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Mitigating food insecurity through mallard duck egg production: The case of a rural community in the Philippines

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ABSTRACT

Poverty, food insecurity, and lack of employment opportunities are fundamental issues experienced in the rural Philippines. They were worsened by the COVID-19 pandemic, which adversely impacted vulnerable sectors. This study examined the potential and viability of mallard duck egg production in a rural community in the Philippines. Twelve (12) rural women in Licab, Nueva Ecija, received 482 heads of ready-to-lay mallard ducks (Itik Pinas breed) as part of the Department of Agriculture Regional Field Office III's livelihood initiatives. Data were gathered using a participatory research design through a household profile survey, focus group discussion, and descriptive statistics. The study findings showed that the respondents live below the poverty line and have an average monthly income of ₱2,083.33. The study revealed that during the 18 months of egg production, the recipients were able to harvest a total of 144,534 eggs. This provided the respondents with a gross income of ₱929,838.75 and a net gain of ₱341,156.89, corresponding to an average monthly net income of 1,579.43 per respondent. This allowed each respondent to improve their household income by up to 64.12%. Peak egg output was 76% or 60.33% on average. This study also showed the resiliency of rural women, who utilized locally accessible resources to reduce production costs.

Contribution/Ori ginality: This study contributes information on rural women's resilience to a variety of challenges, such as poverty exacerbated by the COVID-19 pandemic. This study showed the potential of mallard duck egg production to mitigate food insecurity. Moreover, it showed how women managed the project by adopting alternative management practices to lower production costs.

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1. INTRODUCTION

Poverty in rural regions is caused by low agricultural productivity, which most rural inhabitants rely on, and a lack of employment options outside of farming. According to a study by the United Nations Food and Agriculture Organization, between 2017 and 2019, the Philippines had the highest prevalence of food insecurity in Southeast Asia, with 59 million Filipinos suffering from a moderate to severe lack of continuous access to food (Ocampo, 2020). In addition, the Global Food Security Index Q2 2022 by Deep Knowledge Analytics, comprised of forty food security

indicators in the categories of food accessibility, crisis level, and food system and economic resilience, put the Philippines lowest in East and Southeast Asia with a food security index score of 5.05 (Deep Knowledge Analytics, 2022).

This issue was aggravated by the COVID-19 pandemic, the impact of which on health, society, and the economy has been far-reaching, significant, and devastating (United Nations, 2020). It has exposed inequalities in global social support systems, revealing gaps that further marginalize vulnerable people. According to the Organization for Economic Co-Operation and Development (2020a), the pandemic revealed numerous critical weaknesses in our communities and economic system. The situation was exacerbated in countries with substantial informal sectors and undeveloped social security systems, where a rising number of individuals lost their jobs without access to economic support (Organization for Economic Co-Operation and Development, 2020b). Furthermore, the coronavirus outbreak revealed and highlighted our society's existing social problems. Poverty and food security among the poorest and most vulnerable people must be addressed.

Moreover, COVID-19 has taken a heavy toll on rural livelihoods, with income and job opportunities being the most pressing issues in poor communities throughout the Philippines (Fallesen, 2021). As a result, numerous government and non-government institutions have undertaken various initiatives and programs to improve people's lives, particularly in rural areas. Among the industries that have the potential to improve and enhance livelihoods is mallard duck egg production. The Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) and the Bureau of Animal Industry (BAI) initiated projects to boost the duck industry in the country (The Philippine Council for Agriculture Aquatic and Natural Resources Research and Development PCAARRD-DOST, 2012).

This is because mallard duck (*Anas platyrhynchos*) raising is a lucrative and profitable poultry industry in the Philippines (Villaver, Zacal, Gabaya, & Cantila, 2022). It has a promising future, given the high demand for *balut* (embryonated egg), which accounted for more than 75 percent of the total duck production (Hui-Shung & Dagaas, 2004). It is considered the second-largest poultry industry and has been regarded as one of the contributors to the growth of the country's agriculture sector (Gutierrez, 2019). The demand for duck eggs for *balut* and salted eggs, as well as the general potential for duck meat to be used as a substitute for chicken meat, has motivated farmers and agripreneurs to undertake native duck farming (Alejandria, De Vergara, & Colmenar, 2019). Central Luzon was recently the top duck egg producer, with 7.21 thousand metric tons or 55.9 percent of the total production (Philippine Statistics Authority, 2022a). In general, the Philippines dominates the global duck egg market (Atienza, Rodriguez, Babilonia, Guimary, & Rebancos, 2015).

