What is a CLIMATE CHANGE-ADAPTIVE SCHOOL?

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Note: We asked parents and/or guardians of students to allow us to use their photos in this publication.

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Foreword

Climate change necessitates creative thinking for the benefit of the rice sector that stands to be among the worst-impacted spheres by this unavoidable phenomenon.

Climate change adaptation (CCA) as an approach solicits and accommodates contributions from all sectors, which are vital and crucial both individually and collectively. While we acknowledge that this should be the case, sometimes not having solid and clear entry points results in fragmented and unsustained efforts, and, by extension, in our being unable to mitigate impacts.

In this book, we conceptualize what a climate change-adaptive (CC-A) school is with reference to schools in rice-farming communities. This book is born out of a project funded by the DA-Bureau of Agricultural Research (BAR) in collaboration with 12 participating schools of the Department of Education (DepEd). Various initiatives on CCA are being vigorously pursued involving schools. The emphasis on disaster risk reduction and management (DRRM) is very prominent as evidenced by the DRRM walls in our public elementary schools nationwide.

This book spices up the discourse on CCA involving schools by providing conceptual clarity on how they can play pivotal roles in CCA focusing on the rice agriculture sector.

Schools interested to replicate this CCA initiative can squeeze insights from the cases presented in Part 1. The cases stem from the project implementation activities of the participating schools. The bias is to expose technologies and strategies that are adaptable given scarce resources. In part 2 of this book, the reader is introduced to the set of ideal elements for a school playing key roles in CCA.

This book is freely available online with some active links to important resources such as the teaching modules that the authors developed, and videos from the participating schools. Check out the online version from this link: http://bit.ly/what-is-a-climate-change-adaptive-school.

SAILILA E. ABDULA
Executive Director
PhilRice

Message

We, at the Bureau of Agricultural Research (BAR), applaud the initiative of the Philippine Rice Research Institute (PhilRice) in engaging the education sector and the youth in advancing climate change awareness and adaptation in the rice sector. As you will learn from this book, climate change-adaptive schools are helping rice farmers to visualize the efficiency of climate change-adaptive technologies. This encourages rice farmers to adapt these technologies thereby building their resilience and reducing their vulnerability.

To the public-school teachers who are the intended audience of this book, may you find this instructive and inspiring. We value your capacity to shape the minds of our youth. I hope that, together with PhilRice, you will be able to build your own climate change-adaptive schools in your respective areas. Our rice farmers will surely benefit from this endeavor. You may also consult the PhilRice book, Communicating Climate Change in the Rice Sector, for additional information on integrating climate change in high school curriculum.

For our part, BAR will continue to support R&D activities that are aligned with the Adaptation and Mitigation Initiative in Agriculture Program of the Department of Agriculture. These R&D projects cater to both short- and long-term adaptation projects to address the risk and vulnerability of the agriculture and fisheries sector.

The journey into building a climate-resilient Philippine agricultural and fisheries sector requires the solidarity of all sectors. For the farmers and fishers, the youth and the future generation, let us continue to work hand-in-hand to make this a reality.

DR. NICOMEDES P. ELEAZAR, *CESO IV*
Director
DA-Bureau of Agricultural Research

Acknowledgment

It took us a while to chart the overall direction and concept for this book. The title is admittedly simple and straightforward, but this book is a testament to an old adage in publications that simple concepts come from complex thinking filled with abstractions on its journey to clarity.

We thank the DA-BAR for the funds to explore this subject matter. The funding enabled us to ask plenty of questions surrounding the involvement of schools in rice-farming communities in CCA. We feel that we have used the resources well in coming up with this book.

We also thank our reviewers (PhilRice) Drs. Eduardo Jimmy P. Quilang, Ricardo F. Orge, and Ronan G. Zagado for their suggestions on how to improve the contents of this book.

Our partners in the Technical Vocational Education Unit in the DepEd Head Office in Manila supported us very well in this project. We have been in constant communication with them, which gave us the opportunity to report bits and pieces of what we have been doing in this project.

We thank our former teammate, Mrs. Jennifer V. Mesa, who is now a full-time wife and mother. She significantly contributed during the conceptualization, literature review, and data collection phases of the project. The same gratitude goes to Harvy G. Divina and Jayson C. Castillo, our administrative assistants, for hurdling paper requirements of this project.

We give special thanks to our participating teachers and their respective supervisors and school administrators for helping us implement this project; for coming up with innovations; and for their critical review of our write-ups on how they implemented the project.

To the farmers whom we have interacted with during our monitoring activities, thank you very much. You all have given us inputs and inspiration to do our work well so we can make sense in the rice-farming communities.

We thank God Almighty for keeping us safe during our travels especially whenever we go to remote areas, for the wisdom, and for the diligence that helped us put everything together in this book.

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July 2019

To our departed good friend, Alfred Franco T. Caballero

Libon Agro-Industrial High School, Albay

Introduction

In 2017 to 2018, our team at PhilRice embarked on a DA-BAR-funded project *"Development of agriculture TecVoc high schools offering crops production as key information hubs on climate change-ready rice production technologies for improved agricultural productivity".* We engaged 12 high schools strategically located across the country, which included some of the best implementers of our previous project – Infomediary Campaign. Banking on the insights drawn from this project, this book aims to conceptualize a climate change-adaptive (CC-A) school.

To manage expectations, CC-A schools are schools that are able to offer ways to adapt to the impacts of weather extremes such as droughts and floods. Adaptation, in this book, "relates to the processes people use to reduce the adverse effects of climate on their livelihood and well-being, and take advantage of new opportunities provided by their changing environment".[1]

Furthermore, CCA here only revolves around rice and rice-based agriculture. The book focuses on strategies and/or technologies that can help rice-farming communities better adapt to climate change. We, however, submit that technologies are not a panacea that ensures CCA wellness. Many conflicting factors can make or break adaptation in any community. These positions, particularly the emphasis on technologies, are not difficult to comprehend considering that the authors are from the Philippine Rice Research Institute. Our credentials on rice and rice-based farming systems put us in a secure position to tackle this issue.

Additionally, among our key motivations in treading this direction is to help influence the discourse on CCA as to the involvement of schools. Nationwide, the link between disaster risk reduction and CCA is laudable. In public schools, one cannot ignore the prominence of DRRM walls, which are highly relevant to ensuring a zero-casualty stance in the event of climate-related disasters. Side by side with this effort, we argue that there is a need to double the efforts concerning the livelihood aspect of CCA. We recognize that a variety of initiatives on climate change-agriculture intersections are in place and have been pursued in the past. In fact, we documented them in our first book.[2]

1. Jones, L. (2010). Overcoming social barriers to adaptation. Retrieved from http://www.odi.org.uk/resources/download/4945.pdf.
2. Manalo, J. A., Balmeo, K. P., Berto, J. C., & Saludez, F. M. (2016). *Youth and Agriculture: The Infomediary Campaign in the Philippines*. Manila, Philippines: DA-PhilRice and DA-Bureau of Agricultural Research.

In this book, our aim is to add conceptual clarity when it comes to school involvement in CCA. Such clarity is important as it influences the discourse. For instance, when one is asked, "what role does a school play in relation to CCA?," it is not easy to come up with a quick response. We do not aim for uniformity in response, to be sure. Given the multiplicity of contexts nationwide, that is impossible. What we aim, however, in this book is to provide the minimum expectations or standards. This way, we will be on the same page, and also, it will be easy to push and evaluate efforts in relation to the agriculture dimension of CCA in the context of school involvement.

Also, beyond the conceptual realm of the climate change- adaptive school, we aim to show real-world examples as to how one can go about concretizing the idea. We re-tell the experiences of our school partners so one can be properly guided in its implementation.

This book is written with a Filipino audience in mind. This should serve as a caution in applying insights from this book in other contexts. Specifically, we have in mind public and private school teachers and school administrators who may want to mainstream CCA in their respective schools, with emphasis on the livelihood component. The book provides insights and hopefully inspiration to anyone who wishes to tread on the same direction.

About the Project

The primary aim of the DA-BAR-funded project was to conceptualize a CC-A school. The project zeroed in on schools located in rice- and rice-based farming communities. In CCA discourse, it is known that multi-faceted efforts are welcome to bail out vulnerable communities and sectors. Schools for obvious reasons can play pivotal roles along this line. In this project, we aimed to erect the minimum standards for school involvement.

Twelve schools participated in this project: Batac National High School in Ilocos Norte, Luna National Vocational High School in La Union, Eastern Pangasinan Agricultural College, Libon Agro – Industrial High School in Albay, Corazon C. Aquino High School in Tarlac, Dingle National High School in Iloilo, Leyte Agro – Industrial School in Leyte, Libacao National Forestry Vocational High School in Aklan, Asuncion National High School in Davao del Norte, Bagumbayan Agro-Industrial High School in Davao Oriental, Baluan National High School in General Santos City, and Maguling National High School in Sarangani.

We carried out this project with our participating schools in 2017-2018. We started with courtesy calls and briefings with the school heads and participating teachers, training on climate change and rice production with the teachers and their principals (at times with the tech-voc education head) at the PhilRice Central Experiment Station in Nueva Ecija. We then reviewed the literature as well as our previous work with schools to identify the components that can be rolled out in our participating schools. In deciding what goes on in the list of components, which we call "menu of interventions" we also went back to the modules in the previous Infomediary Campaign training programs, plus our random conversations with Mr. Rizal Corales and Dr. Aurora Corales who have done massive work in promoting and enriching the *Palayamanan Plus* program not just at PhilRice but nationwide. Hence, many of the components were patterned after *Palayamanan Plus.* We then presented the lists of components to our participating schools and asked them to choose their preferences: rice, vegetable, vermicomposting, fish, and corn. The schools were accorded the liberty to innovate such as adding more components or deviating from the technologies that they learned from PhilRice.

The team visited the schools in several occasions for monitoring. A salient component of this project was the teaching demonstrations conducted by our participating teachers. We gave them modules on teaching climate change and climate change-ready technologies for rice. The modules were in Filipino and designed specifically for young audiences. The teachers, however, were given the chance to innovate in teaching the modules. The teaching demonstration was filmed, with their permission. Present during the filming were some of their co-teachers and the principal. After the demonstration and some random interviews with students, a focus group discussion (FGD) followed to reflect on what transpired. Of interest was to flesh out strategies that worked and those that didn't, with the end in view of coming up with a set of recommendations on how to best teach CCA. (Just a brief note: the team does not claim ownership of any of the rice-farming technologies mentioned in this book.)

Figure 1. Data collection and book-writing

Data and details in this book came from the numerous interviews and FGDs conducted during project implementation, and visits to the schools for monitoring purposes. All interviews and FGDs were audio-recorded and transcribed. During the monitoring, we also took the time to scour the surrounding community to help us better understand the development context.

This book has two parts, the first of which presents how the project was carried out in the 12 sites. We treat each school as a case study by first exposing the development context to bring the reader to the site. We briefly sketch the economic situation in the area as well as the experiences of farmers about weather extremes. The book does not establish causation as to whether what are going on in these sites are climate change-related or not. Our basic assumption emanates from IPCC pronouncements that with climate change, chances for the occurrence of weather extremes are high.[3] We then proceed by enumerating the components that they pursued with their corresponding description and justification. We invite the reader to pay close attention to how the schools justified their choices of components as that reveals the logic of implementation. We argue that in CCA, coming up with winning strategies will help rice-farming communities soften the hard impacts of climate change.

In most cases, we have the *Technology Highlights* section that characterizes the technologies that the school employed particularly well or they wish to highlight, owing to contextual relevance. Each case study presentation is concluded with the immediate outcomes section, which details the project accomplishments of the schools. This section expectedly contains instances of information-sharing, and activities conducted to reach out to their immediate community. (Depending on the extent of community outreach that the schools initiated, we sometimes devote a separate section for *"Reaching out to the community"*) For the first part, each case report was reviewed at least by the participating teacher. The Tech-Voc Education (TVE) Head and the Principal (or school administrator) at times added some inputs as well. This review process enabled us to minimize, if not totally avoid, glaring errors in chronicling project implementation.

Using the case studies in part 1, we then conceptualize how schools can play active roles in CCA in a rice-farming community in part 2 of the book. Again, we reiterate that we only tackle the livelihood/agriculture dimension of CCA. In this part, we start by looking at the common elements among our participating schools. We should emphasize that we are not evaluating the schools; we are only reflecting the common denominators that contributed to their success in carrying out this initiative. The reader will find in this section the basic characteristics of a school playing key roles in CCA in their respective communities. It is also in our interest to present the challenges in rolling out this initiative.

3. IPCC. (2012). Managing the risks of extreme events and disasters to advance climate change adaptation. A special report of working groups I and II of the Intergovernmental Panel on Climate Change. Cambridge, UK New York, NewYork, USA: Cambridge University Press.

Theoretical framing

Schools are institutions for learning that serve as sites for the development of the emotional, cognitive, and civic aspects[1] of a human being. Schools prepare human beings to become members of society[2]. Labaree (1997)[3] forwards that schooling is important for credentialing purposes.

In relation to CCA, schools, aside from their teaching role, are not given much attention. What is most common in the literature are studies that relate to complexities in teaching climate change and the biases of educators in terms of the content that they teach in class[4, 5]. It should also be noted that most of the scholarship available in relation to schools are on teaching general knowledge on climate change[6, 7] with the adaptation and mitigation strategies not given much attention. In developing countries like the Philippines, CCA is important as climate change is expected to bring about negative impacts on livelihoods, which increase the vulnerability of rural populations[8, 9]. In sum, it can be said that in relation to CCA, the role of the school is not optimized. In this work, we want to expand the roles played by the schools in CCA. For one, schools are a force to be reckoned with given their strategic locations. In the Philippines, schools are built even in the remotest valleys and hills. Schools can play pivotal roles in disseminating knowledge on CCA. This is a conceptualization engendered by the urgency of the climate change phenomenon.

By expanding their roles, we mean a strengthened school-community linkage. In taking this route, we do not say that this is an entirely unique direction. To be safe, school-community linkages in relation to climate change in general exist such as conduct of tree-planting activities, solid waste management, and others. This linkage is a direction that has been taken for the longest time by universities offering agricultural extension courses, but not among secondary schools. We argue that in many remote communities, and with the rise of the Kto12 curriculum, school-

1. Stemler, S. (2019). How the primary purposes of schooling have shifted over time [Video file]. Retrieved from http://www.purposeofschool.com/philosophical/
2. Counts, G. S. (1978). *Dare the schools build a new social order?* Carbondale, Illinois: Southern Illinois University Press.
3. Labaree, D. F. (1997). *How to succeed in school without really learning.* New Haven, CT: Yale University Press.
4. Duschl, R. (1990). *Restructuring science education: The importance of theories and their development.* New York: Teacher's College Press.
5. Waters-Adams, S. (2006). The relationship between understanding of the nature of science and practice: The influence of teachers' beliefs about education, teaching, and learning. *International Journal of Science Education, 28*(8), 919–944.
6. Ratinen, I., Viiri, J., & Lehesvuori, S. (2013). Primary school student teachers' understanding of climate change: Comparing the results given by concept maps and communication analysis. *Research in Science Education, 43*(5), 1801–1823.
7. Herman, B. C., Feldman, A., & Vernaza-Hernandez, V. (2015). Florida and Puerto Rico secondary science teachers' knowledge and teaching of climate change science. *International Journal of Science and Mathematics Education, 15*(3), 451-471. doi:doi:10.1007/s10763-015-9706-6
8. Buendia, L., Valdeavilla, A., & Escaño, C. (1993). Implication of climate change in the Philippine agriculture *Journal of Agricultural Meteorology, 48*(5), 611-614.
9. Lansigan, F. P. (2008). Frequency analysis of extreme hydrologic events and assessment of water stress in a changing climate in the Philippines. In M. Taniguchi, W. C. Burnett, Y. Fukushima, M. Haigh, & Y. Umezawa (Eds.), *From Headwaters to the Ocean* (pp. 497-501). London: CRC Press.

community linkage is one that secondary schools can very easily do, in a more toned-down level, however. In communities not serviced well by available extension modalities owing to several constraints, schools can fill in.

