

Capacitating Public Schools through Sustainable School Gardening Program in Talakag and Quezon, Bukidnon, Philippines

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Abstract

COVID-19 pandemic struck the world and various problems were faced such as food security, thus higher educational institutions like Central Mindanao University (CMU) are pushed to respond. CMU in the Philippines initiated the establishment of a School gardening program in the public schools in Bukidnon. The school gardening program is a participatory activity with a collaborative effort between CMU, NOMCAARRD Consortium Member Institutions (CMI), and other stakeholders. This initiative of NOMCAARRD was established as an active response to the GALING-PCAARRD Kontra CoViD-19 program. The main objective of this program is to empower students, and school teachers, through the transfer of selected S&T interventions to provide a source of food specially during the pandemic. This study aimed to capacitate students and school teachers, in Bukidnon; and determine the cost and returns, particularly during the ongoing pandemic. A series of observations, Key Informant Interviews (KII), and focus group discussions were conducted among various stakeholders to implement the project, and Secondary data were utilized. The project was implemented among one Elementary school, and one Integrated School, in Bukidnon Philippines with CMU as the project's implementing agency. The project delivered technology packages (POT) covering "Pinakbet" vegetable production, mushroom production, and vermicomposting, to the participants. The implementation was fueled by market linkages, farm on-site and off-site consultation, farm capability building, partnership with the Local Government Units and private companies, and provision of farm inputs, tools, and materials. The implementation of this program is to encourage more students to engage in agricultural entrepreneurship in response to the declining trend in enrolment in agriculture courses in the Philippines. Data gathered includes the participants' year level, gender, and analyzes their costs and returns. The program also conducted training sessions covering various aspects of agriculture and business, ranging from farming techniques to organizational management. An increase in the level of income was recorded at 7.01% and 32.3% for San Jose Integrated School and Lapok Elementary School, respectively.

INTRODUCTION

School gardening in the Philippines includes various benefits and challenges associated with these initiatives. The role of school gardens in urban areas like Metro Manila highlights the importance of urban green spaces and climate change mitigation (Cruz-Tadeja, 2019). Calub et al. (2019) reported that the School-Plus-Home Gardens Project has the potential to promote sustainable development through integrated school and home gardening. The Department of Education's (2018) guidelines on the *Gulayan sa Paaralan* Program (GPP) underscored the role of school gardens in addressing malnutrition and fostering environmental stewardship. De la Cruz and Gregorio (2020) found that school gardens positively impacted students' academic performance and nutrition in rural areas. Monreal and Villanueva (2017) discussed the integration of gardening into the K-12+ curriculum, pointing out the advantages of practical learning for instruction. While Yao et al. (2019) examined international research on the effects of school gardening on health and well-being. Rola et al. (2018) emphasized the role that school gardens play in promoting food security and sustainability. The historical development of school gardens in the Philippines was documented by Barretto-Tesoro et al. (2020), and the sustainability problems faced by these programs were examined by Lantican et al. (2018). Finally, the importance of gardens in fostering ecological literacy in students was highlighted by Medina et al. (2016).

COVID-19 pandemic has had a significant impact on agricultural production. As a response, the Department of Science and Technology—Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (DOST-PCAARRD) has launched the GALING-PCAARRD Kontra CoViD-19 Program (FAO, 2021). The Northern Mindanao Consortium for Agriculture and Resources Research and Development (NOMCAARRD), in collaboration with its member institutions, plays a vital role in facilitating the expansion of agricultural technology transfer and commercialization, with the ultimate goal of fostering a globally competitive and sustainable society. This initiative included Quick Response Projects (QRPs) implemented by consortia like NOMCAARRD, which provided critical support during lockdowns. Institutions such as Central Mindanao University (CMU) played vital roles in

assisting communities and addressing food supply chain challenges. Thus, this study aims to capacitate students and school teachers in Bukidnon through technology transfer of the selected Package of Technology (POT) generated by research of CMU as an additional source of income during the pandemic. Specifically, the project aims to capacitate students and school teachers, in Bukidnon; and determine its cost and return analysis.