The main advantage of duck raising is that it does not require high-end inputs compared to other poultry animals (Gutierrez, 2019). Ducks are also cheap sources of good quality nutritious animal protein. Duck management is also minimal compared to any other poultry. They produce eggs for an extended period and adapt to the local conditions, continuously improving performance. Raising ducks requires only a basic shelter, and the food they consume is inexpensive. They also have high disease resistance, which results in a decreased mortality rate.

Licab in Nueva Ecija province is one of the municipalities with a rural population primarily engaged in agricultural production. It is a fourth-class municipality with a population of 29,269 (Philippine Statistics Authority, 2022b). Since agriculture is the primary industry in the municipality, mallard duck raising is an excellent alternative source of income for the locals. However, although duck raising can potentially engage rural people in duck egg production, it is vital to point out that they must be adequately trained (Jha & Chakrabarti, 2017). Adzitey and Adzitey (2011) also stated that extensive awareness empowers rural duck farming families to enhance duck eggs and commercial meat aspects.

In this regard, this research aims to provide an overview of mallard duck egg production as a potentially profitable and viable source of additional income in a rural community in the Philippines to mitigate food insecurity and a lack of alternative sources of livelihood. In addition, this study also attempted to determine the socioeconomic characteristics of duck raisers, assess and estimate the potential profitability of mallard duck egg production, highlight the challenges and issues faced by duck raisers, and showcase the rural community's resilience in addressing these concerns.

2. MATERIALS AND METHODS

2.1. Study Site

The municipality of Licab is a rural municipality located in the westernmost section of the province of Nueva Ecija (Philippine Statistics Authority, 2022b). The municipality is located approximately 155 kilometers from Metro Manila and includes eleven (11) barangays (Philippine Statistics Authority, 2022b). The study was conducted in Barangay San Cristobal, the third largest barangay in the municipality, with 631.19 hectares of land and a population of 3,863 (Philippine Statistics Authority, 2022b).

2.2. Beneficiary Selection

As part of the extension intervention and initiative of the Livestock Division of the Department of Agriculture Regional Field Office III (DA-RFO III) to mitigate socioeconomic problems in rural communities, a total of four hundred thirty-eight (438) heads of ready-to-lay, at least 22-week-old mallard ducks and forty-four (44) heads of drake mallard ducks (Itik Pinas breed) were entrusted to twelve (12) selected rural women as beneficiaries of the livelihood project. The Itik Pinas are pure lines already breeding true-to-type (Santiago, Lambio, Cañolas, Hernandez, & Dimaranan, 2014). The local government unit of Barangay San Cristobal facilitated the beneficiary selection. Twelve residents of Barangay San Cristobal were chosen based on their willingness to start the enterprise but their inability to do so due to financial constraints. The participants underwent capability training before the start of the intervention. A series of exposure visits were also carried out for them to gain more practical knowledge. The participants introduced and adopted the semi-confinement system and extensive method of duck raising.

2.3. Data Collection

- Household Profiling

A household survey instrument was prepared, administered, and tested in order to collect baseline data and derive the socioeconomic and demographic profiles of the respondents.

- Data Sheet/Form Preparation

A well-structured data sheet was developed and distributed to the participants to record and monitor their observations on egg production, egg sales, feed expenditures, and revenue.

- Focus Group Discussions

The participants were provided monitoring activities and technical assistance to discuss their concerns, problems, proposed solutions, and actions taken.