With the Climate Change Act's strong anchorage on disaster risk reduction and management (DRRM), it is also appreciated that local public schools prominently display their DRRM walls with most salient information on how people can manage disasters brought about by climate change-related extreme weather events. While these are all welcome initiatives, we insist that there is a need for a clearer framework as to how schools in rice-farming communities can play pivotal roles in CCA, particularly on its livelihood dimension.

The roles played by schools must go beyond classroom-teaching, to include demonstrating and promoting technologies, and engaging the local communities to come up with the best adaptation strategies.

Our work is novel for two reasons. First, specific to CCA in rice-farming communities, this is the first work of this scale that we know to have scrutinized how schools in these communities can play pivotal roles in CCA. Second, this is among the very few initiatives that thoroughly document the experiences of participating schools in making this kind of initiative operational. It is also worth recognizing that this work builds on earlier and more established concepts of DepEd's *Gulayan sa Paaralan* and PhilRice's *Palayamanan Plus.* We contend that innovations rest on the shoulders of giants.

It is also safe to forward that our work is highly replicable—that is truly the main motive in coming up with this book: for interested parties to learn from the cases, mix and match with the menu of interventions so they can optimize results from this initiative. As one reads along, the policy imperatives for this kind of initiative to be successful, particularly in Part II, are laid down for his/her appreciation and possible assimilation.

Dingle National High School

Corazon C. Aquino High School

Libon Agro-Industrial High School

Maguling National High School

Eastern Pangasinan Agricultural College

PART 1

Our 12 participating schools and climate change adaptation (CCA)

In this part of the book, we want you to:

- Know the what, why, and how of the project implementation
- See if an area represents your area
- See if the technologies and strategies implemented suit your area
- Get inspiration from what our participating schools have done

We feature here what our teachers did. Hence, we go for practical and relevant technologies and strategies that ordinary schools, mostly with not much resources, can implement. We bank on the creativity and ingenuity of our participating schools. We also forward that our participating teachers, and in some cases their respective Technical Vocational Education (TVE) heads and principals, reviewed their respective sections in this part of the book. Read on and learn from our participating schools!

Batac National High School, Ilocos Norte

SCHOOL

Batac National High School

(BNHS [formerly BNHS – Bungon campus])

LOCATION
Batac City, Ilocos Norte

POPULATION
775 (SY 2018-2019)

PARTICIPATING TEACHER
Norelyn Dela Cruz

PRINCIPAL
Romeo N. Villorente

Development Context

The 5th class city of Batac produces a variety of agricultural goods, from crops to livestock. In 2015, at least 22% of its residents worked in the agriculture, forestry, and fishery sectors while others were involved in commerce, and craft and trade. Of its 16,101 ha total land area, 5,618 ha grow rice, corn, and some vegetables. During the wet season (WS), rice occupies 74% of the city's total agricultural land. In 2016 WS, rice farmers averaged 4.57t/ha. In the dry season (DS), only 220ha can grow rice as agricultural areas are mainly rainfed. While the city has communal irrigation systems, the water generated could only supplement during the WS.

Unpredictable weather intensifies the water scarcity issue in the city. In 2015 and 2016, the rainy season came in later than expected so farmers had to adjust their cropping calendar.[1] Moreover, rainfall was below normal in the previous years. PAGASA weather bureau reported only 60mm of rainfall in July to August 2015 in Ilocos Norte, way lower than the 500mm that fell on the same period in 2014.[2] As a result, the city incurred P19 million worth of damage in farmlands in 2015 according to the Provincial Agriculture Office. Farmers could hardly distinguish between dry and wet seasons in recent years, which has caused them significant farm losses. The city government of Batac, together with concerned government agencies has started building small farm reservoirs in its barangays to reduce the ill effects of water inadequacy.[3] In areas where rice cannot thrive during DS, farmers plant corn, vegetables, legumes, or rootcrops. In BNHS, 90% of students are daughters and sons of farming households with rice as their main crop.

1. Corales, R. G., Corales, A. M., & Manalo, J. A. (Eds.). (2019). *Palayamanan Plus*. Manila: Philippine Rice Research Institute.
2. Adriano, L. (2015, April 21). Drought-hit farmers welcome rain brought by 'Ineng'. *Philippine Daily Inquirer*. Retrieved from https://newsinfo.inquirer.net/715027/drought-hit-farmers-welcome-rain-brought-by-ineng
3. Andres, R. (2018, April 4). Ilocos Norte LGUs to get help on climate change woes. *Philippine News Agency.* Retrieved from http://www.pna.gov.ph/index.php/articles/1030790

Menu of interventions

Rice garden. BNHS initiated the adopt-a-lot program to address its lack of area for a rice garden. They searched for landowners who were willing to lend a portion of their plots for the students to cultivate. Through proper coordination with the Batac City Committee on Agriculture in 2014, they were able to borrow a 750-m^2 irrigated area in Brgy. Baay, an 8-min ride away from the school. The students planted inbred (NSIC Rc 222) and hybrid (SL 12) rice varieties. They transplanted wetbed and modified dapog seedlings. They conducted agro-ecosystem analysis (AESA) and used the Leaf Color Chart (LCC) and organic concoctions in managing the rice crop. As agreed, a small portion of their harvest was given to the landowner as rent. In 2017, BNHS borrowed another 1,800-m^2 lot beside the school from one of its stakeholders. As we write, a Memorandum of Agreement (MOA) is currently being processed to cement the partnership for at least 2 years. They planted the inbred PSB Rc 82. Apart from the rent, harvests from the two lots were stored as seeds for the next cropping season. While the other lot was sufficient for the students' practicum, the school decided to keep the lot in Baay because Norelyn Dela Cruz, our partner-teacher, deemed the location strategic for her students who reside in that barangay.

Vegetable production. All sections in the junior and senior high school classes maintained their own small vegetable areas; thus, plots were scattered around BNHS. The school focused on intensifying these gardens by giving seeds and fertilizers such as vermicast and organic concoctions to each class. In their own plot, our partner-teacher and her students produced string beans. They also planted some vegetables and hyacinth along the dikes of the rice plots.

Fish production. The school also ventured into tilapia production to optimize their existing 750- m^2 water-harvesting facility. They partnered with their local fisheries and aquatic resources bureau that gave them 3,700 fingerlings. Once in 2018, they harvested 25 kg of tilapia which they sold to their visitors. Some of it were cooked and served during the school's festivities.

Vermicomposting. BNHS also produced vermicast in four vermi beds at 0.5x1.2m size each. They used substrates such as rice straw and cow manure acquired from farmers' fields; rice hull from rice mills free of charge; vegetable leftovers and other materials available in their school surroundings such as *kakawate* and *ipil-ipil* leaves. They bought African Night Crawler (ANC) earthworms from a local seller in the nearby municipality of Paoay. In 2018, they harvested 6-8 sacks of vermicast, which the school used in maintaining its rice and vegetable gardens. Meanwhile, the Agricultural Training Institute (ATI) also showed support by providing capacity enhancement activities to the agriculture teachers and agri-crop students of BNHS.

Reaching out to their community

BNHS had a different take in reaching out to their community. They involved *Gulayan sa Paaralan Program* (GPP) coordinators from elementary and secondary schools in Batac City in a 1-day seminar on the basics of climate change and mostly rice technologies for its adaptation. The activities included lectures on modified dapog, carbonized rice hull (CRH), minus-one-element technique (MOET), LCC, *Palayamanan Plus* and sorjan farming systems, capillarigation, and AESA. Teacher Dela Cruz, her agri-crop production students, and some PhilRice personnel delivered the lectures and demonstrations. The event was supported by a MOA between the school and the city schools division superintendent. At least 10 GPP school coordinators, and all BNHS teachers attended the seminar. Agri or non-agri, these teachers were grateful for the seminar because they themselves maintained gardens in their schools and households. According to our partner-teacher, it was best for them to tap GPP coordinators because they were influential in disseminating information to a larger number of students and parents. The school also discussed the project and introduced the technologies to parents who visited or attended meetings in BNHS.

Their adopt-a-lot program also earned good impression from onlookers. Dela Cruz said some farmers showed interest in the certified seeds and CRH that the school used in their plots.

Technology Highlights

The school highlighted the use of quality seeds, proper pest and nutrient management, and water-saving technology as a means to adapt to the drought and reduced rainfall that farmers had experienced lately.

Use of certified seeds. Improving farm productivity had been the most compelling strategy that the school identified. Thus, they managed to always buy quality seeds from accredited seed growers for their hybrid and inbred seed needs. They usually plant PSB Rc 82 because according to the teacher it is one of the widely available seeds in the market. Rc 82 is an early-maturing variety at 109 days, and is good for water-scarce areas like Batac. Meanwhile, our partner-teacher also showed the differences between inbred and hybrid seeds as her students in the past believed that the two were the same.

Carbonized rice hull (CRH) and vermicast application. One of the most common pests faced by Batac farmers are golden apple snails (GAS). BNHS introduced CRH as an effective way of managing GAS in the ricefield. They also promoted organic agriculture; thus, they produced and applied their own vermicast and organic concoctions such as fermented fruit and plant juices.

Water-harvesting facility. With their scarce water resource, the school actively harvested and saved rainwater. Along the school were canals that catch water and channel it down to the small water reservoir. The accumulated water is used in their vegetable plots, and a certain portion of the reservoir is utilized for tilapia production.

Immediate outcomes

Through the school's initiatives, adoption of certain technologies became evident on some parents and farmers from nearby areas.

A rice-tobacco farmer started using CRH in his rice farm to reduce GAS infestation and as soil conditioner. For a time, he had been burning rice hull to dry tobacco leaves through a machine. It was only when his son shared to him the benefits of CRH that he learned and tried the technology. He said he was unaware that the CRH he had been producing had remarkable benefits.

Two more students also shared the use of CRH to their parents. Another two students introduced AESA and organic farming to their parents. We were, however, unable to follow through on the outcome.

Meanwhile, one of our partner-teacher's colleagues also became interested in modified dapog technology after attending the BNHS seminar. A week after the activity, she decided to discuss the technology to her father. She later found that he was doing modified dapog after learning it through the local agriculture office but stopped after a few tries. With persuasion and provision of a mosquito net, her father decided to use the technology again. She shared that their transplanting cost was greatly reduced plus the fact that their work became considerably lighter.

Several partnerships were formed out of this project. As mentioned earlier, BFAR and ATI readily assisted the school, specifically in providing fingerlings and technical knowledge, knowing that BNHS had properly sustained their farm production initiatives.

Similar with other partner-schools, BNHS registered significant enrollment increases in its agri-crop production offering. From 56 enrollees in SY 2015-2016, 69 enrolled in SY 2016-2017, and 90 in SY 2017-2018. Our partner-teacher Norelyn Dela Cruz noted that the project somehow influenced the students' choice because they have proven that there's future in agriculture, and there's more to it than tilling the soil.

Luna National Vocational High School, La Union

SCHOOL

Luna National Vocational High School (LNVHS)

LOCATION
Alcala, Luna, La Union

POPULATION
390 (SY 2018-2019)

PARTICIPATING TEACHERS
Virgilio L. Medina and Arnulfo N. Libao

PRINCIPAL
Perpetua M. Eslava, Ph.D.

Development Context

Luna is a 3rd class coastal municipality in La Union with 40 barangays[1]. The cities nearest it are San Fernando, Candon, Baguio, and Dagupan. Stone-picking is a known industry in Luna, and is a major source of livelihood of 14 of its barangays[2]. Based on our interviews, a stone picker earns on average P200-400/day. The town's seawater is home to different kinds of fish and edible seaweed. Rice farming and fishing are the main sources of livelihood of its residents. A rainfed area, farmers can only plant rice once a year, followed by vegetables and root crops. Luna also hosts several tourist destinations, one of which is the Baluarte, a 400-year-old watchtower in Brgy. Victoria.

Luna is a catch basin of the municipalities of Sudipen, Bangar, and Balaoan in La Union. Locals say that the town used to be a major rice producer. Flooding in the town has intensified in recent years lasting up to 2 weeks, which damages rice crops. Farmers also talk of the unpredictability of weather, which makes it difficult for them to plan their activities during the cropping season. Before, farmers prepared seeds in May when rain usually comes. In recent years, the restless rainfall pattern makes planting risky. Weather unpredictability has also resulted in staggered planting. Farmers also note that strong typhoons usually hit them come harvest time - August, September, or October. Most farmers have resorted to securing their crops through the Philippine Crop Insurance Corporation. In LNVHS, 40% of the students come from rice-farming households.

1. PhilAtlas. (2019). Luna, Province of La Union. Retrieved from https://www.philatlas.com/luzon/r01/la-union/luna.html
2. Provincial Government of La Union. (2019). Municipality of Luna. Retrieved from https://launion.gov.ph/luna-la-union/

Menu of interventions

Rice garden. This is a well-established project component in LNVHS, which devoted 850 m^2 to serve as practicum area for students as well as a demonstration area for rice varieties NSIC Rc 238, Rc 300, and Rc 396. The modified *dapog,* ecological engineering, drumseeder, LCC, and MOET technologies were also showcased. The *dapog* and drumseeder options were highlighted on account of the labor scarcity predicament. The school bought its own unit of drumseeder.

Vermicomposting. The school had three 1x2m vermibeds. They acquired African Night Crawler (ANC) worms from the DA Regional Field Office in San Fernando City. As salinity is an issue in the area, the school regularly produced vermicompost and vermicast as supplementary fertilizers for their rice and vegetable gardens. They sold vermicast to walk-in customers such as students, dragon fruit farmers, and teachers. Vermicast is priced P15/kg; ANC at P500/kg. This component, teachers Medina and Libao said, is easy to establish given the ready availability of raw materials such as *madre de cacao* leaves, banana trunks and leaves, and cow manure.

Vegetable production. Expectedly, the Ilocano blood in Luna influenced their small *pinakbet* garden. In about 200 m^2 grew different vegetables used in the *pinakbet* dish such as bitter gourd and squash. Capillarigation, drip irrigation, and container gardening were also demonstrated.


PHOTO BY VIRGILIO MEDINA

Fish culture. Measuring only 3x6x1m, they showcased aquaponics where the waste of fish was used as fertilizer of plants grown hydroponically. They also had a rainwater-harvesting facility, which is highly needed in a rainfed area like Luna.

Reaching out to their community

The school had two vital activities to showcase their work. The first was their Harvest Festival where they invited Luna farmers to visit their rice garden. The second event was the vermicomposting lecture of Mr. Medina together with his students in their neighboring high school, Bungro-Sucoc Integrated School (BSIS), attended by more than 200 students, parents, and teachers. Medina delivered the lecture while his students demonstrated the technologies on organic pesticides, bio-fertilizer making, and vermicomposting. This was a win-win collaboration for both parties. For one, BSIS had plenty of vermi materials such as animal manure, rice straw, banana bracts/leaves, *madre de cacao,* and neem tree leaves. In fact, LNVHS sourced their materials from BSIS. Initially, BSIS bought vermicast from LNVHS for their *Gulayan sa Paaralan* Project. To date, BSIS is producing its own vermicast, with an initial harvest of four sacks.

Technology Highlights

LNVHS had set up quite a number of components along with their component technologies. Given their context, the school deliberately put up the following:

Raincatcher. This is a rainwater-harvesting facility, which is highly needed in their community. The school decided to put this up to amplify the importance of saving water to irrigate their crops. This is very relevant given that their area is rainfed.

Drip irrigation and capillarigation. These technologies helped the school to efficiently use water in irrigating their vegetables. They managed to grow various vegetables such as eggplant, pepper, tomato, and squash.

Experiment on different setups of trellises for vegetables. This helped them identify which type can withstand strong winds.

PHOTOS BY VIRGILIO MEDINA

Immediate outcomes

We saw plenty of immediate outcomes in LNVHS. In our snowballing, we noted that the information students learned from their teacher or school was passed on to their parents almost seamlessly. An example was when a student outlined to his father how to feed and grow African Night Crawlers. His father believed his sharing knowing that the information was backed up by what his parent saw in their school.