Methodology

Locale of the Study

Bukidnon is one of the five provinces in Region 10. Bukidnon is considered as the food basket of Mindanao and has a wide range of resources and industries. The land resources in the province are fertile and ideal for cultivating high-valued vegetables and vegetables suitable in low-lying areas. Bukidnon is crucial in Philippine vegetable production as it supports the national economy. By engaging with these sites, the project gains access to a wide array of resources and industries, greatly enhancing its potential for well-rounded and holistic outcomes. The criteria for selecting a participant is the willingness to collaborate or partner with the academic community by signing a Memorandum of Agreement. The economic impact of Bukidnon's vegetable industry is significant, as it serves as a source of income for farmers, creates job opportunities, and encourages businesses and entrepreneurial activities such as transportation and logistics (Rola et al., 2018; Lantican et al., 2018; Department of Agriculture, 2020; Calub et al., 2019; Medina et al., 2016). Furthermore, the success of vegetable farming in Bukidnon has encouraged sustainable agricultural practices and innovations that enhance productivity while maintaining environmental balance, reinforcing the province's pivotal role in the Philippine economy. The project was implemented in Lapok Elementary School in Talakag, Bukidnon, and San Jose Integrated School in Quezon, Bukidnon. Figure 2 shows the map of the Philippines showing the locale of the study.

