. Perhaps even more important is that LGUs need to be more aware of such dynamics.

The previous analysis has been very useful in pointing out a few interesting causalities, which would be the subject of the next phase of this research. One is the causality between income per capita and the IRA, which is crucial in correctly assessing the IRA formula. Another is the causality between income per capita and in-migration leading to an increase in provincial population. Lastly, the causality among the three performance indicators, i.e., per capita income, poverty incidence, and income distribution, would be interesting to discern in order to understand the dynamics of these performance indicators. Inclusive

growth should be complemented with shared growth if the fight against poverty is to be sustainable.

Apart from pre-set assemblies, there are many other institutional settings in which these mayors have opportunities for various forms of interaction. Such occasions can serve as venues for activities, workshops, and other programs designed to educate mayors about the advantages of networking with peers and about the skills and approaches that help create strategic ties. Networks that can arise from these efforts are ones strategically formed for smoother exchange of information regarding current policy issues and initiatives as well as regional and national policy agenda.

RECOMMENDATIONS

Nearly three decades have passed since the institution of the Local Government Code, with the IRA as one of its major enabling components. The re-evaluation of the country's decentralization and IRA are long overdue. The criticisms of the IRA formula covered in this study contribute to such re-evaluation but suffer from the application of inconsistent criteria. The two criticisms combined appear to favor provincial level growth but frown on increasing inequity among provinces and worry about tax collection that ultimately moves up with the economic growth.

One recommendation that emerges from this study is to be clear on the criteria when evaluating the IRA. Reforms based on the IRA criticisms with inconsistently applied criteria would have inadvertently sterilized an effective mechanism that could contribute to the achievement of growth that the country badly needs.

Another recommendation is to use shared growth as criteria of assessment of the IRA and the bigger program of decentralization. There are at least two reasons for doing so. One is the close association between decentralization and shared growth, as discussed in this study. Indeed, decentralization could be considered as an overarching principle for shared growth. Another is that, one of the major causes of poverty in the Philippines is the "high and persistent levels of inequality (income and assets), which dampen the positive impacts of economic expansion" (Asian Development Bank, 2015, p. 2).

Even with the application of clear criteria, a re-evaluation of the IRA must also give light on the causal links among the relevant variables, such as that between the IRA and average income of provinces. This inductive study has suggested directions which will be pursued in future deductive research.

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APPENDICES

Appendix 1: Proof of POSSIBILITY 1

Part 1. Based on its qualitative definition, the IRA per province for a certain year "*t*" would be expressed by the following formula:

$$IRA_i = 0.23 * 0.40 * IR_{t-3} \left(0.50 \frac{POP_i}{POP_T} + 0.25 \frac{A_i}{A_T} + 0.25 \frac{1}{N} \right)$$

where:

IRA_i : IRA for province "*i*"

IR_{t-3} : (gross) internal revenue of the national government
in three fiscal years ago

POP_i : population of province "*i*" in year "*t*"

POP_T : total population for all the provinces in year "*t*"

A_i : land area of province "*i*"

A_T : total land area of all the provinces in year "*t*"

N : total number of provinces in year "*t*"

Assuming that the number of provinces is more or less stable, this formula can be simplified as follows:

$$IRA_i = k_1 \frac{POP_i}{POP_T} + A_i k_2 + k_3$$

where:

k_1, k_2, k_3 : constants

From this, the IRA per capita for each province is

$$\frac{IRA_i}{POP_i} = \frac{k_1}{POP_T} + \frac{A_i k_2}{POP_i} + \frac{k_3}{POP_i}$$

This proves the first part of Possibility 1, which states that IRA per capita would be negatively correlated with population through the IRA formula.

Part 2. Assuming a standard Cobb-Douglas production function, which includes land and population as inputs to production, Output can be expressed as follows:

$$Q_i = k_4 A_i^\alpha POP_i^\beta$$

where:

Q_i : output of province "i"

k_4, α, β : constants, and all other variables as defined before

Without loss of generality, α and β are assumed to be less than one. Moreover, at equilibrium, output is equal to income.

Hence, income per capita for province i could be expressed as:

$$\frac{Q_i}{POP_i} = k_4 A_i^\alpha POP_i^{\beta-1}$$

This proves the second part of Possibility 1 which states that population would be negatively correlated with income per capita, assuming a production function with population and land as inputs.

Appendix 2: Proof of Possibility 2

Part 1. From the proof of POSSIBILITY 1, it was found that

$$IRA_i = k_1 \frac{POP_i}{POP_T} + A_i k_2 + k_3$$

The sign of the partial derivative of the provincial IRA with respect to the population of province “*i*” is the same as that of

$$\frac{POP_{T-i}}{POP_T^2} > 0 \quad \text{for any population of province “}i\text{”}.$$

This proves the first part of Possibility 2, which states that IRA would be positively correlated with population through the IRA formula.

Part 2. Based on a two-sector migration model (Harris & Todaro, 1970), it is known that there will be migration from province 1 to province 2 when:

$$w_1 < E_2 w_2$$

where:

w_1 : average wage in province 1

w_2 : the average wage in province 2

E_2 : the employment rate in province 2

Assuming that wage could be proxied by income per capita, there will be migration from province 1 to province 2 for as long as the above inequality exists. Such migration causes the population of province 2 to grow.

Mathematically, this correlation could be expressed as follows:

$$\ln(POP_i) = k_5 + k_6 w_i$$

where:

k_5, k_6 : constants and the other variables are as defined above

This implies that

$$POP_i * [\ln(POP_i) - k_5] = k_6 Q_i$$

Hence, this proves the second part of Possibility 2, which states that an increase in population would be positively correlated with income per capita through an inter-province migration dynamics.

Appendix 3. Information Related to Case Studies

The Seal for Good Local Governance (SGLG) history and mechanics. As part of the Aquino's administration thrust to actively promote good governance among the LGUs, the Seal of Good Housekeeping (SGH) was introduced in 2010 by the late and former Department of the Interior and Local Government (DILG) Secretary Jesse Robredo. In the same year, the Performance Challenge Fund (PCF) was established as the monetary award to be given to LGUs that garnered the SGH. The PCF was to be used for local projects that were aligned with national priorities.

The basic requirements of the SGH include:

1. Absence of negative Commission of Audit (COA) findings on LGU financial statements;
2. Compliance to Full Disclosure Policy;
3. Compliance to Procurement Act; and
4. Anti-Red Tape Act Report Card Survey of Civil Service Commission.

The Seal for Good Local Governance (SGLG) was implemented in 2014, and has six basic areas of performance: financial administration, disaster preparedness, social protection, business friendliness and competitiveness, environment management, and peace and order.

Originally, in order to receive the SGLG, the LGU must pass the first three performance areas and at least one of the last three. In 2017, the DILG moved from this so-called 3+1 scheme to the 4+1 scheme, with the addition of tourism, culture, and the arts as one of the required performance areas.

In contrast to the vagueness in the IRA allotment, the awarding of the PCF is very clearly based on LGU performance as evidenced by the LGUs having been given a SGLG. Moreover, the SGLG has components that could be more explicitly linked, at least, to inclusive growth. One of the financial administration criteria tracks the implementation of the 20 percent development fund of the IRA. The social protection performance area introduces an emphasis on the marginalized of society. There is, however, no obvious link to the distribution of income, which is a main feature of shared growth.

Appendix 3a. Salient features of the case provinces

	2006	2009	2006	2009
Province	Benguet	Benguet	Laguna	Laguna
Average annual family income (PhP)	279,727	303,525	230,028	249,092
Average annual family expenditures (PhP)	213,878	235,220	202,323	227,155
Internal revenue allotment (PhP, million)	322.1	...	832.2	...
Internal revenue allotment per capita (PhP)	480.7	701.9	370.9	594
BIR revenue collection (PhP, million)	2,155.6	2,074	12,563.4	12,797.4
Poverty incidence of families	4	4.2	4.3	6.2

Selection of Case Studies. Benguet and Laguna were chosen as the two provinces for the case study. The two appear to be typical of the patterns observed in the correlation analysis.

- A higher average annual family income (as well as average annual family expenditure) is associated with a higher IRA per capita allotment and lower poverty incidence.
- A higher IRA allotment is associated with a higher BIR collection.

The difference between the two provinces is that Benguet consistently has a higher income per capita but consistently with lower IRA allotment. With respect to the SGLG, the two provinces exhibited differing performances. Benguet has municipalities that were consistent SGLG awardees from 2015 to 2018. Laguna municipalities, on the other hand, were consistent only for two of the four years.

Based on this selection, key informant interviews of both provinces were broadly undertaken on the following questions:

1. Assessment of the IRA
 - Do you think the IRA provides incentives for the development of your province? Why or why not?
 - Do you think the IRA is fair? Why or why not?
 - If you had the chance, what kind of revisions would you like to see in the IRA formula? Please explain.

2. Assessment of the SGLG
 - Could you provide us with the details of your SGLG scorecard for the past four years?
 - Do you think the IRA provides incentives for the development of your province?
 - Do you think the SGLG is fair?
3. SGLG Awardees. For the past four years of the SGLG, what was the greatest number of times that a municipality of your province has been awarded the SGLG?
 - Could you explain the factors leading to be a consistent SGLG awardee?
 - Could you explain the factors leading to being a less consistent SGLG awardee?
4. Which is more important to you, reduction of poverty or reduction of the Gini coefficient? Please explain.
5. Which is more important to you, growth with reduction of poverty or growth with reduction of the Gini coefficient? Please explain.

Appendix 4a. Correlation matrix for performance indicators (levels)

ALL	AVG	STD	HHEXP	PCEXP	HHINC	PCINC	FGT0	HI_GINI	HE_GINI
HHEXP	25625.20	9304.40	1.000	0.970***	0.979***	0.943***	-0.819***	-0.075*	-0.038
PCEXP	5584.40	2187.23		1.000	0.956***	0.979***	-0.838***	-0.026	0.003
HHINC	30641.35	11406.84			1.000	0.969***	-0.843***	-0.066	-0.045
PCINC	6736.18	2708.32				1.000	-0.854***	-0.017	-0.003
FGT0	0.43618	0.172					1.000	0.081*	0.037
HI_GINI	0.370	0.053						1.000	0.905***
HE_GINI	0.334	0.048							1.000

AVG : average, STD : Standard Deviation; *p < 0.10, **p < 0.05, ***p < 0.01; n = 538

Appendix 4b. Correlation matrix for performance indicators of 1997

1997	AVG	STD	HHEXP	PCEXP	HHINC	PCINC	FGT0	HI_GINI	HE_GINI
HHEXP	28531.45	10004.05	1.000	0.981***	0.985***	0.963***	-0.822***	-0.486***	-0.379***
PCEXP	6313.04	2324.40		1.000	0.968***	0.985***	-0.847***	-0.441***	-0.333***
HHINC	34486.91	12176.68			1.000	0.979***	-0.855***	-0.496***	-0.395***
PCINC	7703.35	2838.79				1.000	-0.877***	-0.447***	-0.345***
FGT0	0.3885	0.1680					1.000	0.459***	0.357***
HI_GINI	0.3894	0.0441						1.000	0.932***
HE_GINI	0.3425	0.0428							1.000

AVG : average, STD : Standard Deviation; *p < 0.10, **p < 0.05, ***p < 0.01; n = 77

Appendix 4c. Correlation matrix of performance indicators for 2000

2000	AVG	STD	HHEXP	PCEXP	HHINC	PCINC	FGT0	HI_GINI	HE_GINI
HHEXP	27365.45	9521.96	1.000	0.983***	0.990***	0.974***	-0.875***	-0.396***	-0.232**
PCEXP	6123.46	2338.27		1.000	0.975***	0.991***	-0.894***	-0.361***	-0.193*
HHINC	32710.83	11688.59			1.000	0.984***	-0.883***	-0.383***	-0.227**
PCINC	7382.75	2870.36				1.000	-0.900***	-0.353***	-0.193*
FGT0	0.41335	0.1705					1.000	0.276**	0.105
HI_GINI	0.38518	0.0484						1.000	0.944***
HE_GINI	0.33777	0.0471							1.000

AVG : average, STD : Standard Deviation; *p < 0.10, **p < 0.05, ***p < 0.01; n = 77

Appendix 4d. Correlation matrix of national performance indicators

	AVG	STD	GINI	PI	RGDPPC
Gini	42.3454546	1.62994702	1	0.277	-0.354
PI	32.7272727	7.98512253		1	0.8425***
RGDPPC	1771.53372	389.877849			1

AVG : average, STD : Standard Deviation, ***p < 0.01; n = 11

LITERATURE CITED

- Asian Development Bank. (2015). *Poverty in the Philippines: Causes, constraints and opportunities*. Mandaluyong City, Philippines: Asian Development Bank. p. 2.
- Balisacan, R. H. C. (2016). Exploratory analysis of the correlation between local income and internal revenue allotment: Focus on municipalities that converted to cities from 1994 to 2009. SSRN Electronic Journal. <https://doi.org/10.2139/ssrn.2794754>
- Brewer, D. J. & McEwan, P. J. (Eds.). (2010). *Economics of education*. Amsterdam: Elsevier.
- Canare, T. (2016). The relationship between IRA and local government expenditures: Evidence from a cross-section of Philippine cities. *Philippine Political Science Journal*. <https://doi.org/10.1080/01154451.2016.1236476>
- Capuno, J. J. (2011). Incumbents and innovations under decentralization: An empirical exploration of selected local governments in the Philippines. *Asian Journal of Political Science*, 19(1), 48-73.
- Capuno, J. J. & Garcia, M. M. (2010). Can information about local government performance induce civic participation? Evidence from the Philippines. *The Journal of Development Studies*, 46(4), 624-643.
- Capuno, J. M. (2001). Estimating the income elasticity of local government revenues and expenditures under decentralization. Quezon City, Philippines: University of the Philippines School of Economics.
- Central Intelligence Agency. (2018). *The CIA World Factbook 2018-2019*. Simon and Schuster.
- Diana, M. E. (2008). The impact of internal revenue allotment on Philippine provinces. *NTRC Tax Research Journal*, 26, 1-32.
- Dressler, W. H., Kull, C. A., & Meredith, T. C. (2006). The politics of decentralizing national parks management in the Philippines. *Political Geography*, 25(7), 789-816.
- Eaton, K. (2001). Political obstacles to decentralization: Evidence from Argentina and the Philippines. *Development & Change*, 32(1), 101-127.
- Florano, E. R. (2013) A study on the population factor in the internal revenue allotment's allocation and utilization for local Philippine population management. Retrieved from <http://www.ippapublicpolicy.org/file/paper/1435506484.pdf>. on 1 July 2019.
- Furtado, X. (2001). Decentralization and public health in the Philippines. *Development*, 44(1), 108-116.

