



## RESEARCH PAPER

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## Engagement in crop production practices before and during COVID-19 pandemic: Resiliency of Polanco farmers

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Article published on August 07, 2024

**Key words:** COVID-19 pandemic, Marketing, Practices, Production, Resiliency

### Abstract

We assessed the production practices, problems, and satisfaction of farmers in Polanco, Zamboanga del Norte before and during the COVID-19 pandemic. The survey was used with a structured questionnaire and semi-interview to come up with the frequency distribution and narrative analysis. Most of the respondents are female (54%) with more than 10 years in farming and performed usual activities on the farm with most of them planting vegetables (80%) 3 times per year. However, changes occurred during the pandemic. The usual cultivation of soil was minimized and the farmers' engagement in irrigation from the NIA decreased by 35% during the pandemic, this led to some of them constructing irrigation from rivers (14%). Most of the farmers practiced manual weeding (84%) before the pandemic and further increased (95%) during the pandemic; few were engaged in using herbicides with 26% before the pandemic, however, decreased to 5% during the pandemic. All farmers applied inorganic fertilizers before the pandemic, however, 50% of them switched to organic fertilizers during the pandemic. There were 20% who practiced both cultural and physical methods in controlling pests which is higher than for the biological method (10%), but lower than for the chemical method (50%) before the pandemic; however, the chemical method was decreased to 20% during the pandemic resulting in the majority of farmers switching to cultural (30%), and physical (30%) methods. The biological method was also practiced by some of the farmers by up to 20% increasingly during the pandemic. There were 72% of farmers practiced manual harvesting and the rest used mechanical harvesters (28%) before the pandemic, manual harvesting was further increased to 95% during the pandemic. Both before and during the pandemic, most of the farmers practiced sun-drying and ambient storage (30%), while there were 20% and 10% for cold storage and packaging, respectively. The most common problems were financial aspects, high labor costs, damage to crops due to weather, low prices, high transportation costs, and no control over the price which further encountered as very important problems during the pandemic. Before the pandemic, 77% of the farmers perceived that they were satisfied with receiving support and services from the LGU in terms of agricultural inputs, insurance, and the like, however, there were 15% who were not satisfied, and 8% who have not received any support. During the pandemic, the satisfaction of the farmers with government support increased to 92% because they received more certified seeds and cash for fertilizer based on their farm area size, however, there was still moderately satisfied with 3% of those farmers because they received certified seeds only and 5% were not receiving any service from the government. The farmers' income decreased during the pandemic, but somehow still gained and showed their resiliency amid the calamity.

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## Introduction

The Municipality of Polanco in the province of Zamboanga del Norte, Philippines is a third-class that possesses a total of 9,104 hectares of agricultural land out of 22,532 hectares of the whole land area. The main crops in this municipality are rice (*Oryza sativa*), corn (*Zea mays* L.), cassava (*Manihot esculenta*), sweet potato (*Ipomoea batatas*), coconut (*Cocos nucifera*), and vegetables (PSA, 2004). According to the farmers in Polanco, they gained an adequate volume of production every cropping before the COVID-19 pandemic because they even completely applied the relevant practices and management to their farms to market. However, they encountered difficulties during the COVID-19 pandemic due to restrictions and limitations which resulted in the deterioration of their production and income.

The COVID-19 pandemic is one of the worst calamities that the whole world had been facing. The most negatively affected people are farmers because if they don't work on their farms due to restrictions and lockdowns they will expectedly have no income. Lockdown is everywhere, due to this policy, many farmers are struggling with their engagement in raising their crops and managing their livelihoods. It is difficult for them to manage and cultivate crops amid the pandemic in which time and financial assistance are maybe limited. This influences the decrease in production as it is noticeable that the results underline that sales contraction and price volatility in the context of interruption of the calamity dominate the total losses during the pandemic (Zhou *et al.*, 2020).