Aside from the wide spread of information, the school served as a rallying point of information on technologies for climate change adaptation. LNVHS did this by inviting parents to see their setup during Parents and Teachers Association meetings. There were even some instances when teachers, parents, and officials of the Department of Education bought vegetables from the students. Likewise, their neighboring schools benchmarked with them in terms of the agricultural technologies that they implemented. The BSIS, for instance, after exchanging thoughts with our partner-teachers Medina and Libao and seeing the setup in the school, started to put up their own vermicomposting facility with two 10-feet vermibeds.

Farmers in their surrounding community have expressed interest in what the school is doing as they wanted to buy their seeds. It should be emphasized that many of the farmers we interviewed did not have children in the school. They just came to visit because they were impressed by LNVHS's rice area, and that they saw the good performance of seeds bought by their co-farmers from the school. The desire to buy seeds from the school was necessitated by the reality that Luna had only one seed center; hence, having an alternative source is welcome.

Eastern Pangasinan Agricultural College

SCHOOL

Eastern Pangasinan Agricultural College (EPAC)

LOCATION
Sta. Maria, Pangasinan

PARTICIPATING TEACHER
Jocelyn Alarcio

POPULATION
1,649 (SY 2018-2019)

PRINCIPAL
Phoebe F. Kagaoan

Development Context

Sta. Maria is an agricultural , 4th class municipality. Major sources of income are agricultural products, livestock, poultry, and concrete aggregates such as gravel, sand, and crushed stones. It has 23 barangays spread over 3,500 ha[1].

Rice and corn are its top commodities. Being a rainfed area, rice is planted just once a year while corn is cultivated twice or thrice a year. Vegetables are planted all year-round.

The town suffers from drought and flood making farming challenging. In 2015, a ready-for-harvest 4-ha rice area was swept away by a destructive storm. In 2017, El Niño dried up the town, delaying the start of the cropping season. In general, farmers find the weather very unpredictable. They would usually start their cropping activities at the onset of rain in May but lately, rain had been falling in June or July. Coupled with weather extremes is an observation that farmers in the area apply more fertilizers now than before as they sense that the nutrients of the soil have been greatly depleted over the years.

In this participating school, 80% of the students come from households that rely on agriculture for livelihood. The rest of the families depend on non-farm work such as working overseas or selling goods in the market. On the side, however, these families also maintain their own farms.

1. Province of Pangasinan. (2011). Santa Maria. Retrieved from http://pangasinan.gov.ph/the-province/cities-and-municipalities/santa-maria/

Menu of interventions

EPAC took diversified farming to heart. They converted their small land area for the project into a diversified farming demonstration area. We usually cite EPAC's setup as an example of land use optimization. A visitor would be amazed to see that plenty of elements could all fit in a small land area. Rice, corn, vegetables, and ornamentals are planted in a 420 m^2 area. They also set up a nursery for fruits and vegetables, and ventured into piggery and mushroom production. The main motivation in designing their implementation in this manner was to promote alternative sources of income given that the town is subjected to weather extremes.

Reaching out to their community

Teacher Alarcio told us that she did some visits with her students and asked them about instances of sharing regarding some technologies for CCA they learned in school. In her visits, she tried to add some more information to households that may have implemented some of the components that they also have in school like vermicomposting.

Immediate outcomes

Similar with other schools, we have noted instances of sharing of information by the students to their farmer-parents. In our snowballing, we followed through one student who shared about the use of effective microorganism to his father who ended up using it in rice straw for fast decomposition and in their piggery to manage the bad odor. Another student tackled how to choose rice varieties suited in their area. The same student also convinced her parents to not burn rice straw; instead, they used it as mulch for their vegetables.

As of this writing, our partner-teacher has passed on to two of her colleagues her knowledge about different farming technologies such as the MOET, LCC, and ecological engineering. Teacher Alarcio also started using the PinoyRice. EPAC was also successful in its agripreneurial attempt. In an AgriExpo, they sold 20 3-kg packs of vermicast at P50/pack; and 50 2-kg packs of CRH at P30/pack. After remitting 10% of the income to the school and 20% to the students, the rest was used to buy fertilizers and seeds for their next cropping. On top of selling vegetables, EPAC's Food Processing Department also got on board by processing their harvest into rice wine and other products.

Corazon C. Aquino High School, Tarlac

SCHOOL

Corazon C. Aquino High School (CCAHS)

LOCATION
Gerona, Tarlac

POPULATION
>3500 (SY 2018-2019)

PARTICIPATING TEACHERS
Marlo D. Parazo and Marlene S. Arciaga

PRINCIPAL
Corazon V. Abellar

Development Context

Tarlac is a major rice-producing province, grossing in 2017 579,013 mt of rice along with other crops such as corn, coconut, vegetables, and sugarcane. The province had 73,207 farmers.[1]

In Gerona, one of its 1st class municipalities, farming remains a key driver of local economy despite its rapid urbanization. More than 9,900ha of its total land area (14,147 ha) are devoted for agriculture, of which approximately 4681.75ha are planted to rice.[2] More than half of this rice area is irrigated; the rest is rainfed.

Agricultural workers account for 57% of the municipality's workforce. According to the 2012 Municipal and City-Level Poverty Estimates of the Philippine Statistics Authority (PSA), poverty in Gerona is at 10.9%. As of December 2017, the National Household Targeting Office of the Department of Social Welfare and Development has identified 2,421 households that cannot afford their basic needs such as food, health care, shelter, and education.[3]

In relation to climate change, farmers lamented that they could not predict the weather pattern, which is very important in planning their field activities. The province also had drastic weather-related agricultural losses. In 2018, Tarlac lost P445.873 million to three destructive typhoons.[4]

1. Tarlac Provincial Agriculture Office. (2019). Request for Agricultural Info/Data. [Email]
2. Province of Tarlac. (2015). Municipality of Gerona. Retrieved from http://www.gerona.gov.ph/about-us/municipalprofile/
3. National Household Targeting System for Poverty Reduction (NHTS-PR). (2017). National Household Targeting Office: Department of Social Welfare and Development
4. Baldosa, C. (2018). DA provides swift response on typhoon stricken areas in Tarlac. Retrieved from http://www.da.gov.ph/da-provides-swift-response-on-typhoon-stricken-areas-in-tarlac/

Menu of interventions

PHOTO BY MARLENE ARCIAGA

Rice garden. Despite limited area, CCAHS managed to set up a rice garden that showcased the modified dapog, Minus-One-Element Technique, observation well, Leaf Color Chart technologies, and varieties NSIC Rc 222 and Rc 160. This also served as a laboratory and demonstration area for students and their farmer-parents. A farmer offered approximately 80 m^2 of his land outside the school for this purpose, free of charge. Rice was planted in the garden during the first semester.

PHOTO BY MARLO PARAZO

Vegetable garden. This component was pursued in the second semester on the same spot as rice, even as containers were also planted to maximize space. Students planted the vegetables tomato, pechay, eggplant, lady's finger, string beans, squash, and winged beans. The produce was sold to the school cafeteria and teachers; some of it was spared to the students.

PHOTOS BY MARLENE ARCIAGA

Vermiculture. This component started with a kilogram of African Night Crawlers bought from a farm in Bamban, Tarlac. As of this writing, the school has three beds (1x5x3m) for vermiculture.

PHOTO BY MARLO PARAZO

Floating garden. In 2017, CCAHS initiated this component to utilize a frequently flooded area inside the school. They set up two gardens planted with water spinach, tomato, and eggplant. The school also planned to set up another flood-ready technology—sorjan gardening.

Reaching out to their community

PHOTOS BY MARLENE ARCIAGA

CCAHS knew better than to keep their learnings to themselves. They invited farmers to visit their school and see the varieties they planted. Several seminars were conducted with our partner-teachers as resource speakers. Mr. Parazo lectured on the Modified Dapog Technology with more than 20 farmers in attendance. Likewise, Mrs. Arciaga also lectured about different rice production technologies in one of her professors' classes in Tarlac State University. In July 2018, as part of the Nutrition Month celebration, our partner-teachers delivered lectures anew attended by students and farmer-parents in CCAHS.

Immediate Outcomes

CCAHS students passed on information to their parents, convincing them to adopt and adapt several strategies and/or technologies. A student persuaded his parents to try setting up a floating garden. Cases of farmer-parents sharing with other farmers the information materials they received from their children were also noted.

Another classic example of this outcome is the story of a young lady who introduced *Palayamanan* to her grandmother. During our snowballing, she told us that their ricefield used to be so bare with lots of unutilized areas. After hearing about the concept of *Palayamanan i*n school, she echoed it to her grandmother who then started planting malunggay, papaya, bitter gourd, sugar apple, and taro in the previously empty areas.

In the school's interest, the initiative provided other sources of income. It also expanded the school's network as evidenced by new collaborations that stemmed from this project. They partnered with the Municipal Agriculture Office for their lectures on rice production, which provided them seeds in support of the climate change-adaptive schools project. They were even invited to participate in the provincial competition for vermicomposting and won 4th place among 15 participating schools. CCAHS sold vermicompost at P250 per bag. They also used their vermicompost for rice and vegetable production.

Libon Agro-Industrial High School, Albay

SCHOOL

Libon Agro-Industrial High School (LAIHS)

LOCATION
Libon, Albay

POPULATION
2062 (SY 2018-2019)

PARTICIPATING TEACHER
Lilybeth N. Nolasco

PRINCIPAL
Dr. Lourdes R. Bigcas

Development Context

Albay is a 1st class province comprising 15 municipalities and 3 cities[1]. It has a land area of 2,554km^2 that constitutes 14% of the entire Bicol region[2]. With its fertile lands and long coastal areas, agriculture and commercial fishing are among the major industries in the province. On top of agricultural products are rice, corn, coconut, mango, and banana[3]. Most of Albay is irrigated while some areas are considered rainfed. In 2017, the province produced 175,189mt irrigated rice and 29,635mt of rainfed rice. Other important industries include handicrafts, manufacturing, and tourism. Around 65% of the population are farmers[4].

Agriculture and fishing are also the key drivers of the economy in Libon, a 1st class municipality in Albay. It has an estimated land area of 222.076 km^2 (about 8.7% of the province's total area) divided into 47 barangays. It houses the Pantao Port that connects the Visayas and Mindanao with the rest of Luzon; it is about 300 km southeast of Manila[5].

Similar with other sites, farmers in Libon attested that they could no longer predict the weather that made them tinker with their usual planting dates. During our interviews in July 2018, farmers were still preparing their fields as it has just started to rain. One farmer, who had been in business for 30 years, said that was not the case in the previous seasons because they usually start planting in June. She said even with the irrigation system, farmers were still dependent on rainwater. Ironically, flooding was also a problem as the town serves as the catch basin of Albay. Another

1. Philippine Statistics Authority. (2018). Philippine Standard Geographic Code. Retrieved from https://psa.gov.ph/classification/psgc/?q=psgc/citimuni/050500000
2. Philippine Information Agency. (2019). Albay. Retrieved from https://pia.gov.ph/provinces/albay
3. Philippine Statistics Authority. (2018). Quickstat Albay Retrieved from https://psa.gov.ph/statistics/quickstat/provincial-quickstat/2018/Region%20V%20%28Bicol%29/Albay
4. Philippine News Agency. (2016). Albay solon eyes big dams to irrigate farmlands during dry spells. *Business Mirror.* Retrieved from https://businessmirror.com.ph/2016/08/22/albay-solon-eyes-big-dams-to-irrigate-farmlands-during-dry-spells/
5. Province of Albay. (2019). About Albay. Retrieved from http://albay.gov.ph/about/

farmer said his field gets flooded even with little rain, which is not the case before. In December 2018, Libon was among the places battered by a typhoon that brought landslides and flash floods in the Bicol region and initially damaged P514 million in the rice sector alone[4]. In terms of poverty, Libon had 5,572 poor households as of December 2017[6]. In 2015, Bicol ranked poorest in the country with 2,172,414 poor individuals[7].

In LAIHS, approximately 50% of the school population come from rice-farming households. Other families are engaged in other sectors of agriculture, fishing, services, and business.

Menu of interventions

Rice garden. Initiating this component was a challenge to LAIHS as they had no extra lot for it. Fortunately, the Parent-Teachers Association agreed to cover and lease about 0.8ha of land for P70,000 for four cropping seasons. Just a few meters away from the school, this served as a field site for students to practice rice farming firsthand. The school used approximately 0.6ha for their rice garden and the remaining area for other crops such as cassava, eggplant, camote, and corn. In the rice garden, they demonstrated technologies such as ecological engineering, MOET, LCC, and the use of quality seeds NSIC Rc 222 and Rc 354.

6. National Household Targeting System for Poverty Reduction. (2017). National Targeting Office: Department of Social Welfare and Development
7. Philippine Statistics Authority. (2016). Official poverty statistics of the Philippines: Full year 2015. Retrieved from https://psa.gov.ph/sites/default/files/2015%20Full%20Year%20Official%20Poverty%20Statistics%20of%20the%20Philippines%20Publication.pdf

Vermicomposting. The school used carabao manure, *kakawate,* banana trunks and peelings they got from their canteen, rice straw from their rice garden, and other bio-degradable trash as feed for the vermi worms. Initially, they bought 2kg of African Night Crawlers from a farm in Guinobatan, Albay. They used vermicast for their vegetable gardens.

Vegetable garden. This 500m^2 garden is located just beside the school's vermicomposting setup. They planted spring onions, pechay, *okra,* and *kangkong* fertilized with vermicast.

Reaching out to their community

LAIHS students presented technologies for CCA during Parents and Teachers Association meetings usually attended by 300 parents. Teacher Nolasco distributed printed materials on rice production and expounded on technologies such as LCC, MOET, Palayamanan, ecological engineering, rice varieties, CRH, controlled irrigation, and vermicomposting. Teachers also invited parents to visit the project components they carried out. Another school extension activity was a seminar in nearby barangay San Isidro where students served as resource speakers. They distributed printed materials and 10kg rice seeds that they produced in their rice garden to the 25 attending farmers.

Technology Highlight

During our interviews, two farmers' problems that surfaced were the prevalence of the tungro virus and insufficient water supply. Given their situation, LAIHS was cautious in choosing the right varieties they planted in their rice garden. In the 2018 dry season, they planted NSIC Rc 222, a variety moderately resistant to green leafhoppers, the tungro virus carrier. That season, other ricefields were infected by the virus except the school's rice garden.

Immediate Outcomes

Being zealous in carrying out the project, several outcomes arose from our partnership with LAIHS. The components they implemented attracted farmers who became curious after seeing them with outstanding results. In rice, farmers inquired about the variety the school planted as it yielded better than theirs. During our interviews, a farmer affirmed that the school setup of the rice garden was impressive. They sold their produce to traders and used some of the income for their feeding programs. Some farmers also inquired on how to set up vermicomposting. They sold vermi worms at P800/kg; vermicast at P20/kg. They even erected a booth inside the school where they displayed 5kg bags of vermicast especially during PTA meetings.

The activities done by LAIHS did not only capture the curiosity of farmers but also of other teachers from different tracks. They joined our partner-teacher Nolasco during field demonstrations and even tried operating LAIHS machines. They also bought their products particularly vermicast and vegetables. Support from the provincial and municipal agriculture offices also intensified. The PAO provided them organic fertilizers while the MAO provided them seeds.

On sharing, we noted several students who passed on the information they learned from school to their farmer-parents. Some of the technologies they shared were vermicomposting, ecological engineering, LCC, MOET, and the floating garden.


PHOTO BY MILVIN ZABALA

SCHOOL

Libacao National Forestry Vocational High School (LNFVHS)

LOCATION
Libacao, Aklan

PARTICIPATING TEACHER
Milvin I. Zabala

POPULATION
1,653 (SY 2018-2019)

PRINCIPAL
Zenas V. Nicolas

Development Context

Libacao is a 3rd class municipality with a poverty incidence of 26% in 2012[1], and agriculture as the main economic activity. Barangay Poblacion that hosts LNFVHS survives on rice, then banana, coconut, abaca, and fruit-bearing trees. Most of the students (80-90%) come from rice-farming households.