- Gatmaytan, D. B. (2001). Cost and effect: The impact and irony of the internal revenue allotment. *Philippine Law Journal*, 75(4), 629-679.
- Gomez, J. E. A. & Buenaventura, K. V. (2012). Fields of gold: Empowering local officials to catalyze rural-to-urban development in Tarlac province, The Philippines. *Space and Polity*, 16(1), 29-47.
- Harris, J. R., & Todaro, M. P. (1970). Migration, unemployment and development: A two-sector analysis. *The American Economic Review*, 60(1), 126-142.
- International Monetary Fund. (2018). *World economic outlook, April 2018: Cyclical upswing, structural change*. Washington, DC: International Monetary Fund.
- Ishii, R. (2007). Participation in decentralized local governance: Two contrasting cases from the Philippines. *Public Organization Review*, 7(4), 359-373.
- Ishii, R., Rohitarachoon, P., & Hossain, F. (2013). HRM reform in decentralized local government: Empirical perspectives on recruitment and selection in the Philippines and Thailand. *Asian Journal of Political Science*, 21(3), 249-267.
- de Janvry, A. & Sadoulet, E. (2015). *Development economics: Theory and practice*. London: Routledge.
- Japan International Cooperation Agency (JICA). (2009). The study on the improvement of internal revenue allotment (IRA) system in the Republic of the Philippines. *Japan International Cooperation Agency*. p. 1.
- Kurita, K., & Kurosaki, T. (2011). Dynamics of growth, poverty, and inequality: A panel analysis of regional data from Thailand and the Philippines. *Asian Economic Journal*, 25(1), 3-33.
- Lakshminarayanan, R. (2003). Decentralization and its implications for reproductive health: The Philippine experience. *Reproductive Health Matters*, 11(21), 96-107.
- Lange, A. (2010). Elites in local development in the Philippines. *Development and Change*, 41(1), 53-76.
- Manasan, R. G. (2007). IRA design issues and challenges. *PIDS Policy Notes*, (2007-09), 1-8.
- Martinez-Vazquez, J., & Liu, Y. (2011). Philippines: Designing a local government enhancement fund. Southeast Asia Working Paper Series. Asian Development Bank. Retrieved from <https://www.adb.org/sites/default/files/publication/29146/philippines-designing-local-government-fund-0.pdf>. on 1 July 2019.

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- Pilleron, S., Pasquier, E., Boyoze-Nolasco, I., Villafuerte, J. J., Olchini, D., & Fontbonne, A. (2014). Participative decentralization of diabetes care in Davao City (Philippines) according to the Chronic Care Model: A program evaluation. *Diabetes Research and Clinical Practice*, 104(1), 189-195.
- Pinel, S. L. (2009). Collaborating to compete—The governance implications of stakeholder agendas at Mount Pulag National Park, The Philippines. *Planning Theory & Practice*, 10(1), 105-129.
- Porio, E. (2012). Decentralization, power, and networked governance practices in Metro Manila. *Space and Polity*, 16(1), 7-27.
- Pulhin, J. M. & Dressler, W. H. (2009). People, power, and timber: The politics of community-based forest management. *Journal of Environmental Management*, 91(1), 206-214.
- Shatkin, G. (2000). Obstacles to empowerment: Local politics and civil society in Metropolitan Manila, The Philippines. *Urban Studies*, 37(12), 2357-2375.
- Solon, J. O. C., Fabella, R. V., & Capuno, J. J. (2009). Is local development good politics? Local development expenditures and the re-election of governors in the Philippines in the 1990s. *Asian Journal of Political Science*, 17(3), 265-284.
- Tiebout, C. M. (1956). A pure theory of local expenditures. *The Journal of Political Economy*, 64(5), 416-424.
- The World Bank. (1993). The East Asian miracle: Economic growth and public policy, Summary. Washington, DC: The World Bank.
- Uchimura, H. & Suzuki, Y. (2009). Measuring fiscal decentralization in the Philippines. IDE Discussion Paper. Institute of Developing Economies - Japan External Trade Organization. Retrieved from <https://www.ide.go.jp/English/Publish/Download/Dp/209.html>. on 1 July 2019.
- Verbrügge, B. (2015). Decentralization, institutional ambiguity, and mineral resource conflict in Mindanao, Philippines. *World Development*, 67, 449-460.
- Von Lubke, C. (2012). Striking the right balance. Economic concentration and local government performance in Indonesia and the Philippines. *European Journal of East Asian Studies*, 11(1), 17-44.

Improvement in Self-assessed Knowledge and Changes in Farming System Practices of Climate Field School Graduates in Bicol, Philippines

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ABSTRACT. Rainfed lowland and upland farmers have less access to new technologies especially those that would reduce their vulnerability to climate change. In the Philippines, the Philippine Rice Research Institute developed a package of technology called “*Palayamanan*” that is suited to rainfed sites. This paper presents the results of the study that disseminated the *Palayamanan* technology through the climate field school (CFS) in rainfed areas in Bicol. Thirty-eight farmers from two *barangays* of Pamplona, Camarines Sur, and 78 farmers from three *barangays* of Milagros, Masbate were the respondents. A five-point scale was used to self-assess farmers’ knowledge on topics discussed in the CFS, which were divided into four major parts: climate science, rice production, vegetable and animal production, and pest and water management. Weighted means of the farmers’ self-assessed knowledge scores before and after the CFS were generated. The Mann-Whitney U method was used to test the significance of the differences in the pre-and post-test scores. The differences between pre- and post-test scores were highly significant (at 5% level), especially on the clustered topics of climate, land preparation and seedling establishment, soil nutrient management, pest management, and harvesting. Some farmer-

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cooperators shifted from traditional crop varieties to high-value crop, thus, changing their farming systems from subsistence to commercial. Farmer-graduates in Pamplona and Milagros have improved self-assessed knowledge and farm practices of some farmer-cooperators also changed, resulting in more advanced farm technologies being adopted in the area. The participants also engaged in new recreational activities such as backyard farming, which became a supplemental source of income. There is need to conduct similar study that investigates other factors or variables that could affect farmers' participation in the CFS. The CFS as a mode of extension delivery in rainfed areas is still in its infancy stage. More funds can be poured into the strengthening of the curriculum as well as capacitating the agricultural technicians to be competent resource persons.

Keywords: *Self-assessed knowledge, climate field school, Palayamanan, farming system, Bicol, Philippines*

INTRODUCTION

Studies in agriculture give evidence that knowledge plays an important role in productivity and innovation (Pontius, Dilts, & Bartlett 2002; Manoj, 2013). While students learn in conventional classroom setting, farmers acquire knowledge through practical application and skills. They are actualized from application and field experimentation (Scott, 1998 as cited in Stuiver, Leeuwis, & van der Ploeg, 2003). For farmers, acquiring knowledge is a continuous process of 'learning by doing' (Giddens, 1984 as cited in Stuiver, et al., 2003).

Agricultural knowledge has a great impact on farming activities, but these are not evenly distributed. In Mtega, Ngoepe, and Dube's study (2016), farming areas are classified as either information rich or information poor. For instance, the upland areas in the Philippines can be considered information poor because of technology and information accessibility problems. Literature on upland information transfer is also lacking. On the other hand, lowland areas are considered information rich because the participants have attended farmer forums and summit workshops.

While knowledge and practices could be acquired, Lwoga (2010) as cited in Mtega et al. (2016) described two kinds of knowledge

that farmers use: indigenous and exogenous. Indigenous knowledge and practices are traditional and local knowledge in agriculture that farmers apply. These are common activities practiced and passed down across generations. The other type of knowledge is exogenous, which could be acquired from farmer interactions and from different media channels. Farmer interactions could be from interpersonal communication with co-farmers or with people from the external environment. It could also be through other forms, channels, or sources of information such as television, radio, and formal schooling and training.

One of the ways to increase knowledge of farmers about climate change and the corresponding adaptation strategies is to conduct a climate field school (CFS). The CFS is a non-formal type of education wherein farmers attend schooling (once a week) in makeshift classrooms in their community for half a day.

The farmer field school (FFS) training programs were seen as effective strategies in raising farmers' knowledge (Rola, Jamias, & Quizon, 2002). The CFS is an offset training from the FFS with additional topics on climate change. CFS aims to lessen the vulnerability of agriculture to climate change by enhancing transfer of knowledge and information among farmers and farmer-groups. Through knowledge acquired from CFS, farmers become more able to adapt farming practices that minimize the impact of climate-related hazards on farming and improve yield and productivity. Winarto, Stigter, Anantasari, and Hidayah (2008) stated that the CFS curriculum teaches farmers to build up resilience in farming systems. Stigner et al. (2013) as cited in Leippert (2014) acknowledged that CFS could also change the behavior of participants in a non-directed, independent way.

Evaluating the knowledge gain of farmer graduates is important in assessing which topics are relevant to their farming practices and in determining farming systems suitable to their communities. Moreover, topics in the CFS curriculum and modules that need improvement can be identified. Application of climate information could also be improved through CFS (Boer, Tamkani, & Subbiah, 2003). While numerous studies on knowledge gain and changes in farming practices have been conducted, there is scant literature on the knowledge acquisition of farmers in upland and rain-fed areas in the Philippines, the locale of this study. Thus, this paper focuses on the self-assessed knowledge improvement of the CFS farmer graduates in Pamplona, Camarines Sur and in Milagros, Masbate, Philippines. The objectives of this paper are to measure the improvement in self-assessed knowledge in both sites;

compare this variable between Pamplona, a lowland rainfed community, and Milagros, an upland community; and document the changes in farming system practices of farmer-cooperators of the CFS in both sites.

Knowledge Improvement through Climate Field School

Climate field school. The climate field school (CFS) is one of the innovative channels for information sharing and transfer among experts and farmers. Understanding climate and its effect to agriculture is the main objective of the CFS. Adaptation measures related to farming activities were taught through lectures and technology demonstration (techno demo) farms. The curriculum adapted for CFS was designed for 18 sessions including activities such as field demonstrations, field day or learning trip, and graduation. Topics discussed were divided into four major parts, namely: climate science, rice production, vegetable and animal production, and pest and water management.

The CFS used the participatory approach in designing the curriculum by engaging the local officials during the curriculum development process. A general process flow of CFS in Figure 1 shows the relationship of the three stages of implementation in the study locales. In each of the study sites, a unique set of activities was implemented depending on local needs and aspirations.

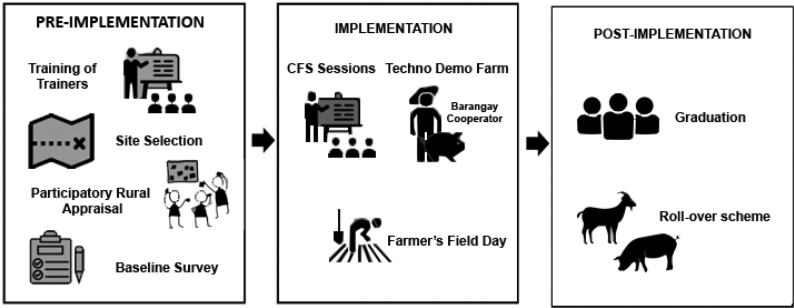
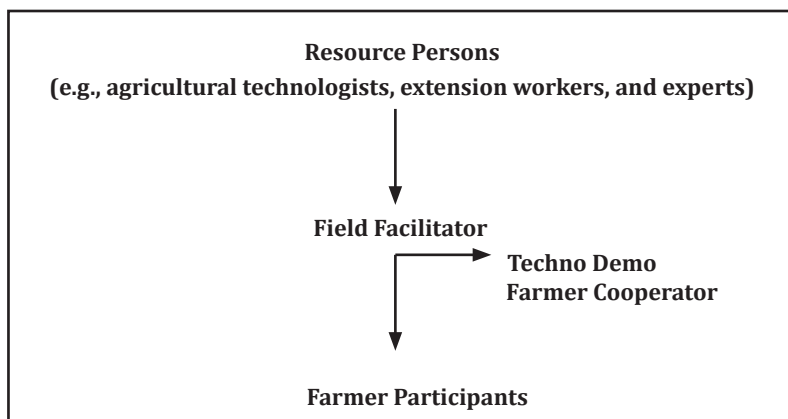


Figure 1. Process flow of the climate field school implemented in Camarines Sur and Masbate, Philippines



**Figure 2. Process of knowledge acquisition in the climate field school
(modified from Leippert, 2014)**

Agricultural extension services such as the FFS were seen as effective ways of conveying knowledge to farmers (Godtland, Sadoulet, Janvry, Murgai, & Ortiz, 2004). Extension services such as the CFS do not only transfer climate knowledge to farmers but also communicate information as an approach to bring about behavioral change toward climate change (Boer et al., 2003). Thus, the CFS curriculum derived from a participatory stance has location-specific activities.

Farmer participants in the CFS acquire knowledge by attending the lectures and engaging in practical demonstrations through the techno demo farms (Figure 2). Agricultural technicians, extension workers, and experts acted as resource persons and facilitators who deliver lectures and apply the lessons learned through actual demonstrations. Boer et al. (2003) stated that extension officers acted as mediators in translating and relaying climate knowledge and information into farmer language that participants can understand. Further, handouts were given and supplemental activities such as learning trips were included in the curriculum.

A farmer-cooperator, selected in each study area, acted as the farm manager of the techno demo plot and managed agricultural inputs provided by the project. This person also served as the leader of the farmer-participants during the CFS. The farmer-cooperator's duties also included reporting problems encountered in the techno demo farms and CFS sessions to the municipal technologists.

Effects of knowledge gain on farmers. Improvement of knowledge from agricultural extension efforts has affected farmer participants in numerous ways. There were self-improvement, enhanced farmer relations and interactions, and greater productivity. Agricultural extension services such as the FFS were seen as effective ways of conveying knowledge to farmers (Godtland et al., 2004). The field school has provided farmers the opportunity to interact with fellow farmers and extension workers. Moreover, it strengthened the farmers' decision-making skills and improved their analytical skills (Mancini, 2005 as cited in Manoj, 2013; Feder, Murgai, & Quizon, 2003).

Improvement of personal abilities and self-regard was also investigated as an effect of participating in agricultural extension activities. In Indonesia, a study reported positive effect on human capital. The farmers have developed positive self-regard, creativity, independence, and mutual collaboration (Braun, Jiggins, Röling, van den Berg, & Snijders, 2006). Duveskog, Friis-Hansen, and Taylor (2011) have also conducted a study on the impact of FFS on farmer's well-being. They said that the increased well-being of farmers has translated into innovation in their farming technologies. Farmers were empowered.

Changes in farming system practices. The study in Mindanao, Philippines showed that CFS small-scale farmer participants have exhibited an improvement in planning and farm management practices such as choice of crops, land preparation, and timing of planting and harvest. Other changes were adoption of organic farming, intensification of the rice system, and establishment of a community seed bank (Chandra, Dargusch, Mcnamara, Caspe, & Dalabajan, 2017).

Yamazaki and Resosudarmo (2008) also reported that FFS graduates have improved not only their farming practices but also their yield performance. Farmers who graduated from the field schools have significant improvement in knowledge and performance. New knowledge was obtained and changes in practice were observed such as a decrease in the use of pesticides. However, the headway was not upheld through the years, and the high performance has declined. The impact of FFS on farmers was seen to be short-lived.

The Palamayanan model. The *Palayamanan* model of diversified integrated rice-based farming system developed and established by the Philippine Rice Research Institute (PhilRice) is composed of synergistically compatible farming ventures (Corales et al.,

2005). PhilRice coined the word to encourage farmers to increase not only their rice yield, but more so their income. The term *palayamanan* is made up of two simple words: “*palay*” – the Filipino term for rice at any stage prior to husking; and “*yaman*” – a term which means wealth. The combined words mean that there is wealth not only in rice, but that rice can be combined with other high-value crops, livestock, and fish to generate more wealth. Rice is the major component of the system as it is the staple food of the Filipinos. Adding high valued vegetable crops, fishponds, poultry, and livestock on their farms increase income of the farming households and also assure continuous food supply for the family.