Amid the COVID-19 pandemic, however, the farmers somehow still need to continue cultivating crops with constant application of important practices and marketing strategies at their best as the major factors affecting farming enterprises (Uematsu and Mishra, 2011). Whatever the farmers' goals and preferences, it is still necessary for them to be guided on what to do to their farming enterprises with the help of the government, especially amid the pandemic. They

must be educated enough on the alternative practices of crop production and marketing methods that help mitigate the negative effects of the COVID-19 shock. Agricultural technologists or extensionists and other relevant government departments should work together to coordinate the development of supply chains and strengthen stability and sustainability (Zhou *et al.*, 2020).

The continuous management of farming enterprises amid the COVID-19 pandemic tying up between farmers and even the Local Government Unit (LGU) is a practice towards resiliency that the Filipinos can still survive despite tremendous calamity. To prove this, the study was conducted to evaluate the impact of the COVID-19 pandemic on crop production in comparison to those before the pandemic in the Municipality of Polanco, Zamboanga del Norte, Philippines, and assess the farmers' satisfaction with the interventions of LGU in addressing detriments.

## Materials and methods

A survey instrument in the form of a well-prepared questionnaire was facilitated to the 25% farmers-respondents who were randomly selected and interviewed from each selected five (5) Barangays of the Municipality of Polanco in the province of Zamboanga del Norte namely: (1) Isis, (2) Silawe, (3) Bandera, (4) Villahermosa, and (5) Santo Niño. Secondary data were secured from the said Local Government Unit (LGU) to likewise assess their support to the farmers. Fig. 1 shows the map where Polanco is located.



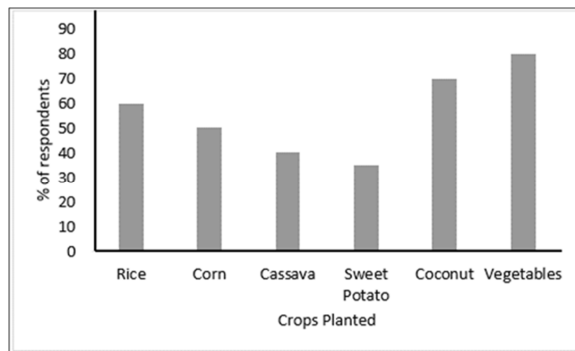
**Fig. 1.** Map of Zamboanga Peninsula where Polanco is located

Percentage frequency distribution and narrative analysis were employed in the parameters. A scoring system and weighted mean were used in the problems encountered by the respondents in production and marketing to interpret the results and analyze them.

**Results**

*Profiles of the respondents*

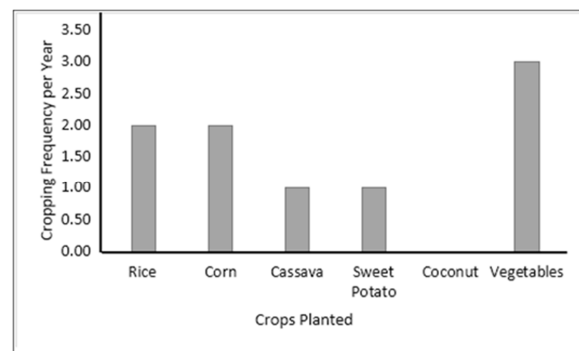
The oldest age range of the respondents is 56 to 60 years old. The youngest is ranged from 20 to 30 years old. Most of them have already more than 10 years' experience in farming. All respondents are Roman Catholic with a majority female of 54%. Most of them attained only elementary education with an average of 67%. There are 67% tenants among the respondents with 50% of them relying on lending institutions as a source of their capital. There 74% of respondent's utilized farms of 0.25 to 4 hectares and 26% beyond. There are 34% of respondents who utilized irrigated areas and the rest are in the rainfed.