Climate change ranked 4th among issues that matter to people in Libacao,[2] with unpredictable weather altering their cropping season calendar. Wet season used to be June to August but as rains do not anymore come as expected farmers have resorted to asynchronous planting and early seed sowing. This aberration has resulted in the emergence of pests such as armyworms, fungi, and golden apple snails. In a report, the Department of Environment and Natural Resources identified Libacao as one of the municipalities most prone to flooding in Aklan.[3] Rice areas have shrunk after a river expanded following torrential rains caused by typhoons. One of the strongest typhoons that hit Libacao was Yolanda in 2013 that damaged watersheds, irrigation canals, and rice areas resulting in water scarcity.

1. Philippine Statistcs Authority. (2014). PSA releases the 2012 municipal and city level poverty estimates. Retrieved from https://psa.gov.ph/content/psa-releases-2012-municipal-and-city-level-poverty-estimates
2. Rappler. (n.d.). Libacao, Aklan elections Retrieved from https://ph.rappler.com/local/region/Western-Visayas/Aklan/Libacao
3. Aguirre, J. N. (2017, 2 August). Aklan needs P1 billion for infrastructure to survive climate change. *Business Mirror* Retrieved from https://businessmirror.com.ph/2017/08/02/aklan-needs-p1-billion-for-infrastructure-to-survive-climate-change/

Menu of interventions

Rice garden. LNFVHS had raised a container rice garden prior to maintaining a 200m^2 rice garden. Through the initiative of the school principal and the project partner-teacher, the idle private land near their school was converted into a rice garden with the approval of the land owner. The rice garden served as a learning field for the students and source of income. Some 30% of the income served as payment for the land rental every cropping season while 70% was given to the LNFVHS Infomediary Student Organization (LISTO). Both the partner-teacher and LISTO managed the rice garden. PSB Rc 82 and NSIC Rc 354 varieties were planted. The area surrounding the ricefield was planted with okra, eggplant, chili pepper, kangkong, gabi, and banana for additional income.

Fish production. Constructed on a higher slope, the 50 m^2 fish pond also served as the school's water-impounding facility to irrigate their rainfed ricefield. The school used to grow tilapia before heavy rains made the pond overflow together with the fish. The facility still impounds water.

Sorjan farming system. Three plots measuring 2m x 10m each were planted with kangkong, bottle gourd, string beans, eggplant, okra, pechay, kalabasa, bitter gourd, and chili pepper. Some of the vegetables were sold to the teachers at a higher price as these were organically produced off-season. The rest of the harvests were brought home for free by the students.

Vermicomposting. The school was also into vermicast production owing to the teacher's knowledge and skill in vermicomposting and his advocacy for organic farming. Located at the upper portion of the school grounds, they had two vermi beds that measure 1x4m each. In 5 months, the school harvested 260kg of vermicast sold at P10/kg during exhibits and other events. Some of the fertilizer was also used in the school's rice and vegetable production and given to teachers who donated substrate and manure.

Modified dapog technology. The school had been practicing the wetbed method but shifted to the modified dapog technology to prevent their seeds from being washed away especially during rainy season. The technology also makes seedling-pulling easier that reduces labor cost.

Minus-One-Element Technique (MOET). MOET results in the area showed students that their soil was deficient of nitrogen and sulfur. To provide the needed nutrients, vermicast, carbonized rice hull, and fermented fruit and plant juices were applied.

Reaching out to their community

The partner-teacher also organized a group of students to help in the implementation of the project. The LNFVHS Infomediary Student Organization (LISTO) as the teacher's partner initiated a sing-and-dance program among the agricultural crop production students that gravitated toward technologies for climate change adaptation. During the Parents and Teachers Association meeting, the partner-teacher showed their setup to the farmer-parents for their appreciation and possible adoption.

Technology Highlights

In Libacao, other sources of income were being tapped to cope with the changing climate. These encouraged LNFVHS to focus on the production of CRH and vermicast, and practice the sorjan cropping system as their featured technologies:

CRH and vermicast production. Owing to the abundance of rice hull and substrate, they produced CRH, which they used as soil conditioner in their rice and vegetable garden and as an income-generating project. They sold CRH at P6/kg. In Libacao, LNFVHS has become a known producer of vermicast and CRH that private individuals wanted to regularly buy. Unfortunately, their production was not enough to satisfy the demand owing to their limited resources.


PHOTO BY MILVIN ZABALA

Sorjan Cropping system. LNFVHS looked at the system as a source of additional income, for they could grow vegetables during off-season together with rice. Off-season organic vegetables earned much; their pechay was sold at P100/kg.

Immediate outcomes

The strong project implementation of the school has generated benefits for the partner-teacher, students and their parents, and the school itself. The teacher was promoted to Teacher II in 2016, and to Teacher III in 2018.

Information or knowledge-sharing also occurred from the students to their farmer-parents particularly about the modified dapog technology. This sharing received various reactions from the parents, one of whom said that the use of dapog entailed more cost than direct seeding. Another parent tried using the modified dapog method; pulled the seedlings from the bed and damaged the roots.

The school's credibility and competency in teaching agricultural crop production was evidenced by their 100% (30 students) passing rate in the assessment on Agricultural Crops Production National Certificate I. This certification could help the students qualify to an agri-related job.

Their agri-related project activities have also helped the school in its income-generating efforts, specifically through their CRH and vermicast production.

Dingle National High School, Iloilo

SCHOOL

Dingle National High School (DNHS)

LOCATION
Dingle, Iloilo

POPULATION
1,676 (SY 2018-2019)

PARTICIPATING TEACHER
Janero Baltero

PRINCIPAL
Mercy Grace P. Parreño

Development Context

Dingle is a 3rd class municipality with 33 barangays surrounded by the towns of Pototan, Dueñas, San Enrique, Anilao, and Barotac Nuevo. For Catholics and history enthusiasts, the town is known for its Baroque church, the Parish Church of St. John the Baptist.

Iloilo is among the country's top rice-producing provinces, and Dingle itself was among the top 50 rice-producing towns in the Philippines in 2011. The distinction was bestowed during the *Agri-Pinoy Rice Achievers Awards*[1]. In 2017, corporate rice farming was introduced in Iloilo where the Dingle Multi-Purpose Cooperative (DMPC) signed an agreement to supply rice in all Ayala-owned businesses in Iloilo City/ province.[2]. DMPC is a recipient of a Rice Processing Complex from the Korea International Cooperation Agency[3].

Rice is the main crop, coupled with corn, sugarcane, and vegetables. Dingle and its nearby towns source irrigation water from the Jalaur Irrigation Dam. [4]

Some 40% of the DNHS students are children of rice-farming households; parents of the rest rely on public and private sector employment. DNHS is around 45 minutes to progressive Iloilo City, and is close to the DA Office in Dingle, which facilitates access to information.

1. French, L. (2012) Dingle wins awards for rice production. https://thedailyguardian.net/local-news/dingle-wins-award-for-rice-production/ Accessed 16 January 2019
2. Yap, T. (2017) https://news.mb.com.ph/2017/08/04/corporate-rice-farming-introduced-in-iloilo/ Accessed 16 January 2019
3. Mogato, A.G.A. (2018)DA points to Iloilo co-op as model for cheap rice. https://www.bworldonline.com/da-points-iloilo-co-op-model-cheap-rice/ Accessed 16 January 2019
4. Iloilo net.ph http://www.iloilo.net.ph/dingle-iloilo/ Accessed 16 January 2019

Farmers near the school reported more frequent occurrences of extreme weather events such as strong typhoons. In 2018, Western Visayas was among the regions that suffered huge agricultural damage from tropical depression Agaton (Bolaven). Together with Regions 4-B, 7,8,9, 11, and 13, total rice area damaged by the typhoon was close to 140,000 ha; 103,864 ha for corn. Farmers added that they have been experiencing prolonged rainfall followed by dry days making planning for their farming activities more difficult than before. Particularly, farmers said that they find it difficult to choose the crops to cultivate.

Menu of interventions

Rice garden. In their 500m^2 rice garden, they planted NSIC Rc68 and Rc 10 for being early-maturing and for thriving well in their area during the wet season.

Fish production with floating garden. Despite being in a rainfed area, the school opted to pursue this component given that Dingle areas adjacent to Dumangas and Pototan get flooded from time to time. To expose a productive intervention for these areas, the 100-m^2 pond is situated in the lower midsection of the school campus, which is a strategic area for catching rainwater. The pond also served as water source for their rice garden aside from growing African freshwater catfish and tilapia.

Vegetable production. In this component, they showcased the setting up of drip irrigation and container gardening using discarded tires. Dingle has inadequate water for vegetable production.



Vermicomposting. This component made good use of the readily available raw materials such as banana peelings and grasses. They had 3 vermibeds at 1x6m per bed that supplied vermicast for their vegetable production.

Technology Highlights

Being in a rainfed area, DNHS decided to showcase drip irrigation, which the participating teacher learned from his training at PhilRice. While the school has a deep well that provides irrigation, the water level sinks deep in March to May.

Immediate outcomes

Similar with other sites, several instances of information-sharing transpired from the students to their parents, to other farmers. One case is when a student convinced his father to incorporate rice straw into his ricefield instead of burning it, who also promoted the practice to his fellow farmers. Several students also reported that they promoted vermicomposting to their farmer-parents and to farmers they know.

Farmers near the school shared that they were impressed as to how the school was able to train the students to plant rice. A farmer said “Even those only in Grade 8 already know how to operate a hand tractor, do direct seeding, apply fertilizers and pesticides, and harvest their produce. It’s [the project] a big help for the youth!”

Leyte Agro-Industrial School, Leyte

SCHOOL

Leyte Agro-Industrial School (LAIS)

LOCATION
Leyte, Leyte

POPULATION
1,170 (SY 2018-2019)

PARTICIPATING TEACHER
Manuel Hornales

PRINCIPAL
Teodorico N. Sulla

Development Context

Leyte is a 4th class agricultural and coastal town in Leyte, the major palay producer in Eastern Visayas[1] and one of the top five rice-producing provinces in the country[2]. Surrounded by mountain ranges and coastlines, this municipality produces rice, corn, vegetables, rootcrops, fruit trees, and edible fish and crustaceans.[3] Out of its total agricultural land area of 20,641 ha, rice is grown in 10.54% or 2,175 ha. At least two-thirds of the area is irrigated, but most of the rice farms in Barangay Poblacion where LAIS is located, are generally rainfed. While the municipality is classified under Type IV climate, (i.e., rainfall is evenly distributed throughout the year), farmers complained they have experienced heavier rains and stronger typhoons in recent years. In 2018, for instance, they lamented that they could only see the sun twice a week. Most of the time, their days were drenched with scattered rainshowers. A farmer narrated that flooding has been frequent in his rice field because the creeks that surround it overflow during rainy days.

In 2013, their farms were among those submerged and covered with mud, and their properties were heavily damaged by Typhoon Yolanda (Haiyan).[4] The Leyte municipal government contends the heavy rainfalls and typhoons pose hazards such as flooding and landslides to communities that sit beside big rivers, creeks, and other water bodies. With the predicted prolonged rainfalls in the near future, Leyte's concern on these hazards could aggravate. A 3% and 9.4% increase in rainfall is expected to happen in Leyte province by 2020 and 2050, respectively.[5] To prevent floods from

1. Philippine Statistics Authority. (2017). Palay and corn situationer in Leyte – Q3 (2015-2016). Retrieved from http://rsso08.psa.gov.ph/leyte/special-release/palay-and-corn-situationer/Q3-2015-2016
2. Recuerdo, E. V. (2016, 7 November). Program aims to double rice production in Leyte. *Business Mirror.* Retrieved from https://businessmirror.com.ph/program-aims-to-double-rice-production-in-leyte/
3. Municipality of Leyte. (2017). Physical features. Retrieved from https://www.leyte-gardentown.gov.ph/physical-features/
4. National Disaster Risk Reduction and Management Council. (2013). *Final report re effects of typhoon "Yolanda" (Haiyan).* Quezon City: Philippine Government.
5. PAGASA. (2011). *Climate change in the Philippines*. Retrieved from http://dilg.gov.ph/PDF_File/reports_resources/DILG-Resources-2012130-2ef223f591.pdf

building up during heavy rainfall, farmers usually improve their farms' dikes and drainage canals. Added to the changing climate, rice farmers in the municipality are also challenged by their lack of access to high-quality seeds. Data from their municipal agriculturist office show no accredited rice seed growers. Meanwhile in far-flung barangays (e.g. Danus) where some of the LAIS students live, our partner-teacher noted that farmers do not have enough sources of agricultural information[6]. More than 50% of students in LAIS come from rice-farming households; other parents rely on fishing and coconut production.

Menu of interventions

Rice garden. The LAIS 4,000-m^2 rice production area planted NSIC Rc 222, Rc 160, Rc 10, Rc 82, and Rc 158. It served as a practicum site for students who study agri-crops production. They monitored the crops and learned about farm technologies and practices such as use of high-quality seeds, *modified dapog system*, minus-one-element technique (MOET), leaf color chart (LCC), and application of compost and inorganic fertilizers and pesticides. The area produced seeds. Every cropping season, our partner-teacher hired machine operators from a nearby barangay to do the land preparation using a handtractor, known locally as "landmaster". LAIS owns two handtractors, one of which was given by the DepEd Division Office as part of the resources supplied to TecVoc high schools offering crops production. They used it side by side with their own plow and carabao.

6. M.L. Hornales, personal communication, January 16, 2019

The hired operators returned during the harvest season to thresh palay. The students also helped in harvesting and threshing activities during the first cropping season, which were usually done during school days. For the second cropping, which was during the 2018 school break, only volunteer students helped in the farm. At most, 28-30 sacks at 50kg each of rice seeds were harvested in each of the four cropping seasons. A portion of the harvest was set aside for the school's next planting season, 10% of it was for the machine operators, and the rest was sold to interested farmers. A small share from the proceeds of the harvest was remitted as added income. The students who worked in the farm were given monetary incentives.

Compost production. Wastes from harvested rice and other raw materials in the school's surroundings were gathered for their compost production. In a 4x4-sq.m. vacant area beside their rice garden, students mixed rice straw, rice hull, top soil, dried leaves, and free animal manure from livestock and poultry farms for decomposition. In 2018, the school harvested 15 sacks of compost benefiting its vegetable garden.

Reaching out to their community

Word of mouth connected LAIS to the community. On account of the students' stories, farmer-parents became interested in the rice varieties planted at the school. Our partner-teacher reports that parents took the opportunity to visit the school garden and asked for updates on new varieties whenever they attended PTA meetings. Even pedicab drivers randomly told curious locals about the school's farm; thus, word about its farm activities spread quickly.

Meanwhile, the school also reached out to farmers at Barangay Danus that can be reached from LAIS through a 20-minute motorcycle ride plus a 35-minute walk through a muddy footpath. Up to now, Leyte farmers still have problems accessing quality seeds so they resort to exchanging planting materials. Our partner-teacher also noted that farmers have less or no access to agricultural information. While an agricultural extensionist visits Danus monthly, information-sharing is not extensive. This, and the fact that 10% of his students were from the said barangay, prompted our partner-teacher to conduct a farmers' forum there. Together with some PhilRice personnel, he and his students led the activity, which was attended by 12 rice farmers who eagerly asked questions about rice seeds and pests. The team discovered during the activity that they also produce "red rice" acquired from a fellow farmer whose son is a LAIS student. It has red stalk but its grains are white. According to the LAIS student, he asked for some seeds from his teacher and gave them to his father for planting. When neighboring farmers saw that his plants stood very well, they exchanged seeds with him.The "red rice" actually resembles NSIC Rc 158.

LAIS also gave some reading materials to their municipal agriculture office. At present, posters on pests are conspicuously displayed there. Our partner-teacher also spared some LCC and MOET kits to the said office because their supply has already been distributed to farmers.

Technology Highlights

There are no accredited seed growers in Leyte, Leyte.[7] The nearest seed producers are in Ormoc City, some 53km away from the town. To address this, LAIS produced quality seeds that farmers, as of this writing, buy from them.