METHODOLOGY

The project conducted two season-long cycles of CFS in each province, which lasted for 3-4 months. For this paper, only the second-year implementation of the CFS (2016-2017) was used in analyzing self-assessed knowledge scores. The facilitation of CFS in the project sites was supervised by the local government units (LGUs) and partner state universities. Agricultural technologists from the LGUs and experts from the academe served as resource persons. The CFS was designed for 18 weeks with a curriculum patterned after the PhilRice’s *Palayamanan* system with the integration of topics on crop and animal production as discussed earlier. A techno demo farm, managed by farmer-cooperators, were established in the study *barangays*. Changes in the farming system practices of these farmer-cooperators observed during the two-year project implementation are further reported in the paper.

Primary data were obtained from a set of questionnaires administered to 38 rice farmers who were CFS graduates from two rainfed *barangays* of Batang and Tampadong in Pamplona and 78 farmers from the upland *barangays* of Matagbac, Sawmill, and San Carlos in Milagros. The pre- and post-test questionnaires were used to gather information on the farmers’ self-assessment of knowledge in the different topics discussed in CFS, and their evaluation of the CFS and the project itself. Additional information about knowledge gain and changes in farming practices of farmer-graduates were obtained from a baseline survey conducted before the CFS and from interviews with farmer-cooperators and agricultural technologists after the CFS. There were four farmer-cooperators in Pamplona, Camarines Sur and five in Milagros, Masbate interviewed.

The questionnaire used a scale in which self-assessed knowledge was measured using a 5-point rating, where 5 = excellent (*napakahusay*), 4 = very satisfactory (*mahusay*), 3 = satisfactory (*katamtaman*), 2 = poor (*mahina*), and 1 = very poor (*mahinang mahina*). Farmers' responses were encoded using the R software. The encoded responses related to knowledge self-assessment were clustered into eight main topics: 1) climate, 2) land preparation and seedling establishment, 3) soil nutrient management, 4) pest management, 5) water management and special topics, 6) organic agriculture, 7) animal production, and 8) harvesting and postharvest.

Data were analyzed by assigning weights to each rating in order to calculate the mean pre- and post-test scores.

Rating	Weight
5 (excellent)	0.4
4 (very good)	0.3
3 (good)	0.2
2 (poor)	0.1
1 (very poor)	0

The Mann-Whitney U test is a non-parametric test used for determining the mean of two different groups. This method was used in obtaining the mean scores of the knowledge level. To test the significance level of the difference between the pre- and post-test scores, t-test α values of 0.1 (10%) and 0.05 (5%) were set.

Description of the Study Sites

Lowland rainfed areas of Camarines Sur. In Camarines Sur, the poverty incidence registered at 27.1 percent, slightly lower than the regional level, but nonetheless, indicates a relatively high proportion of households that were unable to meet basic needs. Further, the proportion of households in Pamplona, Camarines Sur living below the poverty line was higher at 32.9 percent (Philippine Statistics Authority, 2014). This high figure translates to the fact that a considerable number of people, mostly in the rural areas, were finding it hard to meet their needs for daily subsistence.

In essence, the economy of Camarines Sur was mostly agriculture-based in which 29 of the 37 towns are agricultural. From

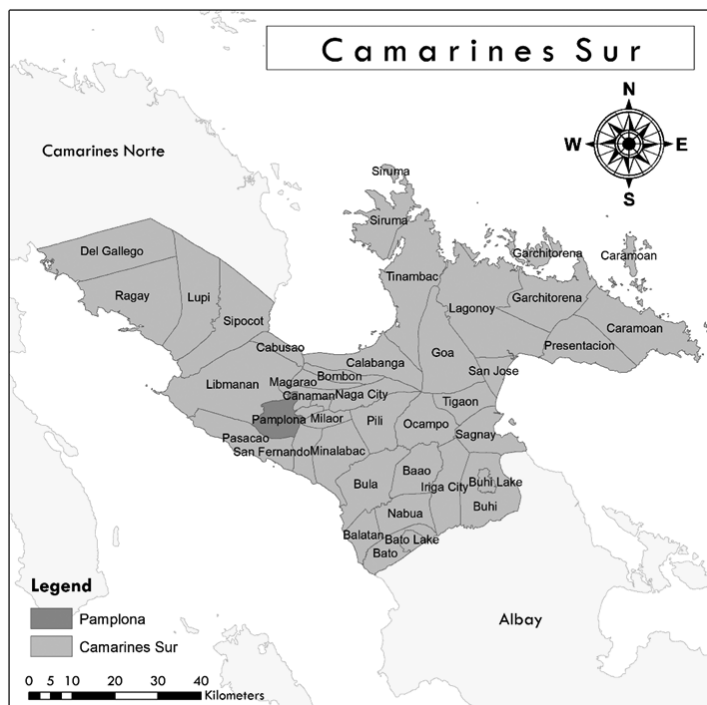


Figure 3. Map of Camarines Sur

2010 to 2013, coconut production was higher than rice production. This pattern was reversed from 2014 to 2016.

Coconut production declined beginning 2014, even if the area devoted to its production remained the same. On the other hand, increase in rice production was mainly due to the increase in area planted to rice. The area planted to rice rose from 316.8 thousand ha in 2010 to 351.1 thousand ha from 2010 to 2016.

The municipality of Pamplona in Camarines Sur (Figure 3) was chosen as one of the study sites due to the presence of rainfed farms in sloping areas and also due to high level of poverty incidence in the municipality. The *barangays* of Batang and Tampadong were lowland rainfed areas. Farming system in the two *barangays* was rice-vegetable-livestock. Rice was grown for two cropping seasons. Common vegetable crops were eggplant, okra, bitter melon, squash, and string beans. Livestock raised were for farm use and source of income such as carabao, duck, swine, and goat.

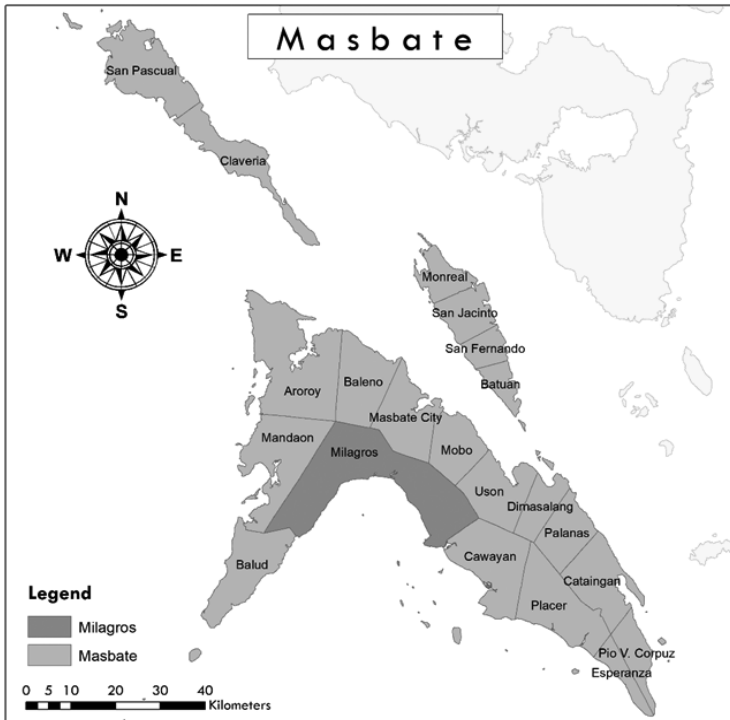


Figure 4. Map of Masbate

Upland areas of Masbate. The poverty incidence in Masbate registered at a relatively higher percentage of 40.6 percent. Looking further at the municipality of Milagros (Figure 4), the poverty incidence in 2012 was 49.6 percent - a figure that is almost half of the total population of the municipality. The high percentage of poverty incidence implies that a great percentage of the population in Milagros had income that is not enough to meet their daily needs.

Mono-cropping was the main farming system followed by respondents, and rice was the main crop. Yields were primarily allotted for consumption and were only sold if need arises or if there were excess to daily dietary needs. For the disposable income of the respondents, majority were sourced from livestock and poultry production. From 2006 to 2017, the rice production in the province was increasing. Production of rainfed rice in Masbate was relatively higher than that of irrigated rice. The average yield of a farmer, when converted to cash, however, was still below the poverty threshold.

Upland *barangays* of Matagbac, Sawmill, and San Carlos were chosen as location of the CFS. Some farmers in these *barangays* practiced rice-vegetable-livestock farming systems. Rice was the main commodity in the area and other crops such as cassava, corn, and sweet potato were also planted. Farmers also practiced vegetable production with crops such as squash, eggplant, mungbean, okra, and white squash. Farm animals and livestock raised were carabao, swine, and goat; while horses were used for transporting harvests to the lowlands.

RESULTS AND DISCUSSION

Socio-demographic Profile of CFS graduates

Above 50 percent of the respondents in both provinces were female. Mostly housewives, female farmers attended schooling more than male farmers who preferred working in their farms. Female farmers were also more patient in attending classes and listening to lectures. According to the farmer-cooperator in Sawmill, she purposely invited female farmers to participate in the CFS to engage them in a new recreational and productive activity rather than stay in their homes.

Farmer-graduates from Camarines Sur were relatively younger than those from Masbate. There were 12 high school student-participants (Grades 9 and 10) in CFS in Pamplona. These students were from the adjacent high school in *Barangay* Tampadong. The interested students joined the CFS sessions together with their adviser. They belonged to the 15-24 age bracket, comprising 26 percent of the total participants. The average age of farmer-graduates in Pamplona was 42 years. Meanwhile, 32 percent of the farmer-graduates in Milagros were in the 33-42 age range. Average age was 43.

Fifty percent of the participants in Camarines Sur reached high school, whereas most of the participants in Masbate had elementary level of schooling (38%).

The most common reason for joining the CFS was to have additional knowledge and information on farming. The farmers believed that their participation in the CFS can improve their productivity and income.

Table 1. Socio-demographic characteristics of farmer-graduates in Pamplona, Camarines Sur and in Milagros, Masbate, 2016

PARAMETER	PAMPLONA, CAMARINES SUR (n=38)		PARAMETER	MILAGROS, MASBATE (n=78)	
	No.	%		No.	%
Sex					
Male	13	34.2	Male	34	43.5
Female	25	65.8	Female	44	56.4
Age (years)					
15-24	10	26.3	23-32	16	20.6
25-34	3	7.9	33-42	25	32.0
35-44	5	13.1	43-52	15	19.2
45-54	6	15.8	53-62	20	25.6
55-64	10	26.3	63-72	2	2.6
65-74	4	10.6	Mean	43	
Mean	42				
Educational attainment					
Elementary level	16	42.1	Elementary level	30	38.4
High school level	19	50.0	High school level	27	34.6
College level	2	5.2	College level	19	24.3
Postgraduate (Master's) level	1	2.6	Vocational level	2	2.5

Agricultural Delivery System and Extension Services in Camarines Sur and Masbate

The municipal agriculture office (MAO), under the local government unit, is responsible for delivering agricultural programs and extension services in the area. The municipal agriculture officer and agricultural technicians are the leading implementers of the different banner programs of the Department Agriculture (DA). Table 2 shows a comparison of the access to agricultural information and delivery system of extension services in the study areas.

Milagros has a larger land area and a bigger farm size as compared with Pamplona. However, despite a bigger area for delivery system of extension services, Pamplona has more extension technicians

Table 2. Comparison of access to agricultural information and delivery system of extension services between Camarines Sur and Masbate, 2016

ITEM	PAMPLONA, CAMARINES SUR	MILAGROS, MASBATE
Land Area	80.60 km ²	565.3 km ²
Farm Area	4,682.72 ha	54,746 ha
No. of extension technicians	6	5
Ratio of farmer to technician	1:800 for rice banner program	1:1000
Distance from agricultural extension services (from Municipal Agriculture Office to <i>barangay</i> study sites)	Batang: 1.81 km Tampadong: 4.79 km Del Rosario: 2.43 km Tambo: 0.85 km Veneracion: 2.71 km	Bacolod: 2 km Cayabon: 2.7 km Tawad: 3 km Narangasan: 5 km Capaculan: 6.7 km Matagbac: 42 km Sawmill: 45 km San Carlos: 52 km
Existing agricultural program in the area	Department of Agriculture's banner programs: rice, corn, high value crops Other programs: Philippine Rice Information System, farm business school	Department of Agriculture's banner programs: rice, corn, vegetables, cassava
Availability of expert's advice	Experts from Central Bicol State University of Agriculture and DA-Regional Field Office V	Experts from Masbate Center for Livestock Development, Dr. Emilio B. Espinosa Sr. Memorial State College of Agriculture and Technology

than Milagros. One technician attends to 800 farmers in Pamplona, while the ratio of technician to farmer in Milagros is 1:1000. Pamplona has also more DA banner programs implemented than in Milagros.

Farmers in Pamplona have easier access to agricultural information and extension services because the chosen study sites were closer to the MAO. The closest *barangay* is only 0.85 km away while in Milagros, extension providers have to travel using motor vehicles (habal-habal) to the upland *barangays*. San Carlos, the farthest *barangay* among the study areas, is 52 km away from the MAO. Technicians do this just to reach the farmers to conduct trainings and to provide expert's advice. It was the belief that agricultural information and extension services like the CFS are effective methods in the knowledge improvement and change in practices of the farmers.

Results of CFS in Pamplona, Camarines Sur

Self-assessed knowledge improvement. A comparison of the self-assessed pre- and post-test scores of participants from Pamplona revealed that not a lot of rice farmers have prior knowledge about the CFS topics. This is despite long years of experience and the knowledge accumulated through farming practices over time. There were also farmer-graduates who have attended and participated in the FFS conducted earlier in the town. The average percentage for the pre-test was 36.3 percent, which was relatively low (Table 3).

A huge difference was observed in the farmers' scores after CFS participation. The farmers' post-test scores increased in almost all the clustered topics, especially land preparation and seedling establishment, and soil nutrient and pest management.

Using the Mann-Whitney U method, with the level of significance set at 5 percent, differences between pre- and post-test scores were tested. Results showed highly significant changes in scores related to climate ($U=144.0$, $p=.000$), pest management ($U=62.00$, $p=.001$), land preparation and seedling establishment ($U=49.00$, $p=.001$), soil nutrient management ($U=25.00$, $p=.008$), and water management ($U=16.0$, $p=0.029$) and animal production ($U=16.0$, $p=0.029$). This indicates farmers' self-assessed knowledge gains from these topics after participating in the CFS. Table 3 also shows that other main topics did not exhibit statistically significant changes in the percentage of test scores.