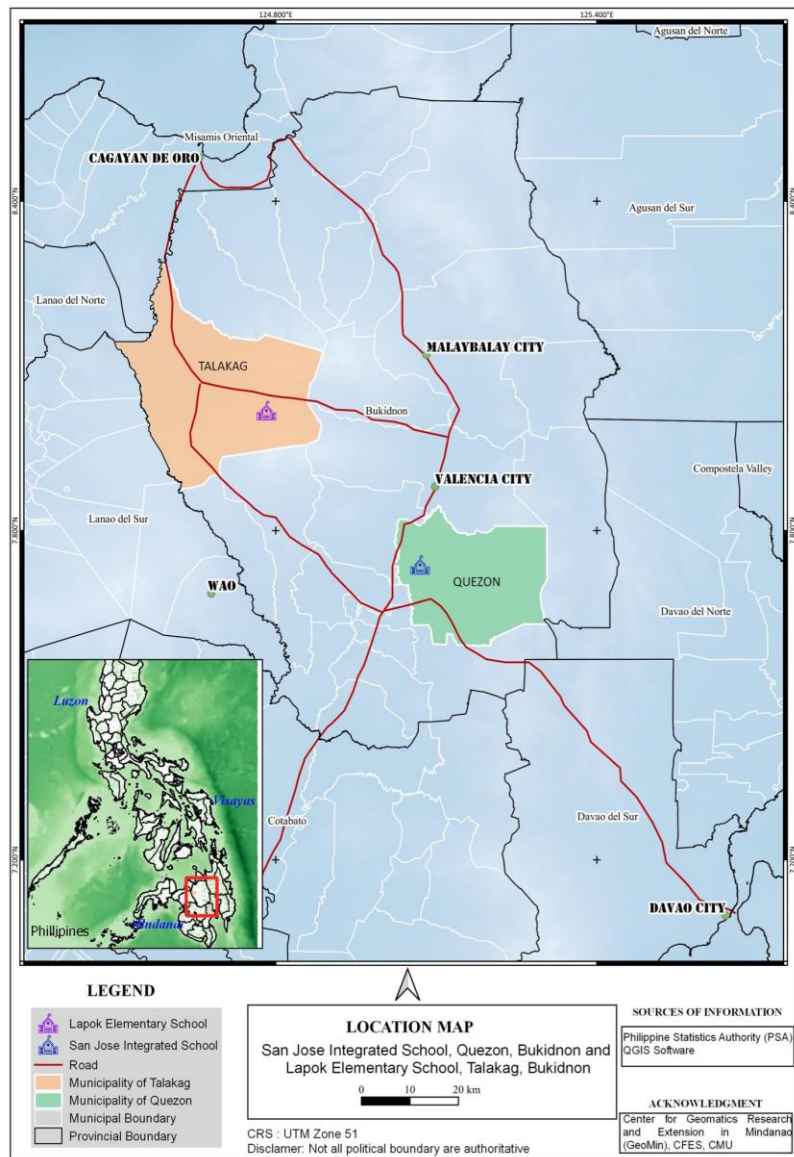


Figure 2. Map of the Philippines showing the locale of the study

The following criteria were followed in choosing the school as a participant in the study as per discretion of the CMI:

1. **Organizational Registration:** Beneficiary organization must be an organized organization validated at the barangay level.
2. **Minimum Membership:** Organization must have at least 15 active members.

3. Land Area for Diverse Farming: Beneficiary organization of CMU should possess a land area suitable for various agricultural activities, including vegetable production, mushroom cultivation, and vermicomposting. Table 1 presents the participants of the program

Table 1. Summary Final Participants

CMI	No. of Participants	Location
CMU	20: 39 SHS students	San Jose Integrated School
	20: 70 Elem. Students	Lapok Elementary School

RESULTS AND DISCUSSIONS

Profile. The participants of the programs show a total of 109 individuals who are active in participating program's activities. High School levels were 35.78% while 64.22% were elementary students. It can be gleaned from the data that more than one-half of the participants are elementary students implying as early as elementary years, the program complemented the Department of Education's Gulayan sa Paaralan Program underscoring the role of school gardens to potentially address malnutrition among its students at the same time fostering environmental consciousness. Junior High school students were also targeted because they are in the stage of deciding their senior high school strand and eventually their college degree, thus this project encourages students to take up TVL strand in their senior high school and Agriculture in their college degree to answer the declining enrollment in Agriculture.

Table 2. Number of Participants

CMIs	Total No. of Participants (Group)	Total No. of B Participants	Educational Level
CMU	Students	39	Junior High School Students
		70	Elementary Students

Gender Distribution of Participants. The gender distribution among the participants in San Jose Integrated School is female dominated by 84.62%, while Lapok Elementary School is comprised of female participants with 80%. This implies that both participants in the public schools are female-dominated. This result is the same as the study of Quijano-Pagutayao (2020) who mentioned that public school students in Bukidnon are generally female. Table 3 shows the summary of the gender distribution of the participants.

Table 3. Summary of the Gender Distribution of the Participants

	Total	Female	Frequency		
			Percentage	Male	Percentage
San Jose Integrated School	39	33	84.62	6	15.38
Lapok Elementary School	70	56	80.00	14	20.00
	109	89	81.65	20	18.35

Capability Building Activities

Packages of Technology (POTs) and Information, Education, and Communication (IEC) materials were developed. The program provided comprehensive training seminars and workshops to the students and teachers to encourage changes in knowledge, skills, attitude, and practices among the participants.

Package of Technology (POT)

Package of Technology (POT) refers to the variety of technologies created to provide solutions to the challenges, and needs of the intended communities in a specific geographical location tailored to address specific and to promote sustainable practices (Garcia et al., 2019). The project implemented various Packages of technologies to include mushroom production technology, pinakbet vegetable production and vermicomposting resulting in an augmented revenue stream for the participants. Students in public schools were exposed to agricultural activity to let them appreciate the beauty of agriculture and that there is money in agriculture. Implementing the package of technology has helped the environment and improved soil fertility and subsequent crop yields. These POT were implemented in Lapok Elementary School and San Jose Integrated School in Bukidnon, Philippines. The distribution of the three packages of technologies among the students and teachers in the public school has improved the competitiveness of the participants. Three Package of Technologies (POTs) were introduced and farm inputs were distributed to the school as shown in Table 4.