Quality seeds. LAIS continues to produce rice seeds notwithstanding their small area. With our partner-teacher and his students' determination, the school has become a source of rice seeds for farmers from eight nearby barangays: Danus, Belen, Macupa, Libas, Palid, Rawis, Elizabeth, and Palarao. They sell it at P18-20/kg, depending on the current market price. Certain farmer-parents of LAIS students also negotiated with our partner-teacher to come up with a scheme like the "plant now, pay later" type. Under this scheme, the farmers pay double the volume of the seeds they acquire from the school after harvest. Out of the 12 farmers who opted for this setup, 8 have complied inspiring the school to continue helping farmers who appreciate good-quality seeds.

7. BPI. (2018, April). Inbred Rice Seed Growers in the Philippines: Region 8 Seed Growers. Retrieved from http://www.pinoyrice.com/seed-growers/region-8-seed-growers/

Danus, Leyte

Poblacion, Leyte

Danus, Leyte

Poblacion, Leyte

Immediate outcomes

The initiatives of LAIS were a cut above the rest. Focusing on rice seed production, they tried to respond to the immediate concerns of their community. Thus, farmers were introduced to different rice varieties that they can choose from. Farmers in Danus like to plant Rc 158 while those in other barangays prefer the high-yielding Rc 222.

Our partner-teacher was promoted from Teacher III to Master Teacher I in July 2018. He said that one of the key factors in his achievement was the fact that LAIS was among the Top 10 Best Implementers in 2016 of the Infomediary Campaign, and that the Promotions Board found his initiatives under the project and in rice production encouraging and relevant.

More importantly, agri-crops production students in their school have increased in the past three years: from 34 enrollees in SY 2016-2017, it went up to 38, and 42 in SY 2018-2019. Our partner-teacher attributes the growth to the fulfillment that the students savor as they receive incentives for their hard work in the field while learning about farming and being able to share their lessons learned to their farmer-parents. Other students noticed it, too, especially the granting of incentives to those who help in the school garden; thus, some of them developed interest in the said competency.

Asuncion National High School, Davao del Norte

PHOTO BY ARIEL ORCULLO

SCHOOL

Asuncion National High School (ANHS)

LOCATION
Asuncion, Davao del Norte

PARTICIPATING TEACHER
Ariel D. Orcullo

POPULATION
4,000 (SY 2018-2019)

PRINCIPAL
Arnel A. Serviño

Development Context

Asuncion is a landlocked 1st class municipality with 20 barangays, and is near the cities of Tagum, Panabo, Samal, Davao, Mati, and Valencia. It is highly agricultural with rice and banana as main crops, the bananas being export-quality, plus corn, cacao, and coconut. It is one of Davao del Norte's food baskets[1]. About 60% of ANHS students come from rice-farming households that speaks of the heavy reliance of the community on agriculture. The Magdao River is an important water source for agricultural purposes in the province[2].

In recent years, the town has been suffering from frequent flooding. Our participating teacher said that from only twice a year, they are now flooded almost five times yearly. In 2012, *Typhoon Pablo* (Bopha) hit Asuncion and left agricultural damage worth P10.4B. In 2017, Davao del Norte and Oriental were placed under state of calamity due to floods with Asuncion being undesirably affected. The Provincial Disaster Risk Reduction and Management Council of Davao del Norte estimated P11M worth of damage to crops[3]. Aside from these weather extremes, farmers have confided to us about the unprecedented infestation of rice black bugs and stemborers.

1. Province of Davao del Norte. (2019). DavNor tourism highlights Retrieved from http://www.davaodelnorte.gov.ph/index.php/tourism/tourism-highlights-page
2. PHL-Microsat. (2016). Featured Image: Davao del Norte. https://blog.phl-microsat.upd.edu.ph/featured-image-asuncion-davao-del-norte-66869937ecb5 Accessed 16 January 2019
3. Sambalud, M.D. 2017. Davao Norte, Oriental placed under state of calamity. http://davaotoday.com/main/environment/davao-norte-oriental-placed-under-state-of-calamity/ Accessed 16 January 2019

Menu of interventions

ANHS implemented three components that highly match their conditions and their capacity to implement in terms of available resources. For instance, even as they wanted to grow fish, the school does not have a fish pond.

PHOTO BY ARIEL ORCULLO

Rice garden. ANHS set up their rice gardens over a 4000-m^2 area inside the school and 2500m^2 outside it. They planted NSIC Rc 160, Rc 82, and Rc 300, the most suited varieties in the area based on farmers' observations. Students practiced agroecosystems analysis (AESA), a method that gives salient information about the growth of the rice plant as well as the presence of harmful and beneficial organisms.

Vegetable garden. They planted eggplant, tomato, and bitter gourd in their 1500m^2 garden. Like pechay, these can be planted anytime of the year, which means more income. They marketed vegetables in Tagum City.

Container Vegetable Garden. They cultivated bahay-kubo plants in their 300-m^2 garden that also showcased medicinal herbals. They also reared fish and chickens.

Vermicomposting. ANHS had four 1x4m vermi beds, with African Night Crawlers purchased from Bukidnon. Our partner-teacher said they participated in trade fairs to sell their vermitea and vermicast.

Techno-demo of Minus-One-Element Technique (MOET) and Oyster Mushroom production during the school's outreach program.

Technology Highlights

ANHS zeroed in on vegetable production because it gave them the highest earnings relative to their other two components. They used their own vermicast in their vegetables, a semblance of integration. Their vegetable garden garnered second place in their Division contest for *Gulayan sa Paaralan*. For them, the vegetable garden is a good component to show how one can earn additional income. During our visits, we remember our participating teacher telling us that they had to transplant thrice in their rice garden. If you are a farmer who relies solely on rice, it can be very difficult to make ends meet; hence, they see the vegetable garden as a good component to showcase and address this income deficit.

Immediate Outcomes

With 15 farmers in attendance, our participating teacher lectured on the advantages of not burning rice straw. He picked this topic as he noticed that many farmers near the school still burned rice straw. The event was solely organized by ANHS.

The location of the school garden is also strategic - just along the municipal road; hence, farmers could easily come by to visit the setup. Our participating teacher, with his people-person personality, had explained several times to farmers who have shown curiosity about the technologies that were being showcased and the whole project itself.

Instances of information-sharing by the students were also documented. For instance, one student was successful in convincing her mother to try out the vermicomposting technology that she learned in school. Her mother was able to harvest two sacks of vermicast that she sold at P250 per sack. Her aunt, emulating her mother's example, followed suit.


Bagumbayan Agro-Industrial High School, Davao Oriental

SCHOOL

Bagumbayan Agro-Industrial High School (BAIHS)

LOCATION
Bagumbayan, Lupon, Davao Oriental

POPULATION
423 (SY 2018-2019)

PARTICIPATING TEACHER
Rosalina Y. Saylan

PRINCIPAL
Nilda V. Franco

Development Context

Lupon is a first-class municipality that sits on a total land area of 88,639 ha, with agriculture and fisheries topping the main economic activities.[1] Lupon is also a top rice producer in Davao Oriental, next to Banaybanay and Cateel.[2] In Barangay Bagumbayan where BAIHS is nestled, rice, vegetables, and fruit trees such as durian, lanzones, rambutan, and mangoes are the commonly cultivated commodities. With good access to irrigation, rice production is done twice a year and hybrids are widely cultivated.

Farmers in Lupon shared that rice production pursuits have changed over time because of unpredictable weather. Their dry season used to start in December; now, it is wet up to late January. Farm activities have also suffered as early-morning temperature is relatively hotter than before coercing them to lessen their time on field. They have also been dealing with extreme weather events lately, evidenced by the provincewide state of calamity in 2016 due to prolonged dry spell.[3] This phenomenon spelled damage to more than 3,000 ha of agricultural land worth P42.1 million.

To help resource-poor farmers cope with the weather changes, the provincial government of Davao Oriental has launched the Sustainable Agriculture Village Enterprise (SAVE) Program to promote the adoption of certain climate change adaptation strategies.[4] At least 75% of BAIHS students come from rice-farming households.

1. Municipality of Lupon. (2019). Quick facts. Retrieved from http://lupon.gov.ph/quick-facts/
2. Official Website of Davao Oriental. (n.d.) Retrieved from http://news.davaooriental.com.ph/index.php/province-profile/economy/
3. Alconaba, N. (2016, April 23). Davao Oriental put under state of calamity due to drought. *Philippine Daily Inquirer.* Retrieved from https://newsinfo.inquirer.net/781031/davao-oriental-put-under-state-of-calamity-due-to-drought#ixzz5Spnq4bxz
4. Golez, R. M. (2017, 2 June). New agri program launched to fight poverty. *Official Website of Davao Oriental* Retrieved from http://news.davaooriental.com.ph/index.php/new-anti-poverty-agri-program-launched/

Menu of interventions

Rice garden. Situated in an irrigated area, BAIHS is keen at maintaining its 3,900-sqm rice field that serves as a practicum area for students and as source of income for the school. Some of the rice varieties planted were NSIC Rc 300, Rc 224, and Rc 160 for their average yields and high fresh palay selling prices. Banking on technologies and strategies that can help increase their production while reducing their cost of inputs, BAIHS focused on the use of carbonized rice hull (CRH) as soil conditioner, leaf color chart, and agro-ecosystem analysis. With eggplant and okra planted on the dikes, they hope to manage pests while optimizing the area.

Fish production. BAIHS is also into *tilapia* production in a 1.5x3.5-m pond. Courtesy of the Department of Agriculture, they acquired 100 free fingerlings that added up to what they had bought. While they find the pond efficient, current construction activities make it difficult for them to maintain it due to its unsecured location.

Vegetable production. Bell pepper, eggplant, tomato, pechay, and chili pepper were planted in its 250m^2 area. As in their rice crop, BAIHS also used CRH as soil conditioner in preparing the vegetable seedlings. For instance, they mixed CRH with vermicast and added it to the soil media where the tomato seedlings were planted. Though their harvest was sold wholesale to a local vendor at a cheaper price, their income could still purchase school supplies for their horticulture students who also happened to be the main caretakers of the vegetable crops. A portion of the income paid for hand tools needed in the school garden.

Vermicomposting. BAIHS was also into vermicast production in two vermi beds at 1x3 meters each. The African Night Crawler earthworms were fed with air-dried *madre de cacao* and *ipil-ipil* leaves, mixed with cow manure and decomposed rice straw. In 2-3 months, they harvested up to six sacks of vermicast at 60 kg each. They either used it for their planting materials or sold it to ornamental growers. They also supplied vermicast (and CRH) to two elementary schools near them that used the materials in their *Gulayan sa Paaralan Program* (GPP).

Reaching out to their community

BAIHS promoted the technologies by conducting simple techno-demo activities in their crop production area where the students served as lecturers, and their farmer-parents as their audience. They showcased CRH production and its many uses, and some farmers were convinced to adopt it. Among the notable adopters of the technology was a student's father who learned about the use of CRH from his daughter. After her school's affirmation, her father applied the CRH in his rice and vegetable farms, which eventually yielded positive results. Adopting CRH saved him P22,000 to P25,000 from chemical use in his 5-ha farmland. He also felt he made a little contribution in saving the environment and mitigating the ill impacts of climate change.[5]

BAIHS also exhibited the technologies during the evaluation of their GPP in August 2017. DepEd personnel and principals from other schools who served as evaluators expressed interest in CRH, vermicomposting, and capillarigation after watching the students demonstrate these technologies to them. Among them was Bagumbayan Elementary School (BES), their CRH and vermicast buyer. In an activity with over 50 students and teachers of BES, our partner-teacher lectured on the process of CRH production and vermicomposting. As a start-up, BAIHS lent their carbonizer to the school and gave out free ANC for BES to work on. As of this writing, BES is producing its own CRH and vermicast, and continues to consult BAIHS for their GPP implementation.

5. Pasiona, S. P. (2017). The Triumvirate that makes a climate-smart community *PhilRice Magazine* 20-23.

Technology Highlights

In Lupon, increasing the current rice yield of the community and energizing the adaptive capacities of the farmers against the unpredictable weather, specifically drought, are of utmost importance. These motivated BAIHS to focus on nutrient and water-related management practices as their featured technologies, specifically:

CRH and vermicast production. BAIHS duly made full use of rice hull, an abundant but wasted resource in their community. Through the use of an open-type carbonizer, they regularly produced CRH that they used as soil conditioner in their school garden and as revenue-generating project. In a week, they sold 15-20 sacks of CRH at P60/sack (P5/kilo). In Lupon, BAIHS has become a known producer of vermicast, and their usual customers are vegetable and ornamental growers, and some school teachers as well.

Capillarigation. The school also accentuated the need to properly manage their scarce water resource especially during the dry season; thus, they established their own capillarigation setup. They used a 30-40-liter drum as water container, with an attached simple faucet bulb to regulate the release of water. A main water hose connects the water source to the capillary-like hoses made out of used tarpaulins, drinking straws, and wicks. Their setup served three vegetable plots at 0.5x4-m area each, where they produced tomatoes and chili peppers.

Immediate outcomes

Outcomes of the school's strong project implementation were evident in the benefits that it brought to the partner-teacher, the students' households, and the school. The partner-teacher was tapped as the representative of Region 11 in DepEd's initiative to develop the national curriculum for rural farm schools. The output of this initiative will be integrated in the Technical Vocational Education and Technology and Livelihood Education subjects of all secondary schools nationwide. She was also promoted to senior high school Teacher II, from junior high school Teacher I.

Students' learnings from the lectures and activities were also evident in the way they actively engaged themselves, mostly as technology demonstrators to the school visitors. In our interviews, at least 13 students confirmed they shared the technology to their parents and/or to other members of their family involved in farming-related activities. We found that 5 of the farmer-parents of the students adopted the technologies specifically the use of CRH and ecological engineering.

BAIHS also relished the fruits of their labor. For one, the number of students who enrolled their agri-related track increased in recent years. From 88 enrollees of horticulture in SY2016-2017, it jumped to 101, then to 117 in SY2018-2019. Their agri-related activities have also helped the school with its income-generating activities, specifically through their CRH and vermicast production. Most especially, they have helped other schools learn and showcase these technologies in their own school gardens.


OLERICULTURE GARDEN
THROUGH SORJAN SYSTEM

SCHOOL

Baluan National High School (BNHS)

LOCATION
Baluan,
General Santos City

POPULATION
892 (SY 2018-2019)

PARTICIPATING TEACHER
Edmar B. Juanitez

PRINCIPAL
Rosie T. Diaz

Development Context

General Santos City is in the southernmost tip of mainland Mindanao, SOCCSKSARGEN's center of commerce and industry being a first-class city. [1] GenSan is highly urbanized but 14,486 ha or 27% of its total land area (53,606 ha) is utilized for agricultural purposes. Records from the City Agriculturist's Office in 2011-2013[2] showed that rice is its third most cultivated crop, next to fruits and corn. Rice farms in Baluan are generally irrigated, and are prone to flashfloods, which usually last for 1-2 days. Farmers are working hard to adapt to the flooding problem more so that frequent and stronger typhoons have occurred in their area lately.

In 2012, government reports described Baluan and nearby areas as highly at risk of increasing rainfall and rising sea levels in the coming years.[3] PAG-ASA projects that rainfall in in December to February may increase by as much as 10.1% in 2020 and 8.6% by 2050.[4] To mitigate flooding, the city government of GenSan has already taken precautionary measures like improving drainage facilities as noted by our partner-teacher in BNHS. Ironically, the city is also prone to drought. During the first quarter of 2016, the City Council declared GenSan under a state of calamity due to the bad effects of El Niño, which destroyed almost P30 million worth of agricultural crops.[5] Farmers told us they have already adjusted their cropping calendars to escape occurrences of sudden flashfloods or droughts. A farmer wants to forget the time when he only harvested 30 sacks from his 1-ha rice area because of a flashflood at the time of harvest. At least 75% of the students in BNHS come from rice-farming households.