**Table 3. Comparison of pre-test and post-test of CFS graduates,
Pamplona, Camarines Sur, 2016**

CLUSTERED TOPIC	PRE-TEST SCORE (%)	POST-TEST SCORE (%)	MANN WHITNEY U	P VALUE
Climate	31.3	64.9	144.0	.000*
Land preparation and seedling establishment	44.9	72.0	49.0	.001*
Soil nutrient management	36.2	68.8	25.0	.008*
Pest management	39.8	66.7	62.0	.001*
Water management and special topics	31.8	63.1	16.0	.029*
Organic agriculture	35.7	63.7	9.0	.100 ns
Animal production	37.0	65.0	16.0	.029*
Harvesting and post-harvest	33.8	59.4	23.0	.32 ns
Mean	36.3	65.45		

*Significant if p value is <0.05 while not significant (ns) if p value is > 0.05

Farmer graduates have significant knowledge improvement on subtopics under climate change (i.e., its causes and impact on agriculture, climate of the Philippines, basic meteorology, climate forecast, and analysis of weather effects) mainly because of its relevance to the climate hazards that farmers saw in their area. During the second year of implementation of CFS in Camarines Sur, two strong typhoons have damaged agricultural crops. The increase in self-assessed knowledge could also be attributed to the farmers' exposure to different training programs and climate fora. Hence, CFS became some sort of a review of previously acquired knowledge. Also, the results revealed that farmers possessed technical knowledge in other topics such as pest and soil nutrient management. Traditional farming practices dealing with these topics were acquired through years of experience as majority of the participants were already into farming for more than five years. Practical application and field experimentation in the techno demo farms also contributed to the self-assessed knowledge gain. During interviews,

farmers claimed that through the CFS, they have significant learnings on proper application, use, and handling of fertilizers.

Changes in farming system practices. Farmers are expected to adapt farming activities to changes in climate. Changes in farming practice such as choosing what crop and variety to plant, deciding what cultural measures to apply, and managing soil, water, and other resources were also observed (Winarto et al., 2008). Farming has been a practice in the study areas for a long time. Majority of the families in the community came from generations of farmers. Based on interviews conducted among *barangay* cooperators from the two provinces, farmers relied mainly on rice before the project. They described their farming activity as simple because they only knew about planting of rice and a few vegetables. With the project intervention, cooperators said farmers were encouraged to seek new opportunities to try new varieties of rice as well as deal with such commodities as high-value vegetables and livestock (Table 4).

Table 4. Changes in farming system practices of farmer-cooperators in Pamplona, Camarines Sur

YEAR	PARAMETER		No. (n=4)	%
	From existing practice	To change in practice		
1	Farming practice of planting rice, corn, and traditional vegetable varieties (e.g., okra, <i>ampalaya</i> or bitter gourd, squash, eggplant)	Farming practice of planting rice, corn, and high-value crops/vegetables (e.g., carrot, baguio beans, broccoli, cabbage)	2	50
2	Farming practice of planting rice, corn, and traditional vegetable varieties (e.g., okra, <i>ampalaya</i> , squash, eggplant)	Farming practice of planting rice, corn, and high-value crops/vegetables (e.g., carrot, baguio beans, broccoli, cabbage)	2	50
	Farming system of rice-vegetables	Shift to diversified cropping system of rice + vegetables + livestock	2	50
	Rice farming as sole activity for source of income	Additional source of income (e.g., livestock raising, vegetable production) and activity (e.g., backyard farming)	1	25

Others also claimed that they practiced what they learned from the CFS in their backyard gardens, and this has become a productive pastime. The cooperators enjoyed picking vegetables from their gardens instead of buying them from the market.

Results of CFS in Milagros, Masbate

Self-assessed knowledge improvement. Farmer graduates in Milagros did not know much about climate, land preparation, and seedling establishment before participating in CFS. Table 5 shows that the average pre-test score was 29.3 percent, which was lower than in Pamplona with 36 percent. The highest pre-test scores were seen in traditional farming activities and practices under the clustered topics of land preparation and seedling establishment (33.2%). The average post-test score was 71.2 percent.

Table 5. Comparison of pre-test and post-test of CFS graduates in Milagros, Masbate, 2016

CLUSTERED TOPIC	PRE-TEST SCORE (%)	POST-TEST SCORE (%)	MANN- WHITNEY U	P VALUE
Climate	46.7	68.1	121.0	.000*
Land preparation and seedling establishment	33.2	75.8	49.00	.001*
Soil nutrient management	26.4	71.9	25.00	.008*
Pest management	25.4	71.1	64.00	.000*
Water management and special topics	24.8	71.6	9.00	.100 ns
Organic agriculture	29.3	69.3	9.00	.100 ns
Animal production	25.4	69.3	16.00	.029*
Harvesting and postharvest	23.8	73.2	25.00	.008*
Mean	29.3	71.2		

*Significant if p value <0.05 while not significant (ns) if p value > 0.05

The knowledge scores showed improvement in the topics of land preparation and seedling establishment, harvesting and postharvest, soil nutrient management, and water management. The differences between pre-and post-test scores were tested at the 5 percent level of significance. Results showed that main topics on climate ($U=121.00$, $p=.000$) land preparation and seedling establishment, ($U=49.00$, $p=.001$), soil nutrient management, ($U=25.00$, $p=.008$), pest management ($U=64.00$, $p=.000$), animal production ($U=16.00$, $p=.029$), and harvesting and postharvest ($U=25.00$, $p=.008$) were significantly different.

The increase in self-assessed knowledge about climate was relevant in the area because climate hazards such as droughts and dry spells were experienced in the project sites. There were delays in the onset of rains and has affected the agricultural activities of the farmers. In the case of Milagros, topics on harvesting and postharvest showed statistically significant results. The subtopics under this cluster are proper harvesting of vegetables, postharvest handling of vegetables, roguing, harvest and postharvest technologies for rice, and yield assessment. Knowledge was obtained from the field demonstrations.

Masbate is known for cattle raising; hence, farmers here already have a high level of knowledge on animal production. Nevertheless, the differences in pre- and post-test scores still showed improved self-assessed knowledge in animal production. In terms of water management, farmers demonstrated poor knowledge on the topic because of the lack of irrigation in the area. Only a small portion of Matagbac has irrigation while the upland communities of Sawmill and San Carlos were purely rainfed. As to topics on organic agriculture, the test scores did not exhibit statistically significant differences because the farmers in Milagros prefer to use synthetic fertilizers.

In a study conducted by Mtega et al. (2016), the factors that inhibited access to agricultural knowledge among rice farmers in Tanzania included the following: limited number of demonstration plots, late delivery of information services, limited number of agricultural extension agents, and poor information and communication technologies. These same factors were also observed in Milagros, Masbate, which could have contributed to the low pre-test scores of the farmer-graduates.

Farmer-graduates in the upland areas of Milagros were very appreciative of and receptive toward the project. The positive attitude of the farmers also contributed to the high knowledge gain as reflected by their post-test scores.

Changes in farming system practices. Changes in farming techniques by farmer-cooperators were observed in Milagros. According to one agricultural technologist and *barangay* cooperator, the introduction of *Palayamanan* in the area has changed some traditional practices of the farmers. One of the cooperators described the project as being “high-tech,” or more advanced than the other technologies practiced in their communities.

Farmers said that they are now very conscious of the importance of following the proper procedures and techniques in farming. The examples given were the proper propagation of *ampalaya* (bitter gourd), proper application of fertilizers using the prescribed amount, and following plot measurements in crop planting (Table 6). Another change in practice lessened the number of days devoted to land preparation because farmers now follow a prescribed schedule. A cooperator also reported trying a new rice variety, and has planted that same variety for the duration of the project. Aside from these, farming activities leveled up because farmers are now able to plant high-value crops aside from the usual varieties of *pinakbet* (a native dish that is a mixture of vegetables such as beans, squash, okra, and *ampalaya*). They have become more knowledgeable about animal production and breeding, thus opening more opportunities for potential income earning activities.

According to one farmer-cooperator, farmers’ habits, hobbies, and activities also changed. Before, the farmers were into gambling. When the CFS sessions started, their gambling activities were reduced, according to a community member.

Comparative Analysis Between Masbate and Camarines Sur Farmer’s Self-assessed Knowledge Improvement

Comparing the knowledge improvement of farmer-graduates from both municipalities validates that lowland rain-fed areas are more information rich than those in upland municipalities. Information-rich areas have smaller value addition since they have more and easier access to agricultural information and extension system. On the other hand, upland areas are considered information poor because of challenges in delivery system of extension services and inadequate channels of information dissemination.

Table 6. Changes in farming system practices of farmer-cooperators in Milagros, Masbate

YEAR	PARAMETER		No. (n=5)	%
	From existing practice	To change in practice		
1	Farming practice of planting rice, corn, and traditional vegetable varieties (e.g., okra, <i>ampalaya</i> or bitter gourd, squash, eggplant)	Farming practice of planting rice, corn, and high-value crops/vegetables (e.g., carrot, baguio beans, broccoli, cabbage)	2	40
2	Farming practice of planting rice, corn, and traditional vegetable varieties (e.g., okra, <i>ampalaya</i> , squash, eggplant)	Farming practice of planting rice, corn, and high-value crops/vegetables (e.g., carrot, baguio beans, broccoli, cabbage)	3	60
	Farming system of rice-vegetables	Shift to diversified cropping system of rice + vegetables + livestock	3	60
	Land preparation practices only include cleaning and planting in the farm	Lessen number of days for land preparation and more systematic planting techniques	1	20
	Use of fertilizers as a crop management	Proper application of fertilizers following the prescribed amount	2	40
	Traditional propagation of bitter gourd	Propagation of bitter gourd using <i>ampalaya</i> net technology and proper trimming of leaves	2	40
	Farmers are into vices such as gambling	Acquired new activity such as backyard farming	1	20

For both provinces, the self-assessed knowledge improvement of farmer-graduates varied, depending on the component, but there were similarities in terms of significant changes in the pre- and post-test scores, specifically on the topics of climate, land preparation and seedling establishment, soil nutrient management, and pest management. Table 7 indicates that, through CFS, the level of self-assessed knowledge of farmer-graduates in Pamplona and Milagros was raised. This increase could be attributed to the lectures delivered by the resource persons and experts during the CFS. The use of handouts as supplement to the learning modules also raised the farmers' retention of knowledge. Farmers' practical demonstration and application of lessons learned, especially in land preparation and seedling establishment up to harvesting, through a techno demo farm also facilitated learning.

Mean differences between the pre-and post-test scores were obtained by subtracting farmer scores in Camarines Sur from those in Masbate. The differences in self-assessed knowledge scores of Milagros farmers were relatively higher than those of Pamplona farmers possibly because access to agricultural information was relatively easier in lowland Pamplona than in the upland municipality of Milagros where access to transportation and communication is a challenge. More farmers attended CFS in Milagros because they were very eager and more motivated to learn. Despite the poor facilities in the area, farmers in Milagros were appreciative of the agricultural extension services. They have been hungry for information and farming technologies, which, in turn, changed their attitudes toward adopting better farming practice.

CONCLUSIONS AND RECOMMENDATION

The analysis showed that farmer-graduates in Pamplona and Milagros have improved self-assessed knowledge as exhibited by the highly significant differences in their pre- and post-test scores. However, there were also topics discussed during the CFS that did not result in significant self-assessed knowledge gains. Some of these topics were quite new to them while others are not applicable to their farming activities and practices. In the future, other useful topics for the curriculum are marketing and farm planning and budgeting, the knowledge gains for which would contribute to the farmers becoming entrepreneurs.

Table 7. Comparison of pre- and post-test scores of CFS farmer graduates in Pamplona, Camarines Sur and Milagros, Masbate

CLUSTERED TOPIC	PRE-TEST				POST-TEST			
	Pamplona, Camarines Sur (%)	Milagros, Masbate (%)	Mean Difference	P value	Pamplona, Camarines Sur (%)	Pamplona, Masbate (%)	Mean Difference	P value
Climate	31.3	46.7	-3.3	.000*	64.9	68.1	-11.4	.000*
Land preparation and seedling establishment	44.9	33.2	-3.7	.000*	72.0	75.8	-12.7	.000*
Soil nutrient management	36.2	26.4	-2.8	.000*	68.8	71.9	-12.0	.000*
Pest management	39.8	25.4	-1.9	.016*	66.7	71.1	-12.0	.000*
Water management and special topics	31.8	24.8	-12.5	.045*	63.1	71.6	-12.2	.001*
Organic agriculture	35.7	29.3	-3.7	.031*	63.7	69.3	-12.0	.001*
Animal production	37.0	25.4	-3.3	.002*	65.0	69.3	-10.4	.022*
Harvesting and postharvest	33.8	23.8	-2.4	.007*	59.4	73.2	-13.8	.000*

*Significant if p value <0.05 while not significant (ns) if p value > 0.05

Farm practices of some farmer-cooperators also changed, resulting in more advanced farm technologies being adopted in the area. Examples included the more systematic and conscious approach in land preparation. The use of traditional crops has also changed as farmers tried growing other rice varieties and vegetable crops. The participants also engaged in new recreational activities such as backyard farming, which became a supplemental source of income.

Further research is needed. One recommendation is the conduct of a similar study that investigates other factors or variables that could affect farmers' participation in the CFS. For instance, the decision-making skills of farmers with respect to the adoption of a technology such as the *Palayamanan* could be investigated. Other possible research topics are identifying the factors that influence knowledge gains and change in practices of CFS farmer-graduates. The information transfer from CFS graduates to co-farmers or members of the family or community could also be studied.

The CFS as a mode of extension delivery in rainfed areas is still in its infancy stage. More funds can be poured into the strengthening of the curriculum as well as capacitating the agricultural technicians so they can become competent resource persons. Rainfed areas are not as accessible to the extension system compared to irrigated areas, but incentivizing the CFS facilitators and resource persons can bring more technology information to farmers in these marginalized areas.

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LITERATURE CITED

- Boer, R., Tamkani, K., & Subbiah, A. R. (2003). Communicating climate forecast to farmers through climate field school: Indonesian experience. Paper presented at the Workshop on Insights and Tools for Adaptation: Learning from Climate Variability, Washington DC, USA. Retrieved from <http://www.climateadaptation.net/docs/papers/Rboer-Subbiah%20paper.pdf> on 13 June 2018.
- Braun, A., Jiggins, J., Röling, N., van den Berg, H., & Snijders, P. (2006). *A global survey and review of farmer field school experiences*. The Netherlands: International Livestock Research Institute.
- Chandra, A., Dargusch, P., Mcnamara, K. E., Caspe, A. M., & Dalabajan, D. (2017) A study of climate-smart farming practices and climate-resiliency field schools in Mindanao, the Philippines. *World Development*, 98: 214-230. <http://dx.doi.org/10.1016/j.worlddev.2017.04.028>.
- Corales, R. M., Juliano, L. M., Capistrano, A. O. Y., Tobias, H. S., Dasalla, N. V., Cañete, S. D., Casimero, M. C., & Sebastian, L. S. (2005). Palayamanan: A rice-based farming systems model for small-scale farmers. *Philippine Journal of Crop Science*, 29(1): 21-27.
- Duveskog, D., Friis-Hansen, E., & Taylor, E. W. (2011). Farmer field schools in rural Kenya: A transformative learning experience. *Journal of Development Studies*, 47(10): 1529-1544. <https://doi.org/10.1080/00220388.2011.561328>.
- Feder, G., Murgai, R., & Quizon, J. (2003). Sending farmers back to school: The impact of farmer field schools in Indonesia. *Policy Research Working Papers*. <https://doi.org/10.1596/1813-9450-3022>.
- Godtland, E., Sadoulet, E., 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. *Economic Development and Cultural Change*, 53(1): 63-92. <https://doi.org/10.1086/423253>.
- Leippert, F. (2014). Climate field schools: A sustainable approach for climate change adaptation: The Indonesian case. Retrieved from https://www.ethz.ch/content/dam/ethz/special-interest/gess/nadel-dam/documents/mas/mas-essays/MAS_2012_Leippert_Fabio.pdf on 13 June 2018.
- Manoj, A. (2013). Impact of farmers' field schools on farmer's knowledge, productivity and environment (Doctoral Dissertation, Indian Agricultural Research Institute, New Delhi, India). Retrieved from http://krishikosh.egranth.ac.in/bitstream/1/65685/1/1.1top%20pages_14.Schedule.pdf on 13 June 2018.