**Fig. 2.** Percentage of farmers who engaged in raising crops

The most common crops raised by the farmers in Polanco are rice (*Oryza sativa*), corn (*Zea mays*), cassava (*Manihot esculenta*), sweet potato (*Ipomoea batatas*), assorted vegetables, and coconut (*Cocos nucifera*). Fig. 2 shows the percentage of farmers who engaged in raising those crops. Results revealed that many farmers raised vegetables with an average of 80% followed by coconut at 75%. Biñas, (2020) also found that the farmers-households of the municipalities of Ma-ayon in the province of Capiz planted more vegetables to augment the basic families' supply for consumption, especially during the COVID-19 pandemic. Moreover, the cropping

frequency of these crops per year is also shown in Fig. 3. The result shows that the farmers can grow vegetables three (3) times per year, two (2) times per year for rice and corn, and one (1) time per year for cassava and sweet potato. On the other hand, farmers cannot ensure that they plant coconut every year because coconut is a perennial type of crop. The cropping frequency depends on the maturity period of crops. The vegetables grown by farmers mostly have a short period to maturity compared to the other major crops.

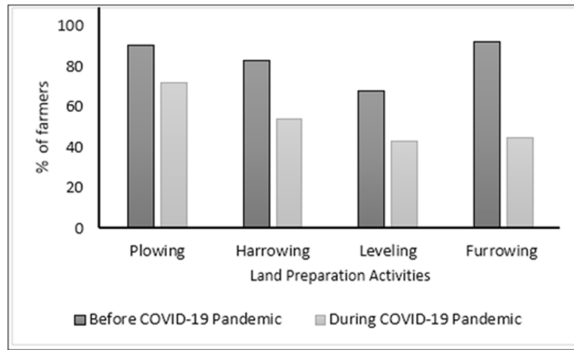


**Fig. 3.** Cropping frequency of raised crops per year practiced by the farmers

*Production practices of the farmers*

*Land preparation*

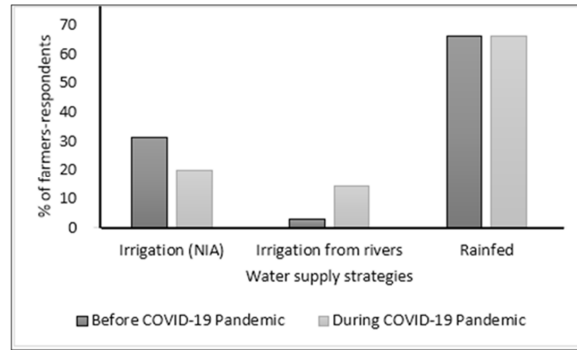
The major land preparation activities are plowing, harrowing, leveling, and furrowing. Fig. 4 shows the percentage of farmers in Polanco on land preparation before and during the COVID-19 pandemic. Results revealed that during the pandemic the plowing, harrowing, leveling, and furrowing practices decreased to the percentage of 20, 35, 37, and 51, respectively. The farmers said that the land preparation needs manpower but due to the lockdowns and lack of financial assistance hiring of laborers became limited. However, they continuously raised their crops with minimum tillage because they were taught by the extensionists that minimum tillage has also positive effects on yield and the environment. Less soil erosion, better water penetration, and greater soil health are just a few benefits that minimal tillage systems have over traditional tillage techniques. It promotes conservation, maintains the health of the soil, and aids farmers in producing abundant crop yields. This supports the same report of Triplett and Dick (2008).