1. Philippine Information Agency. (2019). General Santos Retrieved from https://pia.gov.ph/provinces/general-santos
2. City Economic Management and Cooperative Development Office. (2014). *Gensan annual economic profile* Retrieved from https://gsantoscity.files.wordpress.com/2014/07/gensan-economic-profile1.pdf.
3. Sarmiento, B. S. (2012, April 22). Region 12 high-risk to climate change impact. *MindaNews.* Retrieved from http://www.mindanews.com/environment/2012/04/region-12-high-risk-to-climate-change-impact/
4. PAGASA. (2011). *Climate change in the Philippines.* Retrieved from http://dilg.gov.ph/PDF_File/reports_resources/DILG-Resources-2012130-2ef223f591.pdf
5. Mindanews. (2016, 11 March). GenSan allots P24M for farmers hit by drought. *MindaNews.* Retrieved from http://www.mindanews.com/top-stories/2016/03/gensan-allots-p24m-for-farmers-hit-by-drought/

Menu of interventions

PHOTO BY EDMAR JUANITEZ

Rice garden. When the project started at BNHS, a 0.75-ha rice area was established primarily to serve as a practicum site for their agri-crop production students. They planted NSIC Rc 160, which they managed organically. Through time, rice production-related activities in the school have intensified. The General Santos City Agriculturist Office (CAO) granted the school a walking-type mechanical transplanter and tiller, and they also endorsed BNHS to the DA Regional Field Office as recipient of a walk-behind rice combine harvester. According to our partner-teacher, this was a result of the school's partnership with CAO in the conduct of the students' field school for rice and vegetable production. CAO witnessed the activities and the need of the students for machines to improve their farm activities.

As we write, however, the school's rice area is being converted as site of a 4-storey school building, and a gymnasium. To address this, our partner-teacher has collaborated with the principal of their neighboring elementary school so BNHS can continue its rice cultivation efforts.

Vegetable production. Aiming to become a model school for urban gardening, BNHS intensified their vegetable production through planting in available plots and containers. Over 30 kinds of lowland vegetables were cultivated in rotation in a 1,000-sqm plot, and in a number of creatively painted recycled water and soda bottles. Through this, the school wished to inform farmers that it is possible to earn more from a small parcel of land.

Vermicomposting. With the school offering organic agriculture as a competency in agri-crop production, BNHS also proved their inclination toward vermicomposting. Through the seminars he attended, our partner-teacher integrated all his learnings and came up with the 70-30 carbon-nitrogen ratio of vermicompost. In their three vermi beds measuring 1x3 meters each, they used rice straw and animal manure from farmers' fields, banana trunks, and used white papers (soaked in water). They also added leaves of waterlily, *kakawate,* and *ipil-ipil*. To hasten the decomposition process, they mixed water with their own-produced indigenous microorganisms or fish amino acids. Based on their need, they usually harvested 2-3 sacks of vermicast at 50 kg each. They either used it as fertilizer for their vegetable crops or sold it during agri-fairs.

Reaching out to their community

BNHS is generous to share their knowledge and resources to their immediate community. In a forum attended by more than 30 farmers, the students led discussions on the use of the LCC, MOET, controlled irrigation, and AESA. They also introduced organic fertilizers such as vermicast, CRH, and concoctions. The farmers in turn visited the school's production site, and verified their learnings through the agricultural extension worker and PhilRice staff who were present during the activity. At the end of the forum, the farmers were given samples of organic concoctions such as fermented fruit juice, organic herbal nutrient, and fermented plant juice made by the students. According to the partner-teacher, the farmers used the concoctions in their crops or animals.

As part of their tasks in the agri-crops subject, the students interviewed 15 rice farmers in Brgys. Ligaya and Baluan in GenSan, during which they distributed copies of information materials on rice and rice production-related technologies.

Farmer-parents were also keen on checking the school's production area after attending parents-teachers association meetings. Some were thankful that their children actually established small backyard vegetable gardens in their own homes after learning them in school.

Through a collaboration with the National Service Training Program students of Ramon Magsaysay Memorial Colleges, an organic farming-related seminar for rice and vegetable farmers was conducted. Our partner-teacher and selected Grade 12 organic agriculture production students of BNHS served as the resource speakers.

Technology Highlights

While moving toward being a model school for urban gardening, BNHS also aimed at helping boost the agricultural productivity of farmers in their community. Thus, they pushed for technologies that will enhance the nutrient management strategies of farmers, expand their sources of income, and adapt to the unpredictable weather.



Vermicast and CRH production. BNHS packaged vermicast and CRH as safe and effective fertilizers, and as added sources of income. Apart from the vermicast that they sold at P70 for 2 kg/pack, they also sold CRH at P20 for 2 kg/pack. They bought rice hull from a ricemill near the school at P18 per sack. Among their customers were vegetable and ornamental growers.



Organic farming. BNHS is now offering organic agriculture as a competency in their senior high school curriculum. Apart from setting up their vermicomposting facility in support of this competency, our partner-teacher also incorporated organic farming practices and strategies (e.g. use of vermicast, CRH, and organic concoctions) as they managed their rice and vegetable gardens. The related facilities and activities served as the students' avenue for learning and practicum site.


Improvised open-type rice hull carbonizer. The school was also noticed for fabricating their own version of the open-type rice hull carbonizer made of recycled paint and milk cans with rivet fasteners. A farmer from Nueva Vizcaya and a local businessman in their community liaised with our partner-teacher to learn the fabrication technique, and the process of producing CRH after they read the school's story published in the June 2017 issue of *Agriculture Magazine.*

Sorjan farming system. Given that the community experiences both drought and flashfloods, the school worked on their sorjan farming system for farmers to know that they can have an added source of income even under the said phenomena. In four raised beds, the students planted leafy vegetables, rootcrops, and legumes. On the side, they cultivated gabi.

Immediate outcomes

Collaborations, enhanced farmers' learnings, and students' enhanced skills sprang out of the school's initiatives. Due to their intensified efforts, the General Santos CAO expressed interest in helping the school sustain their production activities. The CAO endorsed the school to receive machine grants from the regional DA office, from which BNHS harvested a walking-type mechanical transplanter, tiller, and walk-behind-type combine harvester. DA likewise identified the school as one of the implementers of the animal livestock multiplier farm project worth P1.2 million. The CAO also announced that the school is a potential learning site because of their best-fit practices not only in rice but also in agricultural systems production.

Farmers who tried using vermicast in their gardens also recognized its effectiveness. One said his rice crop stood stronger and less green after applying vermicast. This limited pest infestation, and consequently, it reduced his use of urea. The farmer also adds vermicast to his fertilizer inputs. Ornamental and vegetable producers in the area also kept going to the school to buy vermicast and CRH for their crops.

One of the most rewarding outcomes of the school's initiative was the 100% passing rate attained by the 51 BNHS senior high school students who took the NCII examination of the Technical Education and Skills Development Authority (TESDA) in February 2018. The assessor who is also a teacher from Surallah National Agricultural School in even declared that our partner-teacher was one of the best teachers of agriculture in high school.

Maguling National High School, Sarangani

SCHOOL

Maguling National High School (MNHS)

LOCATION
Maitum, Sarangani

POPULATION
886 (SY 2018-2019)

PARTICIPATING TEACHER
Ma. Elma A. Ampatin

PRINCIPAL
Himelda N. Napila

Development Context

Maitum is a 2nd class municipality dubbed as the nucleus of civilization in Sarangani for its anthropomorphic jars dating back 2000 years ago[1]. An irrigated area, it is the rice granary of the province with ricefields spread across its 19 barangays. Other crops are corn, coconut, mango, and banana.

Directly facing the Celebes Sea in the south, aquaculture is also a thriving industry in the municipality. Particularly milkfish, giant prawns, and shrimps are produced for export. The town is also known for its marinated *bangsi* (flying fish).

Despite the lush of resources, poverty remains a menacing problem in Maitum with 4,918 households living below the poverty threshold[2]. For farmers, who are among the poorest, this is even made worse by challenges in production. In Maguling, where rice is planted twice a year, a farmer regrets that they could no longer predict the weather making it difficult to decide on their cropping schedules. There were also instances of long rainless periods. Pests also pester the area, with stemborers and rice bugs persecuting their ricefields causing immense yield losses. A farmer-victim could harvest a measly 27 cavans of palay from his infested 1-ha farm. In MNHS, 88% of the students come from farming and fishing households; other families make a living from small businesses.

1. Municipality of Maitum. (n.d.). Retrieved on January 16, 2019 from http://www.sarangani.gov.ph/index.php/features/firstdistrict/maitum

Menu of interventions


PHOTO BY MA. ELMA AMPATIN

Rice garden. Being in a rice-farming community, MNHS felt obliged to cascade climate change-ready technologies to rice farmers. They did not content themselves with what they already had inside the school; they managed to borrow a 1-ha farm that they could pay after harvest with palay. Their rice garden served as a learning site for students where they could practice rice farming hands-on and a standing testimony to the technologies showcased to students from other schools, farmers, and parents who visit them from time to time. Among the technologies they have featured are the LCC, MOET, modified dapog technology, observation well, and the use of different rice varieties such as NSIC Rc 360 and 160.

Sorjan gardening. The school devoted an approximately 10x12-m area for this component to demonstrate to students its benefits in flooded/damp environments, and as another source of income while waiting for the rice harvest. They planted various vegetables and grew tilapia in the canals.


PHOTO BY MA. ELMA AMPATIN

Vegetable garden. Inspired by sorjan gardening, they first planted vegetables in small areas then converted a previously damp site into greens. In this 175-m^2 area, they planted *kangkong,* pigeon pea, bottle gourd, squash, spring onion, eggplant, tomato, hot pepper, and some herbs. They also set up a capillarigation system to water the vegetables. Teachers bought their produce.

Vermicomposting. The school had four 1m x 3m beds for this setup. African Night Crawlers were provided by the Municipal Agriculture Office. They sold vermicast for P250/sack. They also used it as fertilizers for their vegetable and rice gardens.

Reaching out to their community

PHOTO BY MA. ELMA AMPATIN

With her training in rice production, Ms. Ampatin personally and frequently visited farmers and offered them recommendations to sharpen their farming. A small community requested her to visit them and give advice on how to liven up their livelihood. She gifted farmers with vegetable and rice seeds. The school provided two farmers with free 40kg seeds for one cropping season. The school at times had to deploy students, together with our partner-teacher, to the farms to help farmers analyze fertilizer requirements. They conducted a forum attended by 32 farmers, and invited them in technology demonstrations like the AESA, LCC, controlled irrigation, and MOET. Certain local stakeholders requested students to demonstrate how to produce organic fertilizers. In partnership with the MAO, a students' field school was conducted three times with students as resource speakers. In their school newspaper, they featured climate change and rice production to engage students enrolled in other tracks.

Technology Highlights

PHOTOS BY MA. ELMA AMPATIN

Organic farming. In support of organic agriculture, MNHS produced organic fertilizers such as vermicast, IMO, and fermented juices that they used in their vegetable and rice gardens.

Capillarigation. In Maguling, rain can sometimes be scarce. Their ricefields are irrigated but their vegetable gardens are not. This system helped the school distribute limited water and grow their vegetables despite long dry periods.

Immediate Outcomes

Several outcomes transpired from this project, one of which was the increase of enrollees in their crop production track. Collaborations were created with other agencies such as the local offices of the DA, Agricultural Training Institute, and nongovernmental organizations that provided them with materials and helped them with their activities. They received a grant to develop their vegetable garden. Their school was often cited as an example of good practices and became one of the top implementers of crop production as a track in their division. Other schools started to benchmark with MNHS.

In the community, they became an important source of quality seeds, organic fertilizers, and knowledge as farmers often asked them for assistance on matters regarding rice farming. A particular case is that of CRH. Our partner-teacher asserted that farmers in their barangay never used CRH in the past. Upon seeing it in the school setup, they started to inquire about it and some started buying from them. Three farmers requested them to analyze the nutrient deficiencies of their farms using MOET. One followed their recommendations and got more yield. Another instance is of a farmer who followed MOET, LCC, and controlled irrigation after learning them from the school's technology demonstration. His yield grew from a little more than 80 sacks to 130 sacks/ha. He admitted that it was his highest harvest.

On the level of the students, the MAO found helping hands in the school. They mobilized students to assist in their seminars and field engagements. During our snowballing, we also observed echoing of information from students to their farmer-parents. A student shared about vermicomposting, LCC, biopesticides, and IMO to his father, who adopted them to manage their garbage, control the foul smell of their livestock, and fertilize their vegetable garden and ricefields.

Aside from sharing and technology adoption, entrepreneurship also emerged from this project. While sometimes they gave things for free, the school has slowly developed their capacity in doing business. They sold CRH (P150/bag), vermicast (P250/bag), IMO (P1000/liter), and vegetables. A portion of their income was given to students as incentive and the rest was spent for inputs in their gardens and other school materials.


Maguling National High School
Sarangani


Batac National High School
Ilocos Norte


Dingle National High School
Iloilo


Dingle National High School
Iloilo

Bagumbayan Agro-Industrial High School
Davao Oriental

PART 2

Ideal characteristics of a climate change-adaptive school

In this second part of the book, we sketch an ideal picture of a school playing pivotal roles in climate change adaptation (CCA). In part 1, we presented several cases as to how our participating schools implemented the project. We hope that experiences in the 12 schools have awakened enough insights on how a school can take lead in CCA. Our aim in this second part of the book is to decode the elements of a climate change-adaptive (CC-A) school.

NOTE: There are sections in this part where we refer you to the book "*Communicating climate change in the rice sector*". If you are reading the online version, please click the book title to download your copy. If you are reading the printed version, we recommend you download the online version, free of charge, from this link: http://www.infomediary4d.com download/communicating-climate-change-rice-sector/.

Baluan National High School

Supportive school leaders

We cannot emphasize this enough. A participating teacher can only do so much in pushing for an initiative. Without the support of his/her superiors, an initiative such as the CC-A school will just be an exercise in futility. We have seen this quite well in this project. Most of the successes in our participating schools could be attributed to the seamless collaboration among the participating teacher, the TVE head, and the school administrator/principal. If these three are in good terms, project implementation is smooth-flowing and is very creative. There are even some instances when the lessons from this initiative are integrated in other subjects as the decision-makers in the school see fit. They can also easily see the work demands if they are heavily involved in the project.

It should be recalled that in the preliminary sections of this book we deliberately involved the decision-makers in the school in the training at PhilRice. The decision to involve them was an insight from our Infomediary Campaign project. Back then we saw that a major reason our project could not take off in a particular school was due to the poor support of its decision-makers, and we note that this is due to several reasons. Among them are the decision-makers could not grasp what the participating teacher was doing; hence, they could not ascertain the level of work commitment that needs to be delivered. Or, second, the communication line between the participating teacher and the decision-makers is choppy, so to speak. Either way, we thought that it would be best for the decision-makers to know firsthand what we wish to do with this project. It is a decision that, as we have seen, contributed greatly to successful implementation of the project at the school level.

As we will write later on in this section of the book, the involvement of the decision-makers and the seamless collaboration between them and the participating teachers resulted in myriad innovations at the ground level. Good example is in Libacao National Forestry Vocational High School (LNFVHS) in Aklan where school officials and teaching staff created the LNFVHS Infomediary Students Organization (LISTO), a school-based organization that helps in any agriculture-related activities and promote modern rice farming technologies. A small building was built to serve as an information hub for technologies on CCA. This initiative can be related to the "Whole School Approach" where all members of the school community are being engaged in activities to capacitate the students and to link the school to their surrounding communities.

Dingle National High School

Technology demonstration area

Gone are those days when students or farmers in general should just imagine what is being promoted. All of our sites had demonstration areas for the respective components that they promoted. For those who did not have a specific area inside the school as new buildings were put up, they went out of their way to borrow a space somewhere in the community. Students and farmers must see matters for themselves. Our realization is that the students promoting the technology on their own to their farmer-parents is never enough for adoption to follow suit. As we have underscored in the case presentations in Part 1, farmers followed the technology or a strategy because they saw it working in the setup of the school. It is the complementation between promoting the technology and having a place to show that it works that contribute to adoption or adaptation.

While we laud our partner-teachers who went out of their way to look for a space outside the school for their demonstration area, we feel that it would still be best if the area were inside the school. This way, it would facilitate mobility of the teachers and the students involved. Also, it would ensure that someone can be asked should a farmer come by to inspect or simply satisfy curiosity on the setup. Likewise, from a communicator's perspective, there is a symbolic attribution of the setup to the school if the setup is inside its premises.