- Mtega, P., Ngoepe, M., & Dube, L. (2016). Factors influencing access to agricultural knowledge: The case of smallholder rice farmers in the Kilombero district of Tanzania. *South African Journal of Information Management*, 18(1): a679. <http://dx.doi.org/10.4102/sajim.v18i1.679>.
- Philippine Statistics Authority. (2014, December 30). PSA releases the 2012 municipal and city level poverty estimates. [Press release]. Retrieved from <https://psa.gov.ph/poverty-sae-press-releases> on 10 June 2018.
- Pontius, J., Dilts, D., & Bartlett, A. (2002). *From farmers' field schools to community IPM: Ten years of IPM training in Asia*. Bangkok, Thailand: FAO Regional Office for Asia and the Pacific.
- 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. Retrieved from <https://www.aiaee.org/attachments/article/256/Rola%209.1-8.pdf> on 13 June 2018.
- Stuiver, M., Leeuwis, C., & van der Ploeg, J. D. (2003). The power of experience: Farmer's knowledge and sustainable innovations in agriculture. In J. S. C. Wiskerke and J. D. van der Ploeg (Eds.), *Seeds of transition: Essays on novelty production, niches, and regimes in agriculture*. The Netherlands: Royal Van Gorcum. pp. 93-117.
- Winarto, Y. T., Stigter, C. J., Anantasari, E., & Hidayah, S. N. (2008). Climate field schools in Indonesia: Improving "response farming" to climate change. *Leisa magazine*, 24(4): 16-18.
- Yamazaki, S. & Resosudarmo, B. P. (2008). Does sending farmers back to school have an impact? Revisiting the issue. *The Developing Economies*, 46(2), 135-150. <https://doi.org/10.1111/j.1746-1049.2008.00060.x>.

Factors Associated with Farmers' Adaptation Practices to Weather Variability in Rice-based Farming System in Myinmu Township, Sagaing Region, Myanmar

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ABSTRACT. Due to its dependence on agro-climate condition, the rice-based farming system in Myinmu Township in Central Dry Zone (CDZ), Myanmar is one of the sectors that is vulnerable to weather variability. This study aimed to analyze the association of adaptation practices on production and income of rice farmers in Myinmu Township. One hundred fifty farmers were surveyed and key informant interviews were conducted to gather primary data. Results revealed that most farmers received agricultural and weather information from fellow farmers, extension agents from the Department of Agriculture, attendance to group meetings, and mass media channels such as radio and television. Adaptation practices were categorized into changing cultivated varieties and crops, changing farming systems, conserving rain water, improving irrigation systems, and engaging in non-farm activities. Factors associated with adaptation practices were type of agriculture (ecosystem), total cultivated area, total rice cultivated area, credit accessibility, attendance to training programs and access to inputs. Overall, results revealed an observable pattern of increased weather variability and minimal adaptation practices, which calls for a more vigorous extension intervention to promote practices that can minimize the impact of weather variability on farmers' production and income.

Keywords: *adaptation practices, sources of information, extension framework*

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INTRODUCTION

Global climate change is reshaping crop production and the farming communities (Sharma, 2015), which affects the availability of water for irrigation, amount of solar radiation for plant growth, and pest population (Dhaka, Chayal, & Poonia, 2010). It is predicted that climate change will trigger the increased occurrence of extreme weather events such as drought and flood, and, consequently, worsen the poverty situation in many rice-farming communities (ADAS UK Ltd. and University of Leeds, 2013).

Myanmar is among the most vulnerable to the impacts of weather variability as it has experienced rainfall scarcity, irregular rainfall, heat stress, drought, flooding, seawater intrusion, land degradation, desertification, deforestation, and other natural disasters (Kywe, Hom, Htwe, Hein, & Than, 2015). It has several variant climate zones such as Central Dry Zone (CDZ), Coastal, Hilly, and Delta regions. Annual rainfall intensity is far lower than normal average in Central Myanmar and this area also suffers from below average and uneven rainfall distribution, and high temperature of up to over 40°C during summer (Climate Change Management, 2010 as cited in The, 2012). In recent years, rainfall has become increasingly erratic with significant declines in total rainfall amount that led to reduced water availability for consumption and farming (Livelihoods and Food Security Trust Fund, 2014).

Mary and Majule (2009) argued that while climate change is global, adaptation is local and context-specific. The Intergovernmental Panel on Climate Change (IPCC) defines climate change adaptation (CCA) as “the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (Intergovernmental Panel on Climate Change, 2007, p. 6). Adger et al. (2007, p. 720), citing the Fourth Assessment Report of the IPCC, highlighted that CCA refers to “actual adjustments or changes in decision environments, which might ultimately enhance resilience or reduce vulnerability to observed or expected changes in climate.”

Singh and Tyagi (2003), as cited in Billah (2013), reported that farmers with reasonable adaptive capacities had little constraints in adapting to climate change. If not handled properly, however, these constraints can potentially reduce productivity. Thus, this study contends that farmers need to have adaptive capacities, which the

agricultural extension agency can help address. Central to this study, therefore, is the need to examine the role of extension in dealing with issues relating to weather variability adaptation in the rice-based farming system.

In Myanmar, agricultural extension is primarily responsible for providing educational activities, collecting agriculture-related data, enforcing standard weights and measures, procuring and distributing farm inputs such as high-quality seeds, fertilizers, and insecticides. However, adaptation to weather variability is a complex activity that requires more than addressing a component technology or providing component inputs.

Due to the importance of adaptive capacities and adaptation practices in addressing weather variability, this study aimed to discuss the sources of information on adaptation practices to weather change; determine the extension support received; examine the factors associated with farmers' adaptation practices; analyze the association of adaptation practices on production and income of rice farmers; and design an extension framework to promote rice farm adaptation strategies to weather variability.

METHODOLOGY

Theoretical Framework

Ramamasy and Baas (2007) defined climate as a statistical information, a synthesis of weather variation focusing on a specific interval. Climate is usually based on the weather in one locality averaged for at least 30 years. Climate change, on the other hand, refers to direct or indirect activities of humans, leading to changes in global atmosphere components and changes of natural climate variability observed over comparable time (United Nations Framework Convention on Climate Change, 2007). Climate change would lead to more extreme climate events, compromising crops, food security, shelter, and livelihoods (Intergovernmental Panel on Climate Change, 2007). An extreme weather event refers to meteorological conditions that are rare for a particular place and/or time, such as an intense storm or heat wave. An extreme climate event, on the other hand, is an unusual average over time of a number of weather events, for example heavy rainfall over a season (Pittock, 2003).

An effective way to address the impacts of weather variability is to integrate adaptation measures into sustainable development strategies to reduce the pressure on natural resources, improve environmental risk management, and increase the social well-being of the poor. Adaptation means the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (Intergovernmental Panel on Climate Change, 2001). Adaptation also refers to the process of adapting and the condition of being adapted. Societies have a long record of adapting to the impacts of weather and climate through a range of practices that include crop diversification, irrigation, water management, and disaster risk management (Adger et al., 2007).

Regarding human dimensions, Smit (1993) noted that adaptation involves adjustments to enhance the viability of social and economic activities and reduce their vulnerability to climate, including its current variability and extreme events as well as longer term climate change. Adaptation to climate change takes place through adjustments to reduce vulnerability or enhance resilience in response to observed or expected changes in climate and associated extreme weather events. Adaptation occurs in physical, ecological, and human systems. It involves changes in social and environmental processes, perceptions of climate risk, practices and functions to reduce potential damages or to realize new opportunities (Adger et al., 2007).

Some adaptation measures are undertaken by individuals, while others are planned and implemented by governments on behalf of societies, sometimes in anticipation of change but mostly in response to experienced climatic events, especially extremes (Adger, Huq, Brown, Conway, & Hulme, 2003; Kahn, 2003; Klein & Smith, 2003). There is a long record of practices to adapt to the impacts of weather as well as natural climate variability on seasonal to inter annual timescales – particularly to the El Niño-Southern Oscillation (ENSO). These include proactive measures such as crop and livelihood diversification, seasonal climate forecasting, community-based disaster risk reduction, famine warning systems, insurance, water storage, and supplementary irrigation (Mace, 2006).

According to Mace (2006), technological adaptation can serve as potent means of adapting to climate variability and change. New technologies can be developed to adapt to weather variability, and the transfer of appropriate technologies to developing countries forms an

important component of the UNFCCC. However, technologies are not a panacea. Adaptation options that are effective in one location may be ineffective in other places, or may create new vulnerabilities for other places or groups.

Conceptual Framework

The conceptual framework for this research is presented in Figure 1. Adaptation refers to farm and non-farm adjustments in relation to actual or expected changes in weather variability. The weather variability phenomenon investigated was determined based on the frequency of occurrence using the review of climate data for the past 30 years. Climate data showed that drought, flooding, and too high temperature were the most frequent weather events in the area of study. Employing any adaptation measure is hypothesized to be associated with socio-demographic characteristics of the farm household. The selected socio-demographic factors, which were based on review of literature, included household size, educational attainment, farm experience, type of ecosystem, total cultivated area, total cultivated area for rice, and credit access. Additionally, the choice of adaptation measures will also depend on access to information, training programs, and agricultural inputs from different institutions. These adaptation practices are hypothesized to be associated with production and income.

Research Sites

A field survey was conducted in Myinmu Township, Sagaing District, Sagaing Region in Central Dry Zone (CDZ) of Myanmar. The study area was located in Myinmu Township having a total population of 113,339 with 25,278 households. The respondents came from 10 purposively selected villages (Figure 2).

The general criteria in choosing these villages were the geographical stratification of Myinmu Township (Figure 2) and the extent of occurrences of extreme weather events. Occasionally, all 10 villages suffer from drought during the dry season and flood during the rainy season. Except for the villages of Kan Pyar, Kan Taw, and Pe Ku, some areas for crop cultivation in the other seven villages are affected by seasonal floods especially when Mu and Irrawaddy (Ayeyarwady) rivers overflow. This usually happens from June to October; peak

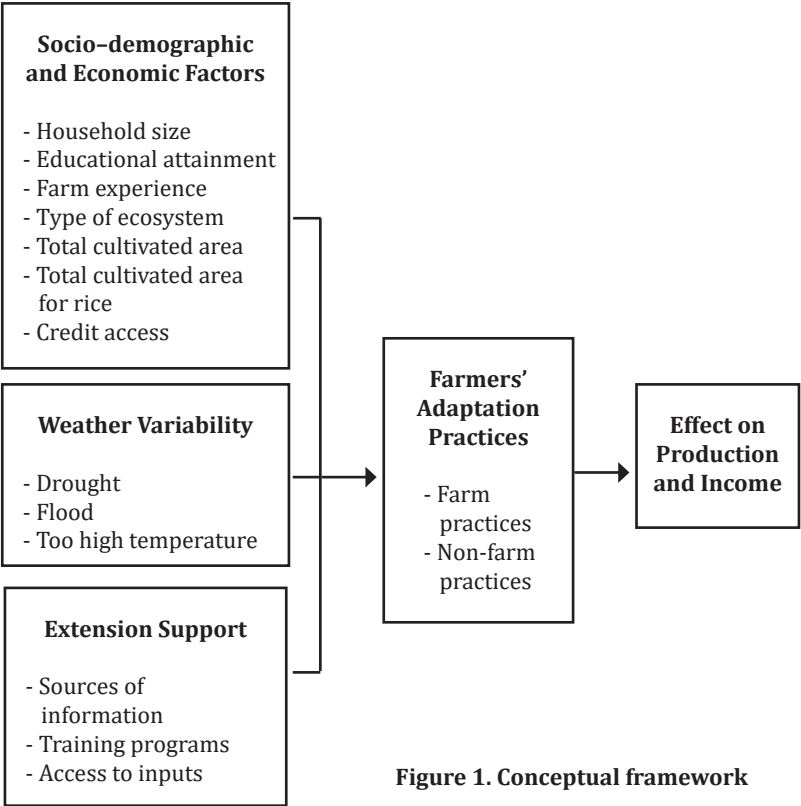


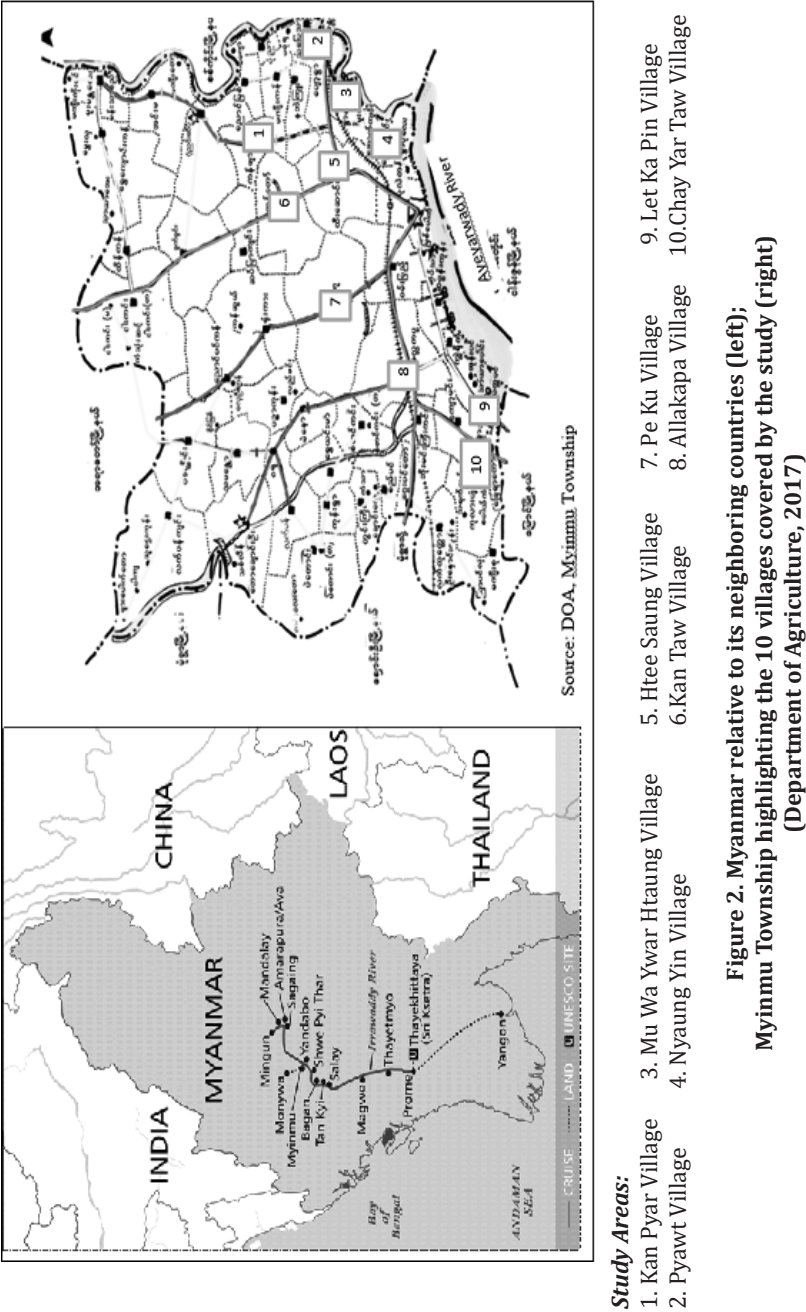
Figure 1. Conceptual framework

month is August. On the other hand, some cultivated areas in the villages of Kan Pyar, Kan Taw, and Pe Ku are flooded occasionally in rainy season because of poor engineering designs of embankments, dams, and canals.