**Fig. 4.** Percentage of farmers doing land preparation practices

### Water supply

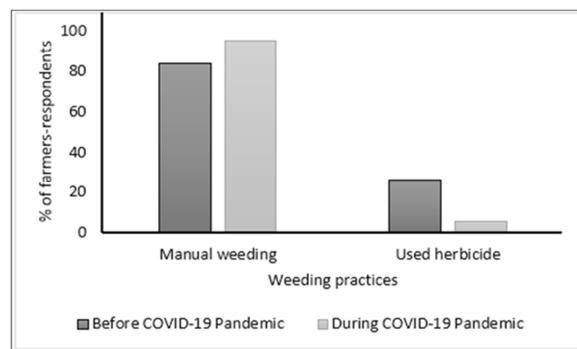
Water is a vital component of agricultural productivity and is crucial to the security of our food supply. A whopping 40% of all food produced worldwide comes from irrigated agriculture, which uses 20% of all cultivated land. It is possible to increase output intensity and crop diversification by using irrigation, which is typically at least twice as productive per unit of land than rainfed agriculture (worldbank.org). The percentage of farmers in Polanco who engaged in water supply strategies is shown in Fig. 5. The farmers' engagement in irrigation from the National Irrigation Administration (NIA) decreased by 35% during the COVID-19 pandemic. The result is one of the proofs of the report on the decreased water availability during the COVID-19 pandemic (Ostadtaghizadeh *et al.*, 2022). This contributed to the Polanco farmers engaging in constructing irrigation from the rivers up to 14% during the pandemic as an alternative to the decreased availability of NIA. On the other hand, their percentage for rainfed was constant at 66%. The NIA also takes action to mitigate the impact of the COVID-19 pandemic on the supply of water especially for farmers (NIA, 2020). For further knowledge, Republic Act (RA) No. 3601 was passed on June 22, 1963, and it established the National Irrigation Administration (NIA), a government-owned and controlled business. Irrigation planning and management fall under the purview of the NIA. The agency's power was expanded and its capitalization was raised as a result of Presidential Decrees (PD) 552 on September 11, 1974, and 1702 on July 17, 1980, which revised the agency's charter (icrs.gcg.gov.ph).



**Fig. 5.** Percentage of farmers who engaged in different water supply strategies

### Weed control measure

Weed control measure is a combination of techniques of prevention, control, and eradication to manage weeds in a crop, cropping system, or environment. The percentage of farmers in Polanco who engaged in manual weeding and using herbicide is presented in Fig. 6.



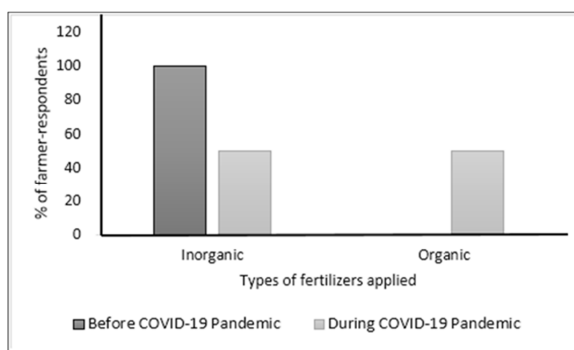
**Fig. 6.** Percentage of farmers who engaged in manual weeding and using herbicide

Most of the farmers practiced manual weeding (84%) before the pandemic and further increased (95%) during the pandemic. This is because the farmers in Polanco are aware of the adverse effects of herbicides on their health and environment. Moreover, the majority of them utilized the uprooted weeds as mulching material for their crops to maintain soil moisture and minimize soil erosion. This can also be a better source of organic nutrients when decomposed. However, few were engaged in using herbicides with 26% before the pandemic, however, this decreased to 5% during the pandemic. This implies that the farmers in Polanco do not rely only on the use of herbicide; they can perform manual weeding as the

basic practice to eliminate undesirable plants either even without or with the pandemic. In tropical zones, the most widespread control measure in eliminating weeds is still manual weeding. This is also noted that manual weeding is an efficient method for weed control (<http://www.knowledgebank.irri.org>).

*Nutrient application*

The activity in this section is the application of nutrient sources needed for the growth and development of a crop. This involves the types of fertilizers applied under the availability and conditions. The percentage of farmers in Polanco who engaged in applying fertilizers is presented in Fig. 7. All farmers applied inorganic fertilizers before the pandemic, however, 50% of them switched to organic fertilizer by utilizing the available materials for composting, concoctions, and the like. This implies that some of the farmers in Polanco have also an initiative and are aware of the importance of organic inputs in farming. Their knowledge of how to make organic inputs was acquired from the seminar training, and their children studied agricultural courses. Mutegi *et al.* (2024) also noticed a decrease in the use of inorganic fertilizers globally and Rosero *et al.* (2023) reported that the demand for healthy foods during the pandemic was highlighted and noticeable. This resulted in the high demand for organically grown products globally which led to farmers utilizing organic inputs.

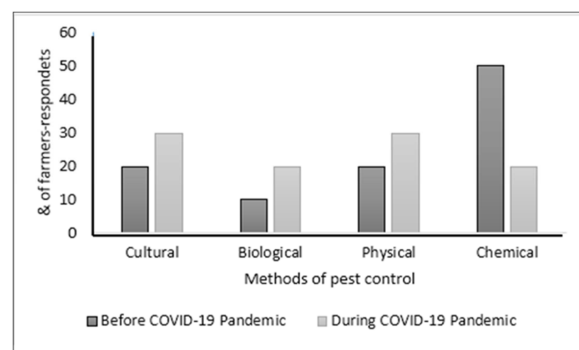


**Fig. 7.** Percentage of farmers who engaged in applying inorganic and organic fertilizers

*Pest control measure*

The pest control measure is safeguarding the crop from pests in which different methods are applied in

accordance to the status of pests incidence and damage in crops, and preference of farmers. The percentage of farmers in Polanco who engaged in the application of different methods of pest control is shown in Fig. 8. The result shows that there were 20% practiced both cultural and physical methods which is higher than for the biological method (10%), but lower than for the chemical method (50%) before the pandemic. However, the chemical method was decreased to 20% during the pandemic resulting in the majority of farmers switching to cultural (30%), and physical (30%) methods. The biological method was still practiced by some of the farmers by up to 20% during the pandemic. It was noticeable that the rampant use of chemical pesticides before the pandemic did even not match the economic threshold level of damage, it is because of the easy way of acquisition and application. However, due to the restrictions and limited supply of agricultural inputs like pesticides, and lessons learned about health risks during the pandemic, farmers started to adopt the alternatives in the integrated pest management pyramid (Lamichhane and Reay-Jones, 2021). The farmers were also advised by the local government to adopt organic and traditional methods of pest control and good agricultural practices to conserve the environment, preserve health, and balance the ecosystem. They were taught the important roles in reducing the use of chemical pesticides, especially during the pandemic as likewise noted by Sapbamrer *et al.* (2023).

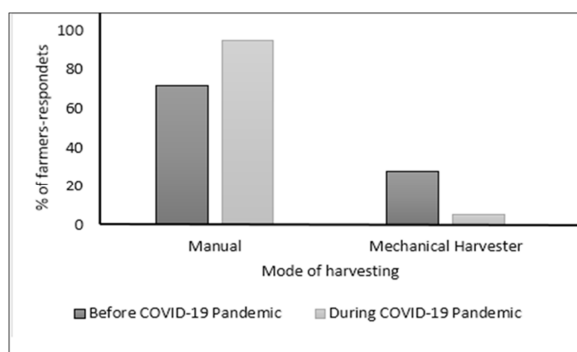


**Fig. 8.** Percentage of farmers who engaged in using different methods of pest control

*Harvesting*

Harvesting is the operation of gathering the useful parts of the plants, especially for economic purposes.

The percentage of farmers in Polanco who engaged in harvesting manually and using the mechanical harvester is shown in Fig. 9. There were 72% of farmers practiced manual harvesting and the rest used mechanical harvesters (28%) before the pandemic. The manual harvesting was further increased during the pandemic to 95%. This may be due to the inadequate availability of machinery operations during the pandemic. Moreover, most of the agricultural land in the Philippines is used for manual harvesting only because there are only 2.2% of agricultural land is fully mechanized with harvesters (DOST-STII, 2022). Regardless of the mechanization in harvesting, the Polanco farmers are still resilient in gathering their field products for yielding and economic purposes for they are capable of doing this manually.

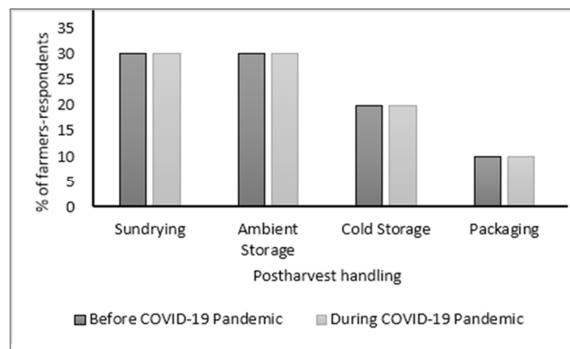


**Fig. 9.** Percentage of farmers who engaged in harvesting manually and using mechanical harvester

#### Postharvest handling

This stage is to protect the gathered products from different factors that can affect the quality. The percentage of farmers in Polanco who engaged in different postharvest handling is shown in Fig. 10. Both before and during the pandemic, most of the farmers practiced sun-drying and ambient storage (30%), while there were 20% and 10% for cold storage and packaging, respectively. This implies that the pandemic did not affect the postharvest handling practices of the farmers in Polanco. Sun-drying is one of the traditional methods of post-harvest handling particularly for grains or agronomic crops. For ambient conditions without the need for sunlight, fruits, vegetables, and root products are most likely to be stored there. The cold storage and packaging are

most likely optional to the farmers because of the required expenses.



**Fig. 10.** Percentage of farmers who engaged in different postharvest handling

Sun-drying and ambient storage are the best for the farmers these are not expensive and most of them produce grains and vegetables. However, sun drying tends to be labor-intensive and has limited capacity. Temperature control is also difficult in this method and grains can easily overheat causing cracked grains which lead to low milling quality. It is also not possible to sun dry at night or during rain ([www.knowledgebank.irri.org](http://www.knowledgebank.irri.org)). The ambient storage can also change the physical appearance and other sensory aspects of goods depending on the ambient condition (Binas and Cagasan, 2021).

#### Farmers' farm income by cropping

All farmers-respondents in Polanco engaged in selling their products to direct buyers, middlemen, and interested customers in wholesale and retail systems. The result revealed that before the pandemic, the highest range of income was recorded in Php28,551.00 to Php38,551.00 with 30% of farmers gaining followed by Php48,552.00 to Php58,553.00 with 24% of farmers who gained. During the pandemic, the highest net income was recorded at Php28,551.00 to Php38,551.00 with 33% of farmers who gained followed by Php8,550.00 to Php18,550.00 with 20% of farmers who gained (Table 1). This seems that the income of farmers decreased during the pandemic. This could be attributed to the impact of the COVID-19 pandemic on the entire farming system. This conforms to the report of Zambrano *et al.* (2024) that most of the farmers'

income decreased during the pandemic. The decrease in income, however, the Polanco farmers revealed their resiliency somehow in coming up with income for their households and daily basic needs.

**Table 1.** Percentage of farmers who gained net income of different ranges

Range of net income (Php)	Percentage of farmers	
	Before Covid-19 pandemic	During Covid-19 pandemic
8,550 -18,550		20.00
18,551 – 28,550	17.00	7.00
28,551 -38,551	30.00	33.00
38,551- 48,552	6.00	7.00
48,552 – 58,553	24.00	
58,554 – 68,553	7.00	13.00
69,554– 78,554	7.00	13.00
78,555 – 88,555	3.00	7.00
88,556- 98,555	2.00	
108,556- 118,555	2.00	
118,555-200,000	2.00	

*Production problems encountered*

The farmers encountered several problems in farming as shown in Table 2. Crop damage due to environmental factors was a very important problem followed by pest infestation; these problems are

common in crop production regardless of the phenomenon. On the other hand, most of the farmers had no problem with the facilities for postharvesting and even the equipment/tools. The rest such as capital, financial sources, technical skills, and labor costs were moderate problems that are expectedly to happen in crop production. However, during the COVID-19 pandemic, the problems increased as the lack of capital, and financial sources, high labor costs, and still the crop damage caused by weather were perceived as very important problems already. The lack of technical skills, equipment/tools, and lack of postharvest facilities remained moderate, less important, and not important respectively. It was expected that the problem in financial aspects to increase during the pandemic (Zambrano *et al.*, 2024). Likewise, weather that could cause damage to crops can occur anytime regardless of the health crisis phenomenon. The increase of some problems, however, the LGU responded and took action to somehow address the said problems during the pandemic.

**Table 2a.** Problems encountered by the farmers before the Covid-19 pandemic

Production problem before Covid-19	Mean	Description
Lack of capital	3.29	Moderate
Lack of financial sources	2.93	Moderate
Lack of equipment/tools	2.31	Less Important
Lack of technical skills	3.32	Moderate
Lack of government support programs	3.44	Important
High labor cost	2.97	Moderate
Low control of insects/pest infestation/damage	3.43	Important
Lack of post-harvest facilities	1.66	Not important
Damage caused by weather	4.41	Very important

**Table 2b.** Problems encountered by the farmers during the Covid-19 pandemic

Production problem during Covid-19	Mean	Description
Lack of capital	4.52	Very important
Lack of financial sources	4.72	Very important
Lack of equipment and tools	2.28	Less important
Lack of technical skills	3.13	Moderate
Lack of government support programs	2.0	Less important
High labor cost	4.27	Very important
Low control of insects/pest infestation/damage	3.40	Less important
Lack of post-harvest facilities	1.59	Not important
Damage caused by weather	4.8	Very important

*Marketing problems encountered*

The farmers experienced high transportation costs and sold their products at low prices due to the low demand in the local market. This can be attributed to the important problem of no control over the

price of products (Table 3). These were further experienced hardly as the farmers perceived very important problems except the low demand in the local market during the pandemic. The marketing problem was expected to exist during the pandemic

as worse than in the normal phenomenon. However, because of the resiliency, the farmers in Polanco were able to continue selling and dealing their agricultural goods. Despite the challenges,

they were still able to formulate and demonstrate strategies for coming up with the standard deals same to the report of Reddy and Mariyappan (2021).

**Table 3a.** Marketing problems encountered by the farmers before the COVID-19 pandemic

Marketing problem before Covid-19	Mean	Description
Low price of product	3.39	Moderate
Poor demand in the local market	3.33	Moderate
High transportation cost	2.75	Moderate
No control over the price of a product	3.44	Important

**Table 3b.** Marketing problems encountered by the farmers during the COVID-19 pandemic

Marketing problem during Covid-19	Mean	Description
Low price of product	4.83	Very important
Poor demand in the local market	3.19	Moderate
High transportation cost	4.32	Very important
No control over the price of a product	4.43	Very important

*Satisfaction of farmers with local government unit support*

Before the COVID-19 pandemic, 77% of the farmers perceived that they were satisfied with receiving support and services from the LGU in terms of agricultural inputs, insurance, and the like. There were also 92% who attended seminars conducted by the LGU and other institutions, most of them were women because they like to attend the food processing seminar which is usually the topic. However, there were 15% who were not satisfied and 8% who have not received any support.

During the COVID-19 pandemic, the satisfaction of the farmers with government support increased to 92% because they received more certified seeds and cash for fertilizer based on their farm area size. However, there was still a moderate with 3% of those farmers because they received certified seeds only and 5% were not receiving any service from the government. The percentage of the seminar attendees decreased to 57%, they accessed through the on-air program titled “*Kabahin sa Pagpanguma*”.

Amid calamity, our government does not forsake the community. Significant interventions are made to address gaps towards resiliency and sustainable development.

**Conclusion**

The Polanco farmers established farms with relevant production practices from land preparation to

marketing strategy. Due to the COVID-19 pandemic, their usual practices were upset which led them to face new challenges. Nevertheless, further knowledge of how to utilize alternative sources for farming systems was acquired and revealed their resiliency towards continuous production and somehow still gaining income with the help also of the local government unit.

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