Relevant technologies

In part 1, we presented the different technologies implemented by our participating schools and their corresponding description and justification, which were important as we wanted to establish that the components were contextually relevant. We showed how schools in rainfed areas prioritized promoting technologies that efficiently manage water such as the cases in Dingle (Iloilo) and Luna (La Union) when they showcased drip irrigation for their vegetables. Based on our observations, these technologies draw farmers to the setup of the school. They are also points of engagement on CCA.

As we have seen in almost all of our sites, the school setup has always sparked conversations on why certain practices are done. In hindsight, the setup hits two birds with one stone: the school is able to promote certain technologies and simultaneously talk about CCA. Through relevant technologies, a school can connect with its surrounding community. The logic is that there has to be a reason a farmer would turn up in a school. Remember that the school is not a usual destination for farmers. There has to be a good reason a busy farmer would go out of his/her way to check the setup in the school.

Figure 2: Starter kit for strategies/technologies for CCA in rice-farming communities.

Mechanism to reach out to the community

In relation to relevant technologies, the school must also devise ways on how it can bring its knowledge across the community. This element can be taxing to pursue; hence, this is where the participating teacher should not be left alone. This one requires skills in community mobilization, which a teacher may not always possess a lot of. Some of the schools that showed success in this regard were those that were supported by their leaders by asking more teachers to be involved in one way or another. Usually, an example of this element is when a teacher lectures on a particular topic attended by farmers in their immediate community like the one we saw in Asuncion National High School in Davao del Norte. This activity does not have to be done frequently but regularly. For instance, a farmers' field day conducted twice a year or a farmers' forum conducted once a year. The frequency must well be matched with the capacity of the school to implement. This one also requires some resources so it would be best if the school could partner with an agency that can give some financial support.

Batac National High School

An example is the case of Batac National High School in Ilocos Norte where they organized a 1-day seminar on climate change-ready technologies participated in by elementary and high school teachers from the Division of Batac. These teachers were purposely asked to participate as they were in-charge of the *Gulayan sa Paaralan* in their respective schools. Another example is the case of Maguling National High School in Sarangani where they partnered with the regional office of the Agricultural Training Institute that provided a training on vegetable production and P75,000 cash assistance in setting up their vegetable garden.

Baluan National High School

PHOTO BY EDMAR JUANITEZ

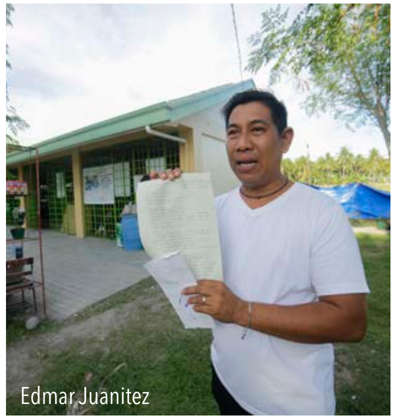
Evidence of entrepreneurship

A key motivation in setting up a climate change-adaptive school is to show that there are different ways in which rice- farming households can have alternative sources of revenue. In the cases that we presented, one may refer to Baluan National High School in GenSan City and Bagumbayan Agro-Industrial High School in Lupon, Davao Oriental. Central to promoting the CC-A school concept is to show that it works; that in the event of weather extremes, farming families need not be hostaged by issues relating to lack of income source. A school pursuing this concept must be able to show how the components complement each other and leading to optimized income.

Engaging local leaders

Related to reaching out to their immediate communities, we also took a close look at the very strategic positioning of activities of some of our partner schools. We noticed that some of them deliberately engaged local leaders such as the municipal agriculturist and officials from the Division Office of DepEd. This was a strategic move as far as replicating the initiative in other areas is concerned. Some examples were the cases of Leyte Agro-Industrial High School and Batac National High School.

Norelyn dela Cruz



Edmar Juanitez

Ariel Orcullo

Driven teachers

While it is truly an edge if a teacher had the necessary technical knowledge to demonstrate technologies, having the drive to push the idea forward is equally important. We have seen how teachers pushed for things to happen like going out of their way to borrow land due to the lack of space inside the school for their technology demonstration area. We saw how they invested efforts to ensure that they could hold a seminar for farmers in their respective areas. These are taxing works that we think cannot be done if one is not deeply passionate. All the more, we argue that having both characteristics—technically capable and driven—is a winning combination—something that we have seen in Bagumbayan Agro-Industrial High School in which our participating teacher is an agriculture graduate and is very passionate in the advocacy. The same can be said for our participating teachers in Baluan and Batac National High Schools, and Libon Agro-Industrial High School.

Characteristics of a CC-A school teacher

A dedicated school teacher surely has these skills already. For emphasis, we enumerate the skills a teacher involved in CCA efforts must possess. These are based from our observations among our participating teachers. Not all of them are gifted with all of these skills. What we did was to identify the skills that enabled them to deliver:

MUST HAVE TECHNICAL KNOWLEDGE

Technical knowledge will be conveyed to students and farmers, thus it is a plus if the teacher is technically equipped. A good example was the teaching demonstration in Dingle National High School. Our participating teacher did a comprehensive research about the technologies, i.e., more than what we originally provided during their training. He also presented cost-and-returns analysis of vermicomposting. Based on our FGDs, knowledge in agriculture and climate change is also a plus so the teacher is able to simplify especially the complex topics.

MUST BE SOCIALLY AWARE

A teacher in a CC-A school will remain ineffective if he or she is not socially aware through immersion. Social awareness is necessary right at the start when the teacher chooses the strategies or technologies that s/he will highlight in implementing the initiative up to the time when s/he will share what they have to farmers. The inseparability of the heart to teach the students and to serve the community is clearly highlighted.

MUST BRUSH UP ON TEACHING METHODS

Factor in teaching for millennials! Teachers know this very well—they do have a rather different group of learners. We are not in the best position to tackle this, but based on our field notes, teaching requires much creativity. We have reservations if plain lectures will work. One thing that we saw effective was the actual demonstration of technologies. Our partner-teacher in Luna did a peer-teaching approach. He assigned three students to talk about the modified dapog method. They used actual materials, and while the students were demonstrating how to use the technology, the teacher threw discussion questions to the class. Similar case was seen in Libacao.

MUST POSSESS SKILLS IN SOCIAL MOBILIZATION

Given that strong community involvement is needed, the participating teacher must have some skills in connecting with the community members. Various materials on social mobilization are available online that interested parties can read. From what we have observed, social mobilization skills are a key to success in this area. An example is the case of our participating teacher in Maguling. She went out of her way to influence neighboring farmers in their community to plant the seeds that they harvested in the school. As mentioned in other parts of this book, Ma'am Elma blended well with the local office of the DA to help her out with this initiative.

MUST BE PASSIONATE

To be sure, this initiative requires heart not just for teaching students but also for creating an impact on the surrounding community. We know this can be taxing; hence, passion coupled with strong support from their respective school leaders are necessary. All of our participating teachers demonstrated this.

MUST HAVE SOME AGRICULTURAL EXTENSION SKILLS

In our previous book, *Communicating climate change in the rice sector*, we highlighted that there are really no climate change communicators. No one is really fully equipped or is highly specialized in this area. What usually happens especially in small community schools or even in small organizations, people find themselves being dragged to talk about climate change from time to time. A teacher in a CC-A school must be ready for this task. Our previous book (Manalo et al. 2017) provides plenty of tips on how to do this. It is freely available online. It should also not come as a surprise for teachers to find themselves in the offices of the local DA or other possible local collaborators in their area.

MUST BE PATIENT AND INDUSTRIOUS

We are aware that public school teachers already have so much on their plate. At some point being a CC-A school teacher would require full preparations intellectually and physically. It is a must that the person is ready for this—or it would be best if the school leaders such as those we have engaged in this project are aware of the tasks ahead so it will be a team of teachers, not just one, that will push this advocacy forward. Some examples from our participating schools were the cases of Baluan and Dingle where their respective school heads assigned teachers for each component that they implemented.

Libon Agro-Industrial High School, Albay

Winning teaching strategies

It is beyond the scope of this book to talk about teaching strategies (aside from the fact that it is beyond our expertise). We, however, noted that some of our participating teachers employed certain strategies that drove home the bacon, so to speak. Localization was one thing that we saw to have worked really well based on our observations during the teaching demonstrations of the teachers and our interviews with the students. What we did in this project was to prepare a module. It was like having the base module where the lectures could be drawn. During their teaching demonstrations we saw how the teachers localized the materials to make sure that they could connect well with the students.

Luna National Vocational High School

Show. In most of the teaching demonstrations that we attended, some of the most successful ones in terms of sustaining attention and interest of the students were those that had hands-on activities. For instance, in talking about the Minus-One-Element Technique, a rapid soil assessment technology, our participating teacher in Maguling did have actual pots that were properly labeled. Plus, she asked her students to perform the activity themselves. A teacher during one of the teaching demonstrations said that it is important to have actual demonstrations as some of the technologies are complex. For instance, in the MOET lecture, she said that she and other members of the panel could not really understand it until the demonstration was done.

Contextualize. Scholars on climate change say that among the reasons it does not always gain traction is that people see it as a distant phenomenon. Hence, they do not really feel the urgent need to do something about it. In the teaching demonstrations that we attended we laud how the teachers incorporated anecdotes, while ensuring they stuck to the scientific explanations, to localize the concept. Based on our observations and interviews on post-teaching demonstrations, the students felt that the strategy was effective in bringing the phenomenon straight to their consciousness. A teacher from Corazon C. Aquino High School said that localization facilitates imagination between situations and adaptation technologies. The teacher said that perhaps in Gerona, a way to localize is to discuss how climate change is impacting their area and the rice varieties that can be planted there. Another way of localizing the content is to use the local language. Students we interviewed from Bagumbayan Agro-Industrial and Dingle National High Schools raised the issue that some terminologies are very difficult to understand if they are not translated into their local language. For their case, they told us that they prefer the *Bisaya* language.

Baluan National High School

See if visuals are necessary. While we distributed ready-made powerpoint presentations to our participating teachers, some innovated by coming up with their own. For instance, in Luna and Libacao, the teachers showed the actual unit of technologies they were demonstrating such as the leaf color chart, carbonizer, and the MOET. A teacher during one of our FGDs after a teaching demonstration said that it is very important to show evidence that the technologies exist and work.

Libacao National Forestry Vocational High School

Games. Climate change and its adaptation can be big and daunting topics. Some of our participating teachers innovated to lighten things up while not losing site of the level of seriousness of the topics. Our teacher in Maguling jumbled some letters and asked her students to rearrange them to identify the technologies that will be taught in the lecture. Our partner-teacher in LNVHS conducted a jingle-making contest, the lyrics basically exploring the impacts of climate change on rice production. Our teacher in Eastern Pangasinan Agricultural College also integrated games in her lecture.To us, that was an exemplary effort. Also, students said that it helped them retain the concepts better as against just cascading those concepts to them in straight lectures.

Leyte Agro-Industrial School

Subdivide lectures. The technologies for CCA have uncommon levels of complexities; hence, they also require different levels of attention and teaching times. Our conversations with teachers who participated in the teaching demonstrations stressed this issue. They suggested that perhaps the technologies can be packaged in such a way that they can be taught in an hour or less combining theories and practical applications. The teaching strategy must well consider the capacity of the students to learn.

Luna National Vocational High School

Libacao National Forestry Vocational High School

Exploring various creative teaching methods. We saw this in a number of sites like in Libacao where the teacher asked his students to express their learnings through poems and drawings. In Baluan, the teacher asked his students to demonstrate their ideas on climate change through newscasting, role playing, and singing.

[Tips on communicating climate change in the rice sector are explored in detail in the book "Communicating climate change in the rice sector"]

Clear messages conveyed through teaching modules

The topic of CCA while oftentimes mentioned appears to have not been clearly understood, or that it is not always very clear to people what they comprehend about this concept in relation to the agricultural context. Specific to our project, we have had several instances during the conceptualization stage and during data collection with our teachers when we would all of a sudden grapple to say something when pressed to simplify CCA in terms of agriculture. As CCA appears popular but ambiguous at the ground, it is imperative that schools into this initiative be very clear of the concept and the strategies and technologies that go with it. Conceptual clarity is key to pushing people to action.

In another book, "Communicating climate change in the rice sector" we explored the misconceptions and several other issues, and how they abound anywhere. We likewise provided a menu of familiar technologies and strategies that people can choose from when talking of options for CCA. We made it clear how those strategies/ technologies could help in terms of CCA and mitigation. We admit that the good strategies we are promoting have long been known but technologies or strategies can always be modified and updated. All we want is people who intend to establish CC-A schools need to be very clear about how these strategies/technologies are communicated.

Mutually beneficial collaboration

Certain elements in this initiative may turn out to be beyond the capacity of the participating school to execute or is best done with a collaborator. We see this in the case of Libon Agro-Industrial High School when they collaborated with their local DA in conducting a farmers' forum. Teaming up helps simplify tasks that may be too big to accomplish if done singly by the participating teacher or the school alone. Implements could be provided by the DA, for instance. Baluan National High School partnered with the local Department of Trade and Industry in selling their carbonized rice hull in a trade fair. Luna National Vocational High School partnered with East-West in producing their vegetables.

Schools can source assistance from their partners. Maguling National High School received free seeds and fertilizers from their municipal agriculture office that also helped them conduct the Students' Field School. Eastern Pangasinan Agricultural College, and Baluan and Libon High Schools also acquired a four-wheel tractor, walk-behind transplanter and harvester, multi-tiller, fertilizer applicator, and shredder under their partnership with local DA offices. Collaborations also helped our participating teachers serve their community more. In Leyte Agro-Industrial High School, our participating teacher was invited to serve as a resource person in one of the sessions of the Farmers' Field School of the local DA. Some agricultural extension workers also borrowed some materials from the school.

Access to information hubs

Many technical details on rice farming could take years to master. The consolation is there are information hubs for these! A CC-A school must know how to access them. The PhilRice Text Center is a text messaging and calling facility for rice. Agriculturists respond to queries in 0-15 minutes during office hours. PinoyRice is also available, an information portal on rice (www.pinoyrice.com). The Agricultural Training Institute and local offices of the DA also provide valuable information and support to implementing this initiative.

Reflection

To close this book, we would like to respond to our main question: What is a climate change-adaptive school? If you have read this book right from the start, chances are you already have your own answers. Based on the cases and elaborations that we already provided, you are now in a privileged position to take implementation to the next level. That is actually the intention of this book: to lay down basic concepts and invite innovations from there. To level-off expectations and to ensure that we are on the same page, CC-A schools are schools that:

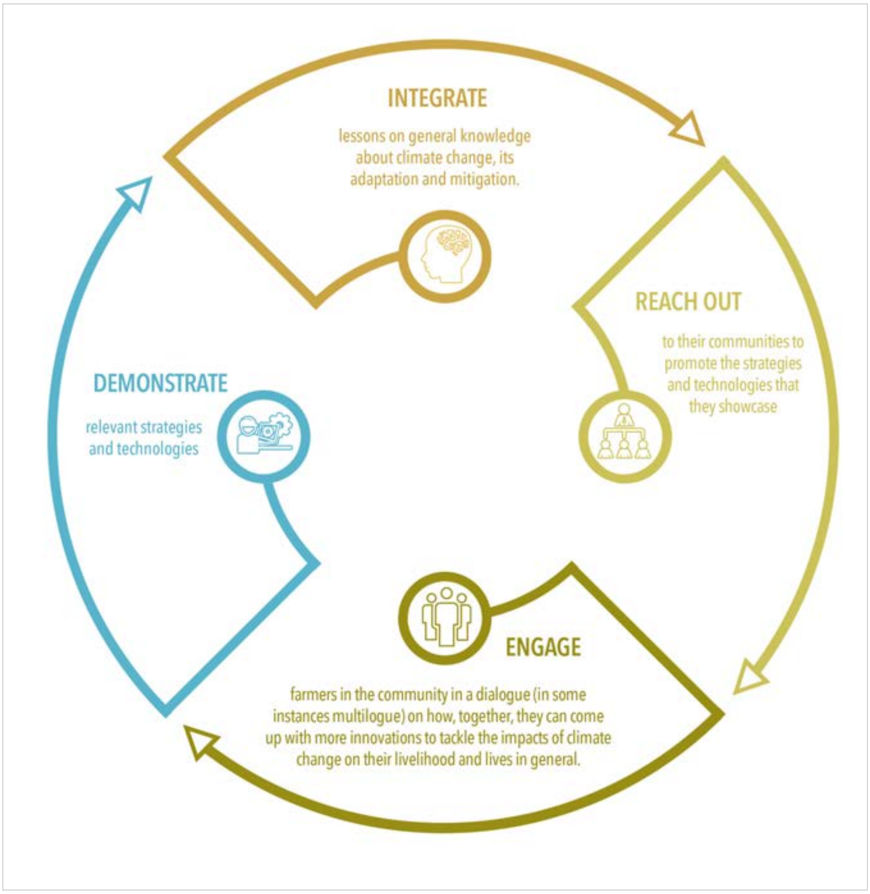


Figure 3: Characteristics of a CC-A school.

We elaborated on these key requirements in the previous sections of this book. An interested teacher or a school decision-maker may please return to how participating schools have implemented their version of this initiative. To be sure, available, updated, and familiar technologies and strategies can cushion the impacts of climate change. What we have offered you, however, are science-based best practices that are doable given the available resources in schools operating in rice-farming communities. We put premium on practicality, innovativeness, and relevance. The thick literature on community development easily tells us that interventions that optimize resources of the community are the ones that have the highest chance of being successful in terms of adoption and adaptation at the ground level. We are confident that you, in your own capacity, can embellish this by coming up with a more contextualized version of school involvement in CCA.

References

Adriano, L. (2015, April 21). Drought-hit farmers welcome rain brought by 'Ineng'. *Philippine Daily Inquirer*. Retrieved from https://newsinfo.inquirer.net/715027/drought-hit-farmers-welcome-rain-brought-by-ineng

Alconaba, N. (2016, April 23). Davao Oriental put under state of calamity due to drought. *Philippine Daily Inquirer.* Retrieved from https://newsinfo.inquirer.net/781031/davao-oriental-put-under-state-of-calamity-due-to-drought#ixzz5Spnq4bxz

Andres, R. (2018, April 4). Ilocos Norte LGUs to get help on climate change woes. *Philippine News Agency.* Retrieved from http://www.pna.gov.ph/index.php/articles/1030790

Buendia, L., Valdeavilla, A., & Escaño, C. (1993). Implication of climate change in the Philippine agriculture *Journal of Agricultural Meteorology, 48*(5), 611-614.

City Economic Management and Cooperative Development Office. (2014). *Gensan annual economic profile* Retrieved from https://gsantoscity.files.wordpress.com/2014/07/gensan-economic-profile1.pdf.

Corales, R. G., Corales, A. M., & Manalo, J. A. (Eds.). (2019). *Palayamanan Plus.* Manila: Philippine Rice Research Institute.

Counts, G. S. (1978). *Dare the schools build a new social order?* Carbondale, Illinois: Southern Illinois University Press.

Duschl, R. (1990). *Restructuring science education: The importance of theories and their development.* New York: Teacher's College Press.

French, L. (2012, 27 February 2012). Dingle wins awards for rice production. *The Daily Guardian* Retrieved from https://thedailyguardian.net/local-news/dingle-wins-award-for-rice-production/

Golez, R. M. (2017, 2 June). New agri program launched to fight poverty. *Official Website of Davao Oriental* Retrieved from http://news.davaooriental.com.ph/index.php/new-anti-poverty-agri-program-launched/

Herman, B. C., Feldman, A., & Vernaza-Hernandez, V. (2015). Florida and Puerto Rico secondary science teachers' knowledge and teaching of climate change science. *International Journal of Science and Mathematics Education, 15*(3), 451-471. doi:doi:10.1007/s10763-015-9706-6

Iloilo Net.PH. (2013). Dingle, Iloilo. Retrieved from http://www.iloilo.net.ph/dingle-iloilo/

IPCC. (2012). *Managing the risks of extreme events and disasters to advance climate change adaptation. A special report of working groups I and II of the Intergovernmental Panel on Climate Change*. Cambridge, UK New York, NewYork, USA: Cambridge University Press.

Jones, L. (2010). Overcoming social barriers to adaptation. Retrieved from http://www.odi.org.uk/resources/download/4945.pdf.

Labaree, D. F. (1997). *How to succeed in school without really learning.* New Haven, CT: Yale University Press.

Lansigan, F. P. (2008). Frequency analysis of extreme hydrologic events and assessment of water stress in a changing climate in the Philippines. In M. Taniguchi, W. C. Burnett, Y. Fukushima, M. Haigh, & Y. Umezawa (Eds.), *From Headwaters to the Ocean* (pp. 497-501). London: CRC Press.

Manalo, J. A., Balmeo, K. P., Berto, J. C., & Saludez, F. M. (2016). *Youth and Agriculture: The Infomediary Campaign in the Philippines.* Manila, Philippines: DA-PhilRice and DA-Bureau of Agricultural Research.

Mindanews. (2016, 11 March). GenSan allots P24M for farmers hit by drought. *MindaNews.* Retrieved from http://www.mindanews.com/top-stories/2016/03/gensan-allots-p24m-for-farmers-hit-by-drought/

Mogato, A. G. A. (2018, 25 February). DA points to Iloilo co-op as model for cheap rice. *Business World* Retrieved from https://www.bworldonline.com/da-points-iloilo-co-op-model-cheap-rice/

Municipality of Leyte. (2017). Physical features. Retrieved from https://www.leyte-gardentown.gov.ph/physical-features/

Municipality of Lupon. (2019). Quick facts. Retrieved from http://lupon.gov.ph/quick-facts/

National Disaster Risk Reduction and Management Council. (2013). *Final report re effects of typhoon "Yolanda" (Haiyan).* Quezon City: Philippine Government.

PAGASA. (2011). *Climate change in the Philippines.* Retrieved from http://dilg.gov.ph/PDF_File/reports_resources/DILG-Resources-2012130-2ef223f591.pdf

Pasiona, S. P. (2017). The Triumvirate that makes a climate-smart community *PhilRice Magazine* 20-23.

References

Philippine Information Agency. (2019). Albay. Retrieved from https://pia.gov.ph/provinces/albay

Philippine Information Agency. (2019). General Santos Retrieved from https://pia.gov.ph/provinces/general-santos

Philippine News Agency. (2016). Albay solon eyes big dams to irrigate farmlands during dry spells. *Business Mirror.* Retrieved from https://businessmirror.com.ph/2016/08/22/albay-solon-eyes-big-dams-to-irrigate-farmlands-during-dry-spells/

Philippine Statistics Authority. (2016). Official poverty statistics of the Philippines: Full year 2015. Retrieved from https://psa.gov.ph/sites/default/files/2015%20Full%20Year%20Official%20Poverty%20Statistics%20of%20the%20Philippines%20Publication.pdf

Philippine Statistics Authority. (2017). Palay and corn situationer in Leyte – Q3 (2015-2016). Retrieved from http://rsso08.psa.gov.ph/leyte/special-release/palay-and-corn-situationer/Q3-2015-2016

Philippine Statistics Authority. (2018). Philippine Standard Geographic Code. Retrieved from https://psa.gov.ph/classification/psgc/?q=psgc/citimuni/050500000

Philippine Statistics Authority. (2018). Quickstat Albay Retrieved from https://psa.gov.ph/statistics/quickstat/provincial-quickstat/2018/Region%20V%20%28Bicol%29/Albay

PhilAtlas. (2019). Luna, Province of La Union. Retrieved from https://www.philatlas.com/luzon/r01/la-union/luna.html

PHL-Microsat. (2016). Featured image: Asuncion, Davao del Norte [Blog post]. Retrieved from https://blog.phl-microsat.upd.edu.ph/featured-image-asuncion-davao-del-norte-66869937ecb5

PinoyRice. (n.d.). *Region 8 seed growers.* Science City of Munoz, Nueva Ecija Philippine Rice Research Institute Retrieved from http://www.pinoyrice.com/seed-growers/region-8-seed-growers/

Province of Albay. (2019). About Albay. Retrieved from http://albay.gov.ph/about/

Province of Davao del Norte. (2019). DavNor tourism highlights Retrieved from http://www.davaodelnorte.gov.ph/index.php/tourism/tourism-highlights-page

Provincial Government of La Union. (2019). Municipality of Luna. Retrieved from https://launion.gov.ph/luna-la-union/

Province of Pangasinan. (2011). Santa Maria. Retrieved from http://pangasinan.gov.ph/the-province/cities-and-municipalities/santa-maria/

Provincial Government of Sarangani. (2019). Municipality of Maitum Retrieved from https://www.sarangani.gov.ph/index.php/features/firstdistrict/maitum

Ratinen, I., Viiri, J., & Lehesvuori, S. (2013). Primary school student teachers' understanding of climate change: Comparing the results given by concept maps and communication analysis. *Research in Science Education, 43*(5), 1801–1823.

Recuerdo, E. V. (2016, 7 November). Program aims to double rice production in Leyte. *Business Mirror.* Retrieved from https://businessmirror.com.ph/program-aims-to-double-rice-production-in-leyte/

Sambalud, M. D. (2017, 25 January). Davao Norte, Oriental placed under state of calamity. Davao Today.com. Retrieved from http://davaotoday.com/main/environment/davao-norte-oriental-placed-under-state-of-calamity/

Sarmiento, B. S. (2012, April 22). Region 12 high-risk to climate change impact. *MindaNews.* Retrieved from http://www.mindanews.com/environment/2012/04/region-12-high-risk-to-climate-change-impact/

Waters-Adams, S. (2006). The relationship between understanding of the nature of science and practice: The influence of teachers' beliefs about education, teaching, and learning. *International Journal of Science Education, 28*(8), 919–944.

Yap, T. (2017, 4 August). Corporate rice farming introduced in Iloilo. *Manila Bulletin.* Retrieved from https://news.mb.com.ph/2017/08/04/corporate-rice-farming-introduced-in-iloilo/

National Household Targeting System for Poverty Reduction. (2017). National Targeting Office: Department of Social Welfare and Development

Orge, R. F., & Dawey, S. A. (2015). Irrigation by capillarity: Development of an efficient method of irrigation for extreme drought. In PhilRice R&D Highlights Retrieved from https://www.philrice.gov.ph/wp-content/uploads/2016/10/CCC-2015.pdf.

Glossary

Accredited seed grower – qualified seed grower who underwent training on seed production organized by the Bureau of Plant Industry-National Seed Quality Control Services (BPI-NSQCS)

African Night Crawler (ANC)- an earthworm used in vermicomposting

Agripreneur – agriculture and entrepreneurship combined to mean entrepreneur in agriculture

Agroecosystem analysis (AESA)- a diagnostic exercise done in the rice field to gather salient information about the growth of the rice crop, general conditions affecting rice (e.g. weather, water availability, weeds, and harmful and beneficial organisms)

Biopesticides - [biological pesticides] pesticides that are drawn from natural sources such as animals, plants, and bacteria

Capillarigation – it is an irrigation concept where " a stable supply of water is provided within the plant's root zone, making water (as well as the nutrients mixed with it) always available to the plants" (Orge and Sawey, 2015, p.14)

Carbonized Rice Hull (CRH) – partially burned rice hull or charcoal; also used as soil conditioner, waste water-purifier, and sanitizer

Carbonizer – a machine used to produce carbonized rice hull

Climate change adaptation (CCA)- relates to the processes people use to reduce the adverse effects of climate change on their livelihood and well-being, and take advantage of new opportunities provided by their changing environment (Jones, 2010, p. 1)

Container gardening- growing of vegetables on containers such as empty paint or milk cans

Controlled irrigation - a water management technology that uses an observation well in guiding farmers to determine the proper timing of irrigating the ricefield; also referred to as Alternate Wetting and Drying (AWD) technology

Corn component- component in which the school showcases corn production and its supporting technologies

Diversified farming - cultivating a variety of crops and growing various animals on the same farm; a practice of growing crops, livestock, and fish within the same farm

Drip irrigation – irrigation technique that regulates the delivery of water droplets to individual plants by using tubes or pipes with small holes

Drum seeder – a manually operated farm equipment for rice direct-seeding using a cylindrical container with holes to deliver seeds; use of this machine enables a farmer to ensure adequate planting density needed for optimized crop growth

Early-maturing variety – variety that matures within 110 days after sowing

Ecological engineering –technique of growing ornamentals or flowering plants on bunds or perimeters of the rice field, which harbor beneficial organisms

Fermented fruit juice –by-product of fermenting sweet ripened fruits, fruit vegetables, and molasses/sugar

Fermented plant juice –by-product of fermenting young plant parts (shoots, fruits, leaves) such as *kangkong,* legumes, trees, and molasses

Fish component- component in which the school grows some fish like tilapia and showcases it to the community

Hybrid rice seeds –seeds produced through the cross pollination of two different parental lines to optimize their yielding abilities (e.g. PSB Rc 72H/ Mestizo 1)

IMO – Indigenous Microorganism beneficial enough to be used to improve soil fertility and as plant growth promoter

Inbred rice seeds –seeds produced through the cross pollination of two same parental lines (e.g. NSIC Rc 222); certain inbred varieties yield as high as the hybrids

Glossary

Infomediary Campaign- initiative that engages the youth in agriculture, launched by PhilRice and supported by DepEd, then by the Consultative Group on International Agricultural Research Program on Climate Change, Agriculture, and Food Security

Intergovernmental Panel on Climate Change (IPCC)- panel of experts from across the globe that synthesizes research studies relating to climate change; IPCC reports provide inputs for policymaking relating to climate change adaptation and mitigation

Irrigated ecosystem- rice-farming communities that have dependable sources of irrigation water, where rice is planted twice or even thrice a year.

Landmaster – a local terminology used in Leyte for “Handtractor”

Leaf Color Chart (LCC) - a tool used to determine nitrogen deficiency or sufficiency in rice plants

Minus-One-Element Technique (MOET) – a technique used to pinpoint soil nutrient deficiencies; farmers can buy MOET kits at PhilRice

Modified Dapog Method – method of growing rice seedlings where two layers of mosquito nets are placed above the top soil on which seeds are sown to prevent their roots from deeply penetrating into the soil; seedlings can be transplanted 10-12 days after sowing.

Observation well – a tube made of plastic or bamboo with holes around it; measures water table under the controlled irrigation/ alternate wetting-and-drying technology

Organic concoction – by-product of mixing or brewing assorted organic plant/ animal parts, normally used as fertilizer or pesticide

Palayamanan Plus- rice-based farming system being promoted by PhilRice to enhance productivity and profitability through diversification, intensification, and integration of different farming ventures

Rainfed ecosystem- rice-farming communities that rely on rainfall as source of irrigation where rice is planted only once a year

Rice component- putting up a rice garden by the participating school where rice production technologies such as the use of certified seeds and MOET are demonstrated

Sorjan farming system – food production system originating from Indonesia involving a series of deep sinks for fish and raised beds for vegetables/upland rice/corn

Vegetable component- putting up a vegetable garden by the participating school where vegetables are planted and showcased

Vermi beds – a box usually made of hollow blocks and cement/wood where a partially decomposed substrate and African Night Crawler earthworms are placed for vermicomposting

Vermicast- the collected manure of the African Night Crawler earthworms produced in vermicomposting

Vermicomposting component- setting up a vermicomposting area/corner by the participating school where biodegradable materials such as leaves and rice straw are converted into organic fertilizers using earthworms as decomposers

Vermitea – a product of brewing the vermicompost/cast in water for fertilizer purposes

Transplanter- a machine for transplanting rice

Rice combine harvester- a machine that performs harvesting, threshing, cleaning, and bagging operations in one passing

Water-harvesting facility – facility that collects and stores water, usually rainwater; commonly used in water-scarce areas

Wetbed method – a method in rice seedling production where pre-germinated seeds are sown in a well-puddled wetbed; seedlings can be transplanted within 18-21 days after sowing

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