Respondents of the Study

The total number of sampled households was calculated using the Yamane's (1973) formula. With a 25,278 households and 10 percent margin of error, a total of 100 sample size was computed.

While the computation suggested 100 respondents, the researchers opted to increase the number of respondents to 150. Hence, 15 respondents per village were selected using simple random sampling.



Data Gathering Instrument in Research

Field survey was conducted from June to July 2017. Primary data were obtained through survey and interviews. The survey questionnaire included socio-demographic and socio-economic characteristics of farmers, major impacts of weather variability over the past 5 and 10 years, perceived impacts of weather variability on crop production, adaptation of farming practices in response to climate change, constraints faced by farmers in adapting to weather variability, and extension support received. Primary data were collected from rice growing farmers, while secondary data were gathered from the Department of Agriculture (DOA) and the Department of Meteorology and Hydrology (DMH) in Myinmu Township and from published and unpublished documents from other government agencies, journals, books, and other references. Focus group discussions (FGDs) and key informant interviews (KIIs) were also conducted in 10 villages. The discussions revolved around resources available in the community, perceptions of climate change and weather variability, experiences and knowledge on weather variability, adaptation measures, adaptation constraints, agricultural extension services, and forms of institutional support.

Statistical Analysis

The data collected were coded and analyzed using Microsoft Excel version 16.0, Statistical Package for Social Sciences (SPSS) version 20.0, and STATA Version 14.1. STATA is a command and menu-driven statistical package designed for data management, data visualization, and statistical analyses (Stata Corp, 2019). SPSS is a popular and widely used package to code data within both academic and business circles as it is a versatile package that allows many different types of analyses, data transformations, and interpretation of results from a large sample size (Arkkelin, 2014).

Descriptive statistics such as frequency, percentage, mean, and standard deviation were used to describe the local patterns of rainfall variability and other variables. Correlation analyses among variables were performed to determine if association exists among variables. Spearman correlation analysis was employed to determine if monotonic association exists between variables measured such as some socio-demographic variables (education level, household size, farming experiences, total cultivated area and total cultivated area for rice) and

adaptation practices in at least ordinal scale (Gibbons & Chakraborti, 2003). On the other hand, Chi-square Test of Independence was used to determine if association exists between two categorical variables such as crop production and family income and adaptation practices.

RESULTS AND DISCUSSIONS

Major Impacts of Weather Variability over the Past 5 and 10 Years

Table 1 shows the impact of weather variability over the past 5 and 10 years. Respondents reported increased occurrence of drought (69%) and high temperature (88%) in the past 5 years. In the past 10 years, almost the same trend was reported: There were observed increases in the occurrence of drought (70%) and high temperature (84%). Aside from the observations reported above, key informant interviews revealed that drought and high temperature occurred more frequently during the periods covered.

Perceived Impacts of Weather Variability on Crop Production

Agricultural production is among the major economic activities in the study area given that farmers' livelihoods depend on upland (rainfed) and lowland (irrigated) rice farming. Table 2 shows the impacts of weather variability on crop production as reported by the respondents. Drought and too high temperature led to water shortage that eventually resulted in yield reduction and soil degradation. Delayed monsoon rain, on the other hand, reduced the area for cultivation for monsoon crops. Moreover, floods lowered crop quality and caused yield loss.

Pest and disease infestation was the most serious problem in the study area followed by weed infestation due to weather variability. Nearly half (47%) of respondents indicated that their crop production was strongly affected by infestation of pest and diseases, while more than one-third (37%) noted that their crops were strongly affected by weeds. Less than one-fourth (20%) of the respondents indicated that their crop production was affected by water shortage.

In terms of crop quality reduction, only 15 percent of the respondents reported that they suffered strongly while the majority

Table 1. Major impacts of weather variability over the past 5 and 10 years (n=150)

IMPACTS	PAST 5 YEARS				PAST 10 YEARS			
	DROUGHT		FLOOD		DROUGHT		TOO HIGH TEMPERATURE	
	No.	%	No.	%	No.	%	No.	%
Increase	103	68.7	132	88.0	27	18.0	105	70.0
Decrease	11	7.3	3	2.0	20	13.3	10	6.7
Irregular	19	12.7	9	6.0	33	22.0	14	9.3
No change	17	11.3	6	4.0	70	46.7	21	14.0
							8	5.3
							73	48.3

Table 2. Perceived impacts of weather variability on crop production (n=150)

IMPACTS OF CLIMATE VARIABILITY	INCREASE PEST AND DISEASE		INCREASE WEED INFESTA-TION		WATER SHORTAGE		RE-DUCTION IN CROP QUALITY		REDUCED PLANTING AREA		CROP YIELD RE-DUCTION	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Very little	7	4.7	13	8.7	73	48.7	47	31.3	129	86.0	61	40.7
Little	19	12.7	22	14.7	18	12.0	46	30.7	19	12.7	59	39.3
Moderate	46	30.7	52	34.7	22	14.7	33	22.0	1	0.7	20	13.3
Strong	70	46.7	55	36.7	30	20.0	22	14.7	0	0	4	2.7
Very strong	8	5.3	8	5.3	7	4.7	2	1.3	1	0.7	6	4.0

suffered “little” or “minor reduction.” Most (86%) of the respondents reported that they reduced their planting area, which they considered as a minor impact of weather variability. While most farmers encountered problems relating to pests, diseases, and weeds, nearly half (41%) of them reported that crop yield reduction was insignificant.

The results of the FGD offer an explanation to the minor yield reduction experienced by farmers despite being strongly affected by weather extremes. It was found that there were several sources of irrigation in the study area such as a reservoir, tube well, and the River Water Pumping Station. A farmer from Pyawt said:

“We used chemical insecticides and/or herbicides to manage insect pests and weeds, respectively. When we were confronted by water shortage because of drought during the planting period, we sourced water from the River Water Pumping Station. If there are difficulties getting water from that Station, we used a pumping system to irrigate water in the field by digging a tube well.”

Farmer’s Communication Exposure

Sources of information on farmers’ adaptation practices.

Extension field staff members used a variety of activities and methods in disseminating to farmers new agricultural technologies and farming adaptation practices. Information sources relating to adaptation practices are presented in Table 3.

Under interpersonal channel, most (72%) of the respondents reported that they accessed information from their co-farmers regularly. Similarly, more than half (55%) of the farmers said that they accessed information from agricultural extension agents (AEA) from DOA on a regular basis. In sum, the farmer-farmer mode of accessing information appears to be the most effective among the sources of interpersonal information.

Group meetings were a regular source of information for more than one-third (37%) of the farmer-respondents. One finding that should be highlighted under the Group category is that a large majority (95%) of the farmer-respondents reported that they have never accessed information through the farmers field school (FFS).

Table 3. Percent distribution of accessibility of information sources (n=150)

SOURCES OF INFORMATION	REGULARLY		OCCASIONALLY		RARELY		NEVER	
	No.	%	No.	%	No.	%	No.	%
Interpersonal ^a								
AEA from DOA	83	55.3	38	25.3	7	4.7	22	14.7
AEA from NGOs/INGOs	21	14.0	33	22.0	15	10.0	81	54.0
AEA from company	29	19.3	70	46.7	9	6.0	42	28.0
Farmer to Farmer	108	72.0	26	17.3	3	2.0	13	8.7
Group ^a								
Group meeting	55	36.7	56	37.3	7	4.7	32	21.3
Demonstration meeting	23	15.3	34	22.7	15	10.0	78	52.0
Field day	19	12.7	24	16.0	8	5.3	99	66.0
Farmers field school	-	-	2	1.3	5	3.3	143	95.3
Training course	12	8.0	19	12.7	9	6.0	110	73.3
Mass Media ^a								
Radio	85	56.7	33	22.0	6	4.0	26	17.3
Television	77	51.3	34	22.7	5	3.3	34	22.7
Print media	33	22.0	42	28.0	10	6.7	65	43.3

^aMultiple response

Legend:

AEA: agricultural extension agents

INGOs: International NGOs

DOA: Department of Agriculture

NGOs: Non-government organizations

Interestingly, most (73%) of them also said that they have never accessed information from training courses.

Radio (57%) and TV (51%) were accessed regularly by farmers. Nearly half (43%) of the farmer-respondents have never accessed information from the print media.

Table 4. Percent distribution of communication channel preferences

MOST PREFERRED CHANNEL	NO. (n=150)	%
Interpersonal		
AEA from DOA	30	20.0
AEA from NGO/INGOs	14	9.3
AEA from company	2	1.3
Farmer to farmer	10	6.7
Group		
Group meeting	28	18.7
Demonstration meeting	7	4.7
Field day	10	6.7
Farmers field school	2	1.3
Training course	9	6.0
Mass Media		
Radio	18	12.0
Television	10	6.7
Printed media	10	6.7

Farmers' communication channels. It was also in the interest of this study to ask for the farmer-respondents' most preferred sources of information by farmer-respondents. Summarized in Table 4, the findings are useful in informing communication plans relating to promoting adaptation practices. The AEA from DOA were mentioned by almost one-fourth (20%) of the respondents as the most preferred channel because they can ask directly and be able to clarify things immediately. Group meetings occupied the second position in the most preferred channels (19%), while radio came in third (12%). Farmers said that they prefer to get information from radio because they can easily listen to the weather and agricultural information being broadcasted. They can also carry it anywhere and listen to it.

Overall, interpersonal sources, particularly the AEA, were the most preferred. Okwu and Daudu (2011) noted that extension agents are preferred sources of information because they can outrightly respond to the technical issues raised by farmers. Mass media, especially the print media, is least preferred owing to the high number of farmers who only finished basic education.

Factors Associated with Adaptation Practices to Weather Variability

Association between the farmers' adaptation practices and socio-demographic and economic variables. Spearman correlation analysis was performed on selected socio-demographic and socio-economic variables concerning the respondents' 18 adaptation measures identified by farmers in the study sites (Table 5). The aim was to verify if association exists between these adaptation measures and the socio-demographic and socio-economic variables of farmers. Estimated Spearman rank-correlation coefficients and Chi-square test statistics are shown in Table 5.

Adaptation practices were categorized into changing cultivate varieties, changing farming system, rain water conservation, improving irrigation system, and non-farm adaptation activities. These adaptation practices were initially shortlisted from the list of adaptation farming practices gathered from review of literature and from interviews with the extension workers and key informant leaders.

Results revealed that type of ecosystem, total cultivated area, total cultivated area for rice, and credit availability were associated with some adaptation practices. Based on the analysis, there was an association between the frequency of intercropping and total cultivated area at 5 percent level of significance. With a reverse coding of 1 as practicing and 4 as not practicing, results showed that as the total cultivated area increases, the farmers are more likely to practice intercropping. In addition, there was also an association between the practice of crop rotation and total cultivated area for rice. As the total cultivated area for rice increases, the farmers are less likely to practice crop rotation. It appears that as farmers have larger farms, the propensity to adopt intercropping increases.

However, when the farm area is planted with rice alone, they prefer to plant rice all throughout the year. Ecosystem types were significantly associated with digging pond/well and with the use of pumps for irrigation at 1 percent level of significance. Pragmatically speaking, the chance that farmers who do not have access to irrigation would dig a well or use water pumps to address this issue is high. It can be inferred that total area cultivated for rice affected the decision to use a drainage system to manage water efficiently to ensure optimum crop growth. Lastly, credit availability was significantly associated with practicing crop diversification. This is understandable given that

Table 5. Measures of association between adaptation practices and different socio-demographic and socio-economic characteristics

ADAPTATION PRACTICES	EDUCA- TION LEVEL		HOUSE- HOLD SIZE		FARMING EXPERIENCES		TYPE OF ECO- SYSTEM		TOTAL CULTIVATED AREA		TOTAL CUL- TIVATED AREA FOR RICE		CREDIT AVAILABILITY	
	rS	χ^2_c	rS	χ^2_c	rS	χ^2_c	rS	χ^2_c	rS	χ^2_c	rS	χ^2_c	rS	χ^2_c
Changing cultivated varieties														
Drought-tolerant varieties	-0.0123	0.0458	0.1423	0.313	-0.1271	-0.1032	0.354							
Short-duration varieties	0.0844	0.1008	-0.0262	10.122	-0.0231	0.0058	2.276							
Changing crops	-0.0046	0.0375	-0.0648	2.830	-0.0071	0.0268	2.589							
Changing farming system														
Changing planting time	0.0231	-0.0392	-0.0493	10.922	0.0607	-0.0417	3.188							
Changing planting method	-0.0295	-0.0728	-0.0527	3.910	0.0280	-0.1243	1.353							
Practicing crop rotation	-0.0451	0.0243	0.1246	7.942	-0.1572	0.1754*	1.03							
Practicing intercropping	-0.1066	-0.0703	0.1147	2.354	-0.1916*	0.0499	1.25							
Practicing crop diversification	-0.0275	-0.0932	0.0586	5.446	-0.1380	-0.0511	9.78*							
Homestead gardening	-0.1340	-0.0435	0.0404	6.581	-0.1030	-0.0008	4.801							
Vegetable cultivation	-0.0910	-0.1447	0.0954	7.364	-0.0867	0.0528	0.192							

*Significant at 0.05 level of significance
** Significant at 0.01 level of significance

Table 5. Continued

ADAPTATION PRACTICES	EDUCATION LEVEL		HOUSEHOLD SIZE		FARMING EXPERIENCES		TYPE OF ECO-SYSTEM		TOTAL CULTIVATED AREA		TOTAL CULTIVATED AREA FOR RICE		CREDIT AVAILABILITY	
	r ^s	r ^s	r ^s	r ^s	r ^s	r ^s	χ^2_c	r ^s	r ^s	r ^s	r ^s	χ^2_c	r ^s	χ^2_c
Rain water conservation														
Digging pond/well	-0.1200	0.0809	0.1535	12.209*	-0.0253	0.1200	2.865							
Mulching with crop residue	0.1047	-0.0487	-0.0001	5.811	0.1046	-0.1157	0.241							
Improving irrigation system														
Use of pumps for irrigation	-0.1221	0.1234	0.0370	20.638**	0.0150	0.1450	1.842							
Use of drainage system	-0.0362	0.0728	-0.0504	4.419	0.0511	-0.1346	6.184							
Non-farm activities														
Duck rearing	0.0369	-0.1469	-0.1428	5.810	0.0399	-0.0370	0.049							
Engaging in trading activities	-0.1254	0.0666	0.1411	0.640	0.1392	-0.0002	0.014							
Changing work (transportation)	-0.0059	-0.0951	-0.0225	5.649	0.1196	0.0243	0.273							
Migration	-0.0422	-0.1072	-0.0767	5.800	0.0305	-0.0740	0.80							

*Significant at 0.05 level of significance
** significant at 0.01 level of significance

farmers would need credit to buy inputs such as high-quality seeds and fertilizers. Yirga and Hassan (2010) noted that access to credit of a household indicates the availability of funds that will enable adoption of adaptive strategies.