Table 4. List of Package of Technology

No.	Technology
1	Mushroom Production
2	“Pinakbet” Vegetable Production
3	Vermicompost Production

Information, Education, and Communication (IEC) Materials Development

The program created and developed a total of 13 IEC materials and were distributed to the participants. Table 5 presents the list of IEC materials developed under the project. IEC materials are necessary for the success of the project, representing a significant contribution to the dissemination and

adoption of information (Jones & Smith, 2021; Patel, 2020). IEC materials aid as the source of knowledge, allowing the project team to disseminate vital information (Garcia et al., 2019). These materials are crucial in changing the participant's knowledge, skills, attitudes, and practices toward agriculture.

Table 5. IEC materials developed by the project

NO.	Title	DESCRIPTION
1.	“Talong” Giya sa Pag tanom	Guide on planting Eggplant
2.	“Okra” Giya sa Pag tanom	Guide on Planting Okra
3.	“Kalabasa” Giya sa Pag tanom	Guide on Planting Squash
4.	“Sitaw” Giya sa Pag tanom	Guide on Planting String Beans
5.	“Ampalaya” Giya sa Pag tanom	Guide on Planting Amplaya
6.	Produksyon sa Paddy Straw Mushroom	Guide on Paddy Straw Mushroom Production
7.	VERMICOMPOSTING “Pamaagi sa paghimo sa vermicompost”	Guide on Vermicomposting
8.	Values Formation (English Version)	Values formation is the process through which individuals develop their core beliefs and principles that guide their behavior and decision-making.
9.	Values Formation (Bisaya Version)	
10.	Organizational Management (English Version)	Organizational management refers to the systematic and strategic administration of resources, processes, and people within an organization to achieve its goals and objectives effectively and efficiently
11.	Organization Management (Bisaya Version)	Organizational management refers to the systematic and strategic administration of resources, processes, and people within an organization to achieve its goals and objectives effectively and efficiently. (Bisaya Version)
12.	Marketing Strategies for Farm Enterprise	Marketing strategies for a farm enterprise are tailored plans and approaches aimed at promoting agricultural products and services to target markets effectively.
13.	Bookkeeping for Farm Enterprise	Bookkeeping for a farm enterprise involves the systematic recording and tracking of financial transactions related to agricultural activities. It encompasses the management of income, expenses, assets, and liabilities specific to farming operations

Training Conducted for School Gardening Program

The following trainings were conducted under the school gardening program in Lapok Elementary School and San Jose Integrated School: Vermicomposting, Pinakbet Vegetable Production, and Mushroom Production.

A collaboration between the East-West Seed Company, Inc. and Central Mindanao University's Research, Development, and Extension Team (RDE Team) work hand in hand in facilitating training on "Pinakbet" vegetable production. The following crops were included in the Pinakbet production in the public schools: ampalaya, eggplant, water spinach, ladies' finger, string beans, and squash. It was planted by the students and facilitated by the teachers in their school garden. The training imparts knowledge and skills to help the participants grow a variety of vegetables efficiently. It is also a way of showcasing how

to diversify crops for food sources. The participants in Bukidnon received the technical assistance, agricultural inputs, and tools promised by the project.

Another training workshop conducted was the mushroom production as it is a nutritious source of food, it can also serve as an alternative source of income.

Vermicomposting is a process that relies on earthworms and microorganisms to help stabilize active organic materials and convert them to a valuable soil amendment and source of plant nutrients. Vermicomposting is an available technology in Central Mindanao University thus a series of trainings were conducted in public schools. The vermicast was able to add income to the participants.

Cost and Return Analysis

San Jose Integrated School's cost and return analysis in Table 6 presents data on various agricultural commodities: eggplant, ladies finger/okra, ampalaya, string beans, water spinach/kangkong, and squash shown total sales of Php 33,060.00. Mushrooms and vermicompost contribute Php 36,995.00 and Php 10,125, respectively. The overall income is Php 25,956.10, reflecting a 7.01% increase. The area planted for vegetables as well as mushroom production and vermicomposting is 2400 square meters.