2.4. Descriptive Statistics

The socioeconomic data were analyzed using descriptive statistics such as averages and percentages and are presented in tabular format. The performance and profitability of duck egg farming were measured and examined in terms of average egg production, feed cost, gross income, net income, and average monthly income. Also, mallard duck productivity was measured in percentage egg output. The following formulas were utilized to determine the various parameters:

- Average egg production =
$$\frac{\text{Total egg produced}}{\text{Total number of female ducks} \times \text{Production period in days}} \times 100$$
- Gross income = No. of eggs collected x Price of an egg.
- Feed expense = Feed consumed in kg x Price of feed per kg.
- Net income = Gross income – Feed expense.
- Average income per month =
$$\frac{\text{Net income}}{\text{No. of months of production}}$$
- % Egg production per month =
$$\frac{\text{Total eggs produced per month}}{\text{No. of female ducks} \times \text{No. Days in a month}} \times 100$$

3. RESULTS AND DISCUSSION

3.1. Socio-Demographic and Economic Profile of the Respondents

The socioeconomic characteristics of the respondents are shown in [Table 1](#). All the respondents were married and characterized themselves as rural subsistence farmers. They ranged in age from thirty (30) to sixty-one (61) years old, which shows that all respondents were adults with an average age of 45.92. Most respondents lived with their nuclear family, while some lived with extended families.

3.1.1. Economic Incapacity

The average monthly income of the respondents was 2,083.33 pesos (around 36.70 dollars as of September 2022). Five (5) responded that they had no income at all. According to the Family Income and Expenditure Survey (FIES) of 2021, the population poverty incidence, defined as the proportion of Filipinos whose per capita income cannot meet their basic food and non-food needs, was 18.1 percent, which equates to approximately 19.99 million Filipinos living below the poverty line of about PhP 12,030 per month for a family of five ([Philippine Statistics Authority, 2022c](#)). This indicates that all the respondents lived below the poverty line; however, despite living in poverty, most respondents had large families ranging from four to ten people.

Moreover, this data showed that agriculture is the primary employment source for impoverished Filipinos. About 80% of the extremely poor and 76% of the moderately poor live in rural areas, and agriculture employs 76.3% of the severely poor and 60.7% of the moderately poor ([Castañeda et al., 2018](#)). Despite being regarded as the "Rice Granary of the Philippines" due to its significance as a producer of agricultural products, many residents in the province of Nueva Ecija endure poverty-related challenges. With 108,922 low-income families, Nueva Ecija has the largest number of impoverished families in the Central Luzon region, according to data ([Tecson, 2020](#)).

Furthermore, according to a former World Bank economist, Nueva Ecija has a high poverty rate of 22.6% ([Dy, 2018](#)). In addition, according to a 2018 study by the Philippine Center for Investigative Journalism, Nueva Ecija had the largest poor population in Central Luzon, with 547,711 people ([Bergonia, 2021](#)). Furthermore, more recent statistics have shown that the province's poverty rate remains high at 18.2 percent ([Philippine Statistics Authority-Region 3, 2021](#)).

The data presented above support the study's findings on how rural families in Licab, Nueva Ecija, faced and experienced poverty-related challenges. Thus, this research on the potential of mallard duck raising could help engage the rural population in opportunities for sustainable food production and livelihood programs that may assist them in

improving their socioeconomic condition. As a result, the mallard duck-raising initiative in a rural community promotes the first three Sustainable Development Goals (SDGs): No Poverty, Zero Hunger, and Good Health and Well-Being.

3.1.2. Lack of Education, Skills, and Livelihood

To most Filipinos, education signifies hope for the future, particularly for Filipino women who consider education the route to a better life (Tiglaio-Torres, 1993). However, based on the respondents' level of education, it is evident that they lacked access to education. The majority of them had attained a secondary or high school diploma. Only one respondent had attended tertiary or college education but did not finish. Lack of access to education is not a new problem because this trend is similar to previous research.

Regarding their livelihood, five respondents said they were homemakers who focused on household duties and childrearing. In contrast, one respondent worked in the barangay as a health worker, three ran small businesses known as "sari-sari stores" that sell grocery items, and three were seamstresses. In addition, a study by the International Labour Organization (2022) posited that almost two million women work in the agriculture, fishing, and mining sectors in the Philippines, where female rural workers experience a pattern of injury and disease, including violence and harassment, and a lack of fundamental labor rights and social protection benefits.