Association between farmers' adaptation practices and information sources. The result of the Spearman rank correlation analysis shows the association between the adaptation practices and various information sources (Table 6). There was sufficient evidence that there existed a very weak positive monotonic association between using drought-tolerant varieties and getting information from demonstration at 5 percent level of significance. With a reverse coding of 1 as practicing and 4 as not practicing for adaptation practices and a reverse coding of 1 as regular source of information and 4 as not at all for source of information as farmers participate in demonstrations, they are more likely to use drought-tolerant varieties. In sum, it shows that the various sources of information were associated with farmers' decision regarding changing cultivated varieties/crops in their farm as a response to weather variability.

As regards the changing of planting method, there was sufficient evidence that there existed a positive monotonic association with some information sources (AEA from non-government organizations [NGOs] or International NGOs [INGOs], demonstration, field days, group meetings, training course, and printed media) at 1 percent level of significance and 5 percent level of significance, respectively. This means that as farmers tend to use these as sources of information, they are more likely to change planting method. The strengths of associations ranged from very weak to moderate associations. Among the sources of information, attendance to demonstration had a moderate association with changing of planting method.

Results of the analysis further showed that there was a very weak positive monotonic association between mulching the soil with crop residue and AEA from NGOs/INGOs, group meetings, field days, and training course as sources of information at 5 percent level of significance. This means that as farmers tend to use these as sources of information, they are more likely to mulch the soil with crop residue.

The analysis also showed that there was sufficient evidence that there existed a positive monotonic association between using the drainage system and getting information from training course

Table 6. Summary of relationships between some adaptation practices and information sources

ADAPTATION PRACTICES	SOURCES OF INFORMATION												
	Interpersonal			Group							Mass Media		
	1	2	3	4	5	6	7	8	9	10	11	12	13
Changing cultivated varieties													
Drought-tolerant varieties	-0.0274	-0.0267	0.0323	-0.1520	0.0863	0.1655*	0.0489	0.1091	0.1169	-0.0249	0.0922	0.1079	0.0553
Short-duration varieties	-0.0147	-0.0112	-0.0110	-0.1277	0.0738	0.1402	0.1342	-0.0581	0.0171	-0.0411	-0.0193	0.0046	-0.0218
Changing crops	-0.0653	0.0812	-0.0919	0.0719	0.0246	0.0820	0.0653	0.0314	0.0545	-0.0363	-0.0915	-0.1774*	0.0764
Changing farming system													
Changing planting time	0.0808	0.0574	0.1143	0.0990	0.0273	0.1290	0.1345	0.0843	-0.0079	0.0274	0.0656	-0.0612	-0.0352
Changing planting method	0.0595	0.2164**	0.0786	-0.0059	0.1898*	0.4263**	0.3420**	0.0625	0.1891*	0.0589	0.0764	0.0386	0.1615*
Practicing crop rotation	-0.1572	0.0016	-0.0417	0.0015	-0.0943	0.0014	-0.0895	0.0814	0.0009	-0.0455	0.0504	0.0124	-0.0108
Practicing intercropping	-0.0522	0.0352	-0.0759	-0.0131	-0.0250	0.0146	-0.0012	0.0118	0.0889	-0.0813	0.0280	-0.0380	-0.0619
Practicing crop diversification	-0.0428	-0.0663	-0.0313	0.0164	-0.0007	0.0158	-0.0120	-0.0326	0.1050	-0.1305	-0.0612	-0.1238	-0.0067
Homestead gardening	-0.0360	0.0657	-0.1566	0.0515	-0.1193	-0.0842	-0.1496	-0.0608	0.1244	-0.0448	0.0866	0.0936	0.1030
Vegetable cultivation	0.1102	0.0713	-0.0772	-0.0169	-0.0464	-0.0612	-0.0554	-0.0052	0.0300	-0.0585	-0.0009	0.0144	0.0389
Rain water conservation													
Digging pond/well	-0.1577	0.0362	0.0489	0.0817	-0.1276	-0.0098	-0.0849	0.0384	-0.0704	0.0202	0.1499	0.1135	0.1218
Mulching with crop residue	0.1062	0.1863*	-0.0313	0.0324	0.1801*	0.1500	0.1819*	-0.0375	0.1858*	0.0186	-0.0468	0.0618	0.0978
Improving irrigation system													
Use of pumps for irrigation	-0.0151	0.0850	-0.0171	0.0161	0.0028	-0.0790	0.0532	0.0469	-0.0375	-0.0277	0.1017	-0.0013	0.1021
Use of drainage system	0.1105	0.0583	0.0121	0.0872	0.1308	0.0998	0.0531	0.1158	0.1611*	0.0226	-0.0484	0.0104	0.2280*
Non-farm activities													
Duck rearing	0.0903	-0.0790	0.0867	0.0745	0.1274	0.0863	0.1681*	-0.0489	0.0201	0.0263	-0.0338	-0.0013	-0.1017
Engaging in trading activities	0.0999	0.0051	0.1025	-0.0418	0.0568	0.1443	0.1148	0.2479**	0.0857	0.0096	0.0261	0.0958	0.1137
Changing work (transportation)	0.0018	-0.0081	0.0524	0.1255	0.1087	0.0319	0.0989	-0.0404	0.0637	0.0706	0.0273	-0.1382	-0.0224
Migration	-0.0265	-0.1044	0.0180	-0.0459	0.0764	0.0347	-0.0669	-0.0600	0.0141	0.0791	0.0954	0.0572	0.1618*

*Significant at 0.05 level of significance

** Significant at 0.01 level of significance

Sources of Information:

1 - AEA form DOA

2 - AEA from INGOs, NGOs

3 - AEA from Agro chemical company

4 - Farmer to farmer

5 - Group meeting

6 - Demonstration

7 - Field day

8 - Farmers field school

9 - Training course

10 - Radio

11 - Television

12 - Farmers Channel

13 - Printed Media

and printed media at 5 percent level of significance. This means that as farmers tend to use these as sources of information, they are more likely to use the drainage system.

Meanwhile, non-farm activities such as duck rearing and getting information from field days had a significant positive very weak monotonic relationship at 5 percent level of significance. This means that as farmers tend to use field day as source of information, they are more likely to employ duck rearing. In addition, engaging in trading activities and getting information from FFS had a significant positive weak monotonic association at 1 percent level of significance. This means that participating in FFS affected farmers' decision to engage in non-farm activities as a way to cope with the adverse impacts of weather variability.

In sum, results cogently showed that the various sources of information are associated with farmers' decision regarding changing cultivated varieties/crops, changing farming system, conserving rain water, and engaging in non-farm activities in their farm as responses to weather variability. Overall, information sources such as AEA from INGOs, NGOs, group meetings, demonstrating meetings, field days, FFS, training course, and printed media were associated with the decision to employ most of the adaptation practices.

Attendance to training programs and access to inputs.

Knowledge of different agricultural information and technologies is important in adapting to weather variability. Farmers obtained information on these matters by attending training programs provided by public and private institutions. Among the training providers were the DOA, Agricultural Mechanization Department (AMD), and INGOs (e.g., World Hunger Health). Some of the topics relating to adaptation that were covered include the use of certified seeds and access to credit and farm machinery. The descriptive statistics for information and knowledge to adopt the adaptation practices to climate variability such as attendance to agriculture-related training programs and access to inputs provided by different organizations are shown in Table 7.

Most (67%) of the respondents reported that they have never attended any training program provided by the public sector through DOA, while about a third (33%) reported to have attended related training programs specific to the promotion of adaptation practices to weather variability. On the other hand, this may imply that only a

Table 7. Forms of access to institutional support

CHARACTERISTICS	NO. (n=150)	%
Attendance to training programs		
Yes	50	33.3
No	100	66.7
Access to inputs		
With access	48	32.0
Without access	102	68.0

few farmers showed interest to improve their knowledge and skills as regards adaptation practices to climate change. None of the farmers surveyed reported that they have attended a training on understanding the technical aspects of weather variability.

There were several input providers in the research site. For instance, there were public and private organizations that provided seeds to farmers through DOA. The AMD provided access to farm machines through custom hiring services or by selling them with different payment terms. Maung (2014) reported that the chance is high for farmers to adapt to weather variability by adjusting their farming practices if they were to seek institutional support. However, 68 percent of the respondents reported that they have no access to the inputs cited above.

Association of farmers’ adaptation practices and attendance to training programs. Correlational analyses were conducted to identify the factors that are associated with the decisions of farmers in employing certain adaptation practices (Table 8). There was sufficient evidence that there existed an association between the training attendance provided by private or public sector through DOA and the mulching with crop residue at 1 percent level, p value = 0.010. Considering the raw data, the association means that a large number of farmers who do not attend training provided by private or public sector through DOA also do not practice mulching with crop residue. In addition, there was sufficient evidence that there was an association between the training attendance provided by private or public sector through DOA and the farmers’ use of drainage system at 5 percent level of significance, p value= 0.033. The association means that a large number of farmers who do not attend training provided

Table 8. Measures of association among attendance of training program, access to input, and some adaptation practices

ADAPTATION PRACTICES	ATTENDANCE TO TRAINING PROGRAMS		ACCESS TO INPUTS	
	χ^2_c	p-value	χ^2_c	p-value
Drought resistant varieties	7.4073	0.060	6.2515	0.100
Short duration varieties	1.6549	0.647	4.4038	0.221
Changing crops	2.4236	0.489	5.9766	0.113
Changing planting time	0.2226	0.974	5.7647	0.124
Changing planting method	2.7896	0.425	5.9625	0.113
Practicing crop rotation	3.7389	0.291	11.2462**	0.003
Practicing intercropping	2.6542	0.265	5.4403	0.066
Practicing crop diversification	1.8968	0.594	3.8770	0.275
Homestead gardening	6.1798	0.103	0.9552	0.812
Vegetable cultivation	1.0348	0.793	2.3481	0.503
Digging pond/well	5.5705	0.062	1.3269	0.515
Mulching with crop residue	11.3282**	0.010	1.7171	0.633
Use of pumps for irrigation	0.1160	0.944	0.7315	0.694
Use of drainage system	8.7355*	0.033	2.2497	0.522
Duck/poultry rearing	0.4888	0.783	2.4790	0.253
Engaging in trading activities	2.5511	0.279	1.0442	0.593
Changing work (transportation)	4.1970	0.241	8.7606*	0.033
Migration	2.2861	0.319	2.5051	0.286

*Significant at 0.05 level of significance

**Significant at 0.01 level of significance

by private or public sector through DOA also do not use the drainage system. On the other hand, no significant relationship was established between training attendance and other adaptation practices to weather variability. An initiative of the Food Security and Agriculture Thematic Group (2010), as cited in Maung, Pulhin, Espaldon, and Lalican (2016), reported that the Dry Zone is an area where the technical knowledge, organizational capacity, and skills among the rural population are still poorly developed to promote community resilience for food security in Myanmar.

There was also sufficient evidence that association between access to agricultural inputs provided by either private or public sector and practicing crop rotation existed at 1 percent level of significance. This means that if farmers will have more access to agricultural inputs, their chance to adapt to weather variability is high. Moreover, there was sufficient evidence that an association between access to agricultural inputs provided by either private or public sector and changing work existed at 5 percent level of significance. The association means that a large number of farmers who do not have access to inputs also do not use the drainage system.

Perceived Effects of Farmers' Adaptation Practices on Agricultural Production and Family Income

An association existed between crop production and adaptation practices (i.e., changing planting method, practicing crop rotation, cultivating vegetables, and rearing duck) at 0.01 percent level of significance (Table 9). This means that the farmers in the study area reduced the adverse impacts of weather variability on their crop production by adapting these practices. This association can be proven by the result in Table 2 showing that nearly half (41%) of the farmers perceived that the weather variability reduced only slightly their crop yield. Meanwhile, a significant association existed between crop production and the adaptation practices involving changing crops, practicing intercropping, and practicing crop diversification. The data pointed out that the factors affecting crop production were those adaptation practices that engage farmers in activities such as animal raising, crop diversification, and crop management improvement.

The chi-square test showed a significant association between family income and short-duration varieties. The use of short-duration varieties, in general, is recommended as an adaptive practice to weather variability as it somehow enables the farmers to avoid the losses brought about by weather extremes such as drought and flood. Similarly, significant relationships were obtained between family income and the use of drought-tolerant varieties and migration. This means that use of drought-tolerant varieties and migration affected family income. Overall, it can be deduced that only these three adaptation practices were the factors that affected family income.