Commodity	Qty	Unit	Price (Php)	Total Sale (Php)	Production Cost	Actual Income	Increase 7%
Eggplant	210	kls	40.00	₱ 8,400.00			
Okra	92	kls	40.00	₱ 3,680.00			
Ampalaya	118	kls	50.00	₱ 5,900.00			
String Beans	107	kls	40.00	₱ 4,280.00			
Kangkong	52	kls	30.00	₱ 1,560.00			
Squash	308	kls	30.00	₱ 9,240.00			
			Sub-total:	₱ 33,060.00	(25,060.40)	7,999.60	
Mushroom	147.98	kls	₱ 250.00	₱ 36,995.00	(23,163.50)	13,831.50	
Vermicompost	41	sack	₱ 250.00	₱ 10,125.00	(6,000.00)	4,125.00	
			Overall Total:	₱ 80,180.00	(54,223.90)	25,956.10	7.01%

The total area planted for vegetables and mushroom production as well as vermicomposting is approximately 3,000 square meters. Table 7 also shows the cost and return analysis of Lapok Elementary school in Talakag, Bukidnon with a total vegetable sales of Php 101,110.00 while mushroom and vermicomposting sales revenue of Php 46,750 and Php 21,250, respectively. The overall income is Php 42,546.50 reflecting an increase of 32.3%.

Commodity	Qty	Unit	Price (PhP)	Total Sale (PhP)	Production Cost	Actual Income	Increase 7%
Eggplant	588	cls	40.00	₱ 23,520.00			
Okra	206	cls	40.00	₱ 8,240.00			
Ampalaya	535	cls	50.00	₱ 26,750.00			
String Beans	180	cls	40.00	₱ 7,200.00			
Kangkong	230	cls	30.00	₱ 6,900.00			
Squash	950	cls	30.00	₱ 28,500.00			
			Sub-total:	₱ 101,110.00	(97,400.00)	3,710.00	
Mushroom	187	₱ 250.00		₱ 46,750.00	(23,163.50)	23,586.50	
Vermicompost	85	₱ 250.00		₱ 21,250.00	(6,000.00)	15,250.00	
			Overall Total:	₱ 169,110.00	(126,563.50)	42,546.50	32.3%

Linkages

The data presented in Table 8 outlines the linkages established between schools in various educational institutions, between 2022 and 2023. These linkages signify a concerted effort towards collaboration and community engagement. The involvement of schools such as San Jose Integrated School, and Lapok Elementary School suggests an emphasis on educational development. In addition to academic partnerships, the inclusion of East-West Seed Company signifies a dedication to sustainable agriculture, agroforestry, and rural development. These partnerships hold great significance as the organization promotes regional growth, knowledge exchange, and sustainable practices which contribute to a holistic project aimed at fostering education, community development, and environmental sustainability in the Mindanao region, ultimately benefiting both the local population and the broader ecosystem.

Table 8. List of linkages forged from 2022-2023

LINKAGES	YEAR
Central Mindanao, University, Musuan, Maramag, Bukidnon	2022
San Jose Integrated School, Quezon, Bukidnon	2022
Lapok Elementary School, Talakag, Bukidnon	2022
East-West Seed Company	2022

Conclusion

Capacity-building activities for students, and school teachers, in Bukidnon, were thoroughly conducted and implemented. Trainings on Pinakbet vegetable production, Mushroom Production, vermicomposting, organizational management, marketing strategies, bookkeeping, and values formation in Lapok Elementary School and San Jose Integrated School in Talakag and Quezon Bukidnon, respectively were carried out successfully. Thirty-nine (39) Senior High School students and 70 elementary students have been capacitated and have availed the Technology Transfers of the selected S&T interventions for additional income during the pandemic. A total of 13 Information, Education, and Communication (IEC) Materials were developed for the participants. Cost and return analysis clearly shows the increase in income by 7.01% and 32.2% for San Jose Integrated Schools and Lapok Elementary School, respectively.

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Conflicts of Interest

The authors have disclosed no conflicts of interest.

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