Furthermore, farming is the primary source of income for the respondents, and their spouses are the ones who are responsible for taking care of their farms. Regarding their skills, all respondents had some level of expertise in planting; however, around half had no other expertise. Three people said that they were skilled at sewing. This demonstrates that the respondents did not have access to training programs or businesses that could have provided them with supplemental income. However, we must remember that for them to thrive, they need ecologically responsible programs and, more importantly, programs tailored to their specific needs, allowing for the exchange of information and the development of new skills.

Table 1. Socioeconomic characteristics of duck raisers (n=12).

Characteristics	Category	Frequency	Percent %
Age range	30-39	3	25
	40-49	5	41.67
	50-59	2	16.67
	60 and above	2	16.67
Family size	3-5	6	50
	6-8	4	33.33
	Nine and above	2	16.67
Educational attainment	Elementary	3	25
	Secondary	8	66.67
	Tertiary	1	8.33
Occupation	Homemaker	5	41.67
	Barangay health worker	1	8.33
	Seamstress	3	25
	Micro entrepreneur	3	25
Skills	Farming only	6	50
	Farming and food processing	3	25
	Farming and sewing	3	24
Income range	None	5	41.67
	1200.01-2400	3	25
	2400.01-3600	1	8.33
	3600.01 and above	3	25
Number of children	1-2	4	33.33
	3-4	7	58.33
	Five and above	1	8.33

3.2. Egg Production and Income of Respondents from Raising Mallard Ducks

The participants in this study were entrusted with a total of 483 heads of mallard ducks. Each received between thirty-three (33) and seventy-four (74) heads. In addition, the ducks were ready to lay eggs, and the ratio of females to males was ten (10) to one (1).

Table 2 displays the respondents' egg production and income during the first six (6) quarters of the production period (from December 2020 to May 2022). It indicates that respondents gathered and sold the fewest number of eggs in the first quarter of egg production at 17,949. However, the highest number of eggs were collected and sold during the second quarter or the fourth to sixth month of egg production at 29,395. Egg production decreased slightly during the third quarter, and this decrease continued in the fourth quarter, with 22,812 and 18,558 eggs, respectively. More eggs were sold during the last two quarters of egg production, with 27,950 and 27,870 eggs, respectively.

Egg production for the entire 18-month laying period was 60.33 percent. This is lower than in the study of Parungao (2019). The findings of Berdos, Martin, Celestino, and Paragas (2019) and Martin, Rafael, Juan, Velasco, and Valdez (2020) suggest that Itik Pinas lines have an egg production rate of 70%; however, our result is consistent with their claims that it is higher than the Pateros duck, which has a 50% egg production rate. Based on simple-sequence

repeats markers, the Pateros duck has high genetic variation (Magpantay, Lambio, Laude, Reaño, & Diaz, 2019). This was supported by the statement of the Duck Industry Association of the Philippines Inc. (DIAPI), as reported by SERD Personnel Editor (2022). The findings show that the number of ducks assigned to each beneficiary was manageable. The beneficiaries successfully raised these ducks to become productive, thanks to the knowledge and skills they gained during their training and their long community experience in mallard duck raising. Moreover, it reflects their willingness to augment their family income as they can see the potential of mallard ducks as a source of additional income.

During six quarters of egg production, the respondents collected and sold a total of 144,534 eggs, at prices ranging from six (6) to eight (8) pesos (around 0.11 to 0.14 US dollars as of September 2022). This is in line with the price published by the Philippine Statistics Authority (2022d), which said that the average farmgate price of a duck egg on commercial farms was PhP 7.00 per egg. Therefore, the total amount sold, also referred to as the gross income from egg production, was ₱929,838.75.

The total amount the respondents spent on feeds was ₱588,681.85, around 10,318.61 US dollars. However, the recipients had lower feed cost thanks to supplemental feeds such as rice bran, rice middling, palay, and snails. This allowed them to reduce the amount of money spent on feed. In addition, ducks were ranged in the rice field during the fallow period, enabling them to eat insects, weeds, snails, palay, and other naturally occurring feeds.

In total, the beneficiaries earned a net income of ₱341,156.89, with an average monthly net income of ₱1,579.43 per respondent. Moreover, their income may increase if they use the eggs for value-added activities, such as making salted eggs and "balut" (a fertilized developing egg embryo). This value-adding activity raises the price of the eggs because salted eggs and "balut" can be sold from ten (10) to fifteen (15) pesos per piece (around 0.18-0.26 US dollars). This is a potential 40%-150% increase in the income of the respondents. As such, the respondents may need to use duck egg incubator technology to make "balut" for value-adding and duckling production to make the project sustainable and maximize their income from mallard duck production. This relates to the studies of Indarsih, Jaya, and Mutmainah (2020) and Lagasca et al. (2022) on the use of locally available resources such as sawdust and bamboo incubators in hatching quail and duck eggs, which showed that hatchability, fertility, and embryonic mortality were comparable to those found when using an electric incubator. Our result also demonstrated the potential of mallard duck production in addressing sustainable development goals such as mitigating food insecurity, combating hunger, and empowering individuals, mainly rural families.

3.3. Productivity of the Mallard Duck

The productivity of the mallard duck over 18 months (December 2020 to May 2022) is represented by the egg production curve in Figure 1. The ducks started laying in December 2020, when they were about 21 weeks old, and reached their peak production of 76% in the 5th month of laying. The egg production percentage is lower, and it takes longer to reach the peak than in the study of Santiago et al. (2014), which found that Itik Pinas lines reach a peak of 98-100% egg production at 28-29 weeks of age. The mallard ducks started laying two weeks later than the reported age of Itik Pinas mallard ducks in their first lay (Diego, Martin, Barroga, & Velasco, 2021). The difference in the results is due to the different feeding and management systems; the respondents raised their ducks in a semi-confinement system with extensive management. The ducks were fed a limited or controlled amount of commercial feed. In contrast, the ducks in the prior research were provided with ad libitum commercial feeds in an intensive and confined environment. This conclusion is supported by the results of Widiyaningrum, Lisdiana, and Utami (2016).

In our study, egg production was lowest in the 11th month (34%). The declined egg production after ten months of laying indicated that the ducks were in the process of molting, which is the annual process by which waterfowl replace their old plumage with new feathers. Molting may be brought on by physical exhaustion and fatigue, completion of the laying cycle, reduced feeding time, and loss of body weight. Molting indicates that the bird's physical condition is deteriorating and, therefore, unable to support egg production. However, after a month, egg production increased and maintained its productivity until the 18th month of production, meaning that the ducks regained their energy and built up their reserves of nutrients.

Table 2. Egg production and income of respondents for the first six quarters of the production period (December 2020 to May 2022).

Respondent	No. of ducks awarded		No. of eggs collected and sold per quarter						Total no. of eggs collected and sold	Gross income (₱)	Feed expense (₱)	Net income (₱)
	Female	Male	Q1	Q2	Q3	Q4	Q5	Q6				
1	68	6	3,013	5,060	3,800	4061	5850	4860	26,644	168,270.54	105,822.10	62,448.44
2	50	6	2,615	4,163	1897	1317	3305	4094	17,391	111,954.16	76,282.09	35,672.06
3	45	5	1,816	2,514	2297	1678	3305	4094	15,704	98,840.27	66,904.14	31,936.12
4	30	3	897	1,165	1319	910	1239	1351	6,881	44,847.61	20,438.05	24,409.56
5	30	3	829	1,594	1804	1165	2450	1890	9,732	64,539.83	41,309.06	23,230.77
6	32	3	1,363	2,575	2481	1804	2370	2580	13,173	87,983.36	57,006.08	30,977.28
7	30	3	1,040	1,533	1101	741	846	1113	6,374	42,704.80	24,245.38	18,459.43
8	33	3	1,124	1,933	1317	1084	1622	2199	9,279	59,451.60	41,374.42	18,077.18
9	30	3	1,289	2,483	1652	954	1086	1113	8,577	56,799.08	31,874.47	24,924.61
10	30	3	1,406	2,514	2175	2089	2460	1950	12,594	79,665.57	53,718.77	25,946.80
11	30	3	1,130	1,532	949	1544	1929	1250	8,334	51,532.67	36,453.03	15,079.63
12	30	3	1,428	2,329	2020	1211	1488	1376	9,852	63,249.27	33,254.26	29,995.01
Total	438	44	17,949	29,395	22,812	18,558	27,950	27,870	144,534	929,838.75	588,681.85	341,156.89

Note: Average egg production.
Average income per month: Php 1,579.43.

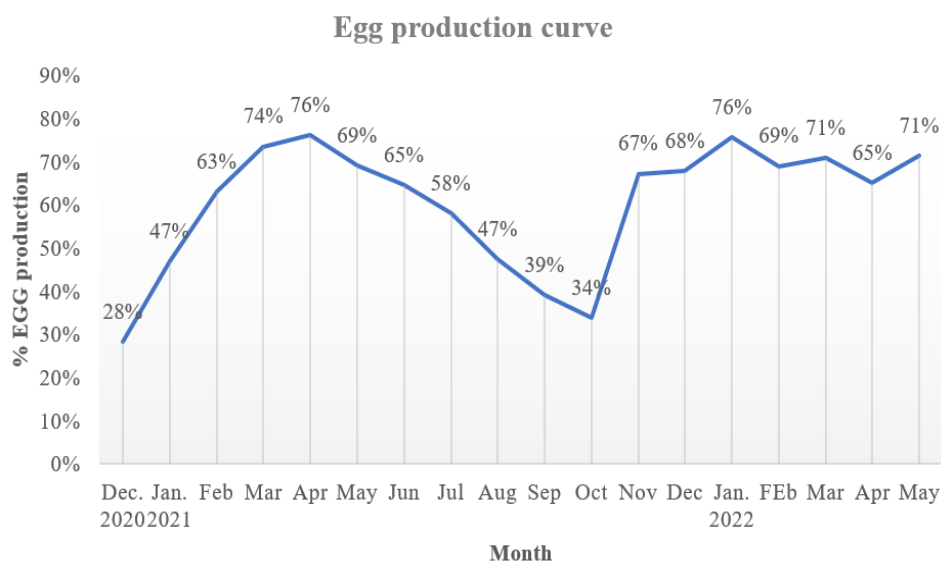


Figure 1. Egg production pattern of mallard ducks in 18 months.

3.4. Issues and Problems Encountered by Beneficiaries and Actions Taken

The respondents encountered different issues and problems during mallard duck egg production. These problems were associated with housing, nutrition, hatching, health, and marketing, which are the main factors affecting successful duck egg production, according to [Jacob, Wilson, Miles, Butcher, and Mather \(2018\)](#). However, the primary problem of the duck industry is the lack of quality breeding stocks because there are no organized duck breeding and selection programs in the Philippines ([Datuin & Magpantay, 2013](#)).

Table 3 shows the issues and problems that the respondents encountered during the implementation of their project and the actions taken to resolve such issues. Due to limited financial capabilities, the respondents had problems providing the mallard ducks with proper housing and pure commercial feeds. These problems align with the results of [Lambio \(2000\)](#) as reported by [Lagasca et al. \(2022\)](#) about the duck industry in the Philippines; he noted that the high cost of commercial feeds is one of the problems, and due to financial constraints, the majority of duck housing is of the litter type, and only approximately 12% has elevated flooring. To solve these problems, the participants used cheap and locally available resources to provide the ducks with enough space to be comfortable. During the off-season, ducks were ranged in the rice field where they could eat palay, insects, weeds, and snails to lessen feed costs without affecting the egg production efficiency of the ducks. Also, ranging ducks in rice fields controls weeds and insects, effectively increasing farmers' income, as stated by [Hossain, Sugimoto, Ahmed, and Islam \(2005\)](#). Alternative feeds such as snails and other locally available materials provide good nutrition for the ducks ([Budiari, Pujiawati, Kertawirawan, & Adijaya, 2021](#)). This was supported by [Wagiman, Bunga, and Sidadolog \(2019\)](#), who revealed that the egg production of ducks fed with snails and powdered green bean leaves was comparable to that of ducks fed with a standard ration. The ducks were also provided with supplemental feeds such as rice bran, rice middling, palay, and snails, especially when rice was planted in the fields, and the