Table 9. Association between crop production and family income, and farmers' adaptation practices

ADAPTATION PRACTICES	CROP PRODUCTION		FAMILY INCOME	
	χ^2_c	p-value	χ^2_c	p-value
Drought resistant varieties	13.1	0.3	17.58*	0.04
Short duration varieties	19.38	0.08	22.19**	0.10
Changing crops	20.67*	0.05	13.44	0.14
Changing planting time	17.74	0.12	6.91	0.65
Changing planting method	38.45**	0.01	9.17	0.42
Practicing crop rotation	41.98**	0.00	9.78	0.37
Practicing intercropping	18.29*	0.02	7.31	0.29
Practicing crop diversification	28.09*	0.03	3.22	0.99
Homestead gardening	9.43	0.66	5.86	0.75
Vegetable cultivation	38.84**	0.00	5.11	0.83
Digging pond/well	13.3	0.10	7.59	0.27
Mulching with crop residue	5.51	0.94	12.91	0.22
Use of pumps for irrigation	11.41	0.18	8.29	0.694
Use of drainage system	7.04	0.86	14.21	0.12
Duck/poultry rearing	20.76**	0.01	2.93	0.82
Engaging in trading activities	5.21	0.74	9.88	0.13
Changing work (transportation)	14.15	0.29	15.04	0.09
Migration	7.93	0.79	20.10*	0.02

*Significant at 0.05 level of significance

**Significant at 0.01 level of significance

Proposed Extension Framework in Promoting Adaptation Strategies to Weather Variability in Rice-based Farming Systems

The framework shown in Figure 3 was designed to promote adaptation strategies to weather variability in a rice-based farming system. It should be noted that most farmers adopt only selected adaptation farming practices such as crop rotation and use of short-duration varieties. Given the ongoing and projected weather variability,

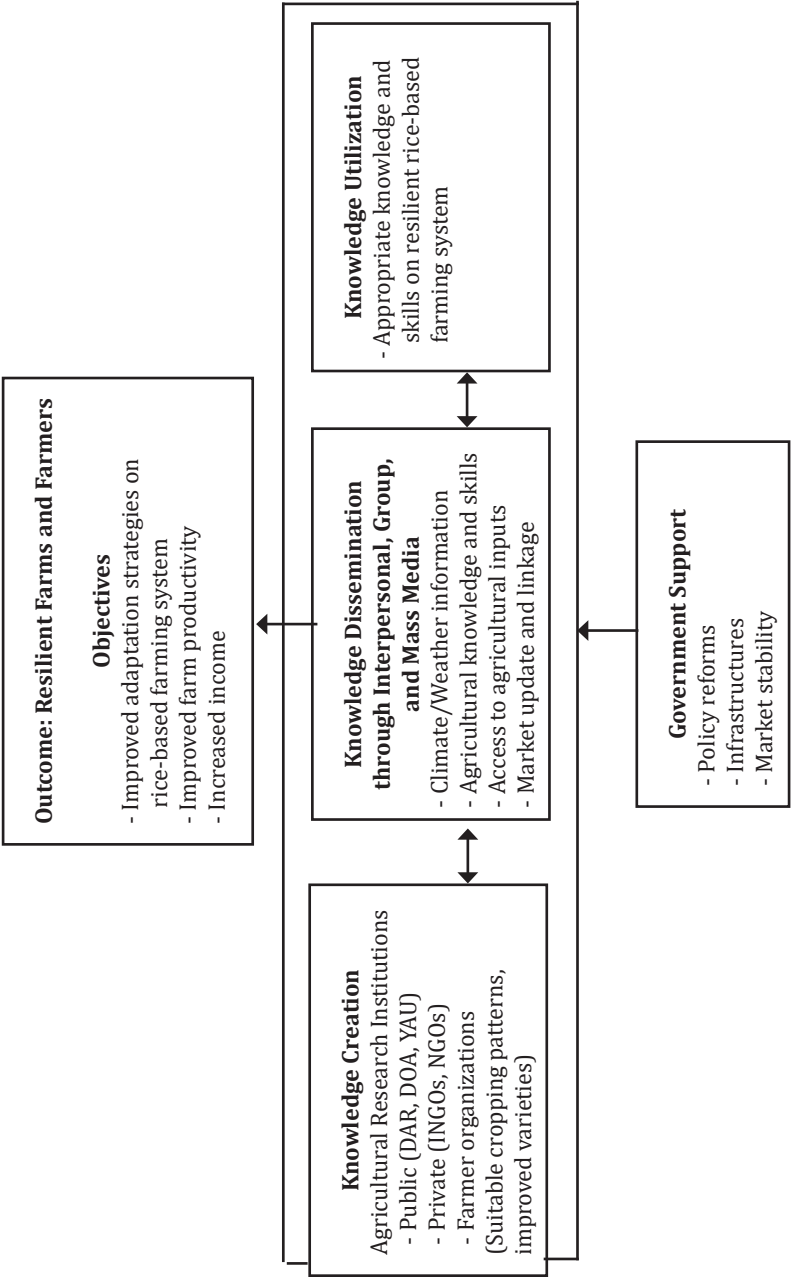


Figure 3. Extension framework for improving adaptation strategies in rice- based farming systems

it is imperative that farmers become more knowledgeable and skillful in applying adaptation practices.

The framework is guided by a knowledge management systems thinking approach, which contends that there should be a synergistic relationship between researchers, extension workers, and farmers in attaining a resilient rice-based farming systems. Hence, the following principles are forwarded:

Synergism among research, extension workers, and farmers. Without new knowledge on appropriate technologies and practices, pushing for resilient agriculture would be a difficult task. It is along this line that research, extension, and farmer-groups should work closely together. The key task is to identify problems, solutions, and processes in effectively disseminating information.

Public agricultural research institutions such as Department of Agricultural Research (DAR), DOA, and Yezin Agricultural University (YAU); private sectors such as INGOs and NGOs; policymakers; and farmers themselves can come together to craft a research agenda about practices that promote farmer resiliency.

As documented in this study, farmers need technologies such as those that relate to optimizing water resources and farm diversification which demands more water use. The government research centers can fund researches, investigate local adaptation practices, and set up farm demonstrations on best cropping combinations.

Along this line, farmers need assistance on input investments such as credit, seeds, and fertilizer after the onslaught of extreme weather events. Research on willingness to pay for crop insurance and mechanisms to deliver crop insurance should be a priority of the research agency.

Pluralism in extension. In promoting adaptation practices, the government, private sector, and farmer organizations need to work collaboratively. In this study, it was found that farmers prefer interpersonal interaction the most; hence, those involved and have the capacity to work with farmers should be guided by a framework that banks on cooperation and dissemination of appropriate information. Both public and private sectors should also work together in

conducting on-farm research using participatory approaches such as FFS. Additionally, local authorities and extension agents may consider conducting farmer-based participatory demonstration trials and field visits, as these activities can enhance knowledge sharing among farmers.

Use of various media for dissemination of weather forecasts and seasonal calendars per district. Farmers need to have updated information regarding weather and weather disturbances. Although the DMH regularly delivers climate information such as Daily Weather Forecast, Seasonal Weather Forecast, Sea Route Forecast, Special Weather Forecast depending on duration, as well as other weather disturbances report through mass media such as radio, television, newspapers, Facebook, and their website (www.dmh.gov.mm), most farmers in the study area did not notice these information sources because of lack of access to mass media. This is despite the fact that DMH also disseminates the important meteorological and hydrological information 24-36 hours before the natural disasters. Because of these reasons, extension workers need to closely coordinate with the weather bureau and researchers to get weather forecasts. The flow of information, therefore, should include extension workers. Moreover, it is suggested that seasonal calendars and other possible adaptation strategies be mapped out by various stakeholders. Developing communication plans that effectively mobilize media channels will ensure that important information relating to adaptation practices will reach the intended audience.

Continuous skills training on technologies and adaptation practices to promote resilient farms. Researchers and extension agents need to be updated on regarding new technologies, techniques, and practices in promoting resilient farms. Thus, it is important that they be trained on relevant topics such as on agro-ecology, climate change, soil degradation, policy reforms in agriculture, postproduction facilities, and provision of crop insurance.

Promotion of diversified farm-based income. A resilient farm means that it can support farmers' needs; thus, it should be diversified. Farm diversification, which is already being practiced by a number of farmers, should be studied further and promoted, especially since there are many opportunities to promote the care for livestock. In

addition, given the market-based orientation of farmers, it is necessary to do more research on export crops to serve as alternative sources of income for farmers.

Provision of appropriate support. In promoting farmer resiliency, it is important for the government to identify critical support areas such as upgrade of irrigation systems, construction of reservoir, and provision of facilities for agricultural information (Puriawanti & Koji ASAI, 2016). Resource-poor farmers need access to inputs, reliable infrastructure, accurate market information, and supportive policy environment. Given the limited funding, it is important that the government identifies priority support systems and infrastructure such as those relating to improved water management systems for drought-prone areas. The allocation of fund support to farmers in terms of seeds as well as assistance in leveling and harrowing the field after an extreme weather event or natural disaster should be a policy. Thus, provision of crop insurance should be a policy worth considering.

As it stands, it appears that there is a plethora of challenges that must be hurdled in promoting adaptation strategies to weather variability in rice-based farming systems. The proposed extension framework is expected to give some direction toward addressing those challenges. The coming together of key players and the provision of much needed support in particular can help enhance farmer resiliency in rice-based farming communities.

CONCLUSIONS AND RECOMMENDATIONS

Farmers acknowledged that increased occurrence of drought and high temperature are the most observable weather variability. The factors associated with the decision to adopt adaptation practices were type of agriculture, total cultivated area, total cultivated area for rice, and credit availability. Farmers accessed information from farmer to farmer regularly, but they prefer to get information straight from AEA since they can outrightly clarify confusing issues.

Moreover, the decision to adopt most of adaptation practices were associated with various information sources such as AEA from INGOs, NGOs, group meetings, attendance to demonstration, field days, FFS, training course, and printed media. Some adaptation practices such

as changing crops; changing planting method; practicing intercropping, crop diversification, and crop rotation; cultivating vegetables; and rearing ducks were significantly associated to production. Family income was affected by the use of drought-resistant and short-duration varieties, and migration.

A more vigorous extension campaign to promote adaptation practices is thus necessary. To promote adaptation strategies to weather variability in a rice-based farming system, there is a need for a suitable extension program to promote adaptation to weather variability.

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LITERATURE CITED

- ADAS UK Ltd. and University of Leeds. (2013). Climate change and extreme weather events: Establishing a methodology for Estimating Economic Impacts on Agriculture. Retrieved from randd.defra.gov.uk/Document.aspx?Document=11293_ExtremeWeatherFinalReport on 16 May 2018.
- Adger, W. N., Agrawala, S., Mirza, M. M. Q., Conde, C., Brien, K. O., Pulhin, J., Pulwarty, R., Smit, B., & Takahashi, K. (2007). Assessment of adaptation practices, options, constraints and capacity. In M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden, & C. E. Hanson (Eds.). *Climate change 2007: Impacts, adaptation and vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK, 717-743. Retrieved from <https://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-chapter17.pdf> on 16 September 2017.
- Adger, W. N., Huq, S., Brown, K., Conway, D., & Hulme, M. (2003). Adaptation to climate change in the developing world. Retrieved from <http://www.glerl.noaa.gov/seagrant/ClimateChangeWhiteboard/Resources/Uncertainty/climatech/adger03PR.pdf> on 5 November 2016.

- Arkkelin, D. (2014). Using SPSS to understand research and data analysis. Psychology Curricular Materials. Book 1. Retrieved from http://scholar.valpo.edu/psych_oer/1 on 13 July 2018.
- Billah, M. 2013. Adaptation of farming practices by the smallholder farmers in Response to Climate Change. Mymensingh, Bangladesh: Department of Agricultural Extension Education, Bangladesh Agricultural University. pp. 1- 58.
- Dhaka, B. L., Chayal, K., & Poonia, M. K. (2010). Analysis of farmers' perception and adaptation strategies to climate change. *Libyan Agriculture Research Center Journal International*, 1(6): 388-90. Retrieved from http://www.idosi.org/larcji/1_6_10/8.pdf on 7 April 2018.
- Department of Agriculture. (2017). Map of Myanmar relative to its neighboring countries and map of Myinmu Township. Retrieved from the Department of Agriculture, Myinmu Township on 30 June 2017.
- Gibbons, J. D., & Chakraborti, S. (2003). *Nonparametric statistical inference*. Fourth Edition, Revised and Expanded. New York City, USA: Marcel Dekker, Inc. p. 422.
- Intergovernmental Panel on Climate Change. (2001). *Climate change 2001: Impacts, adaptation, and vulnerability*. IPCC Third Assessment Report. United Kingdom: Cambridge University Press.
- Intergovernmental Panel on Climate Change. (2007). *Climate change 2007: Impacts, adaptations and vulnerability*. Introduction contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press.
- Kahn, M. E. (2003). Two measures of progress in adapting to climate change. *Global Environmental Change*, 13, 307-312.
- Klein, R. J. T. & Smith, J. B. (2003). Enhancing the capacity of developing countries to adapt to climate change: A policy relevant research agenda. In J. B. Smith, R. J. T. Klein, & S. Huq (Eds.). *Climate Change, adaptive capacity and development*. London: Imperial College Press, pp. 317-334.
- Kywe, M., Hom, N. H., Htwe, N. M., Hein, Y. Z., & Than, S. M. (2015). Myanmar climate-smart agriculture strategy. Retrieved from file:///D:/Final/MCSA.pdf on 7 March 2017.
- Livelihoods and Food Security Trust Fund (2014). Myanmar Dry Zone Development Program scoping report. FAO Investment Centre. Retrieved from https://www.lift-fund.org/sites/.../Dry_Zone/Dry-Zone-Scoping-Report-Final-pdf.pdf on 6 May 2017.

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- Mace, M. J. (2006). Adaptation under the UN Framework Convention on Climate Change: The international legal framework. In W. N. Adger, J. Paavola, S. Huq, & M. J. Mace (Eds.). *Fairness in adaptation to climate change*. Cambridge, Massachusetts: MIT Press, pp. 53-76.
- Mary, A. L. & Majule, A. E. (2009). Impacts of climate change, variability and adaptation strategies on agriculture in semi arid areas of Tanzania: The case of Manyoni District in Singida Region, Tanzania. *African Journal of Environmental Science*, 3(8), 206-218.
- Maung, M. W. (2014). Climate change awareness and farm level adaptation of rainfed farmers (Central Dry Zone) in Monywa Township, Sagaing Region, Myanmar. Master's thesis. University of the Philippines Los Baños, Philippines.
- Maung, M. W., Pulhin, J. M., Espaldon, M. V. O., & Lalican, N. M. (2016). Climate change awareness and farm level adaptation of farmers (Central Dry Zone) in Monywa Township, Sagaing Region, Myanmar. *Journal of Environmental Science and Management* 19(1), 46-57.
- Okwu. O. J. & Daudu, S. (2011). Extension communication channel preference by farmers in Benue State, Nigeria. *Journal of Agricultural Extension and Rural Development*, 3(5), 88-94.
- Pittock, B. (Ed.) (2003). *Climate change: An Australian guide to the science and potential impacts*. Canberra, Australia: Australian Greenhouse Office.
- Putriawanti and Koji ASAI (2016). Questionnaire Survey on Farming Adaptation for Climate Variability in Serang Municipality, Indonesia. Retrieved from <http://petit.lib.yamaguchi-u.ac.jp/G0000006y2j2/file/26866/20170413165811/A040067000205.pdf> on 13 April 2017.
- Ramamasy, S. & Baas, S. (2007). *Climate variability and change: Adaptation to drought in Bangladesh: A resource book and training guide*. Institutions for Rural Development. Rome, Italy: Food and Agricultural Organization. Retrieved from <ftp://ftp.fao.org/docrep/fao/010/a1247e/a1247e01.pdf> on 25 September 2017.
- Sharma, V. (2015). *Climate change and food production challenges*. Random Publications, p. 269.
- Smit B. (1993) Adaptation to climatic variability and change: Report of the Task Force on Climate Adaptation. Prepared for the Canadian Climate Program, Department of Geography Occasional Paper No. 19, University of Guelph, Guelph.
- Stata Corp. (2019). *Stata: Release 16. Statistical Software*. College Station, TX: StataCorp LLC.

- The, N. E. M. (2012). Impact of climate change on rural livelihoods in Pakokku Township, Magway Region, Myanmar. Master's thesis. Yezin Agricultural University, Myanmar.
- United Nations Framework Convention on Climate Change. (2007). *Climate change: Impacts, vulnerabilities and adaptation in developing countries*. Bonn, Germany: UNFCCC Secretariat.
- Yamane, T. (1973). *Statistics: An introductory analysis* (3rd Ed). New York: Harper & Row.
- Yirga, C. & Hassan, R. M. (2010). Social costs and incentives for optimal control of soil nutrient depletion in the central highlands of Ethiopia. *Agricultural Systems*, 103(3), 153-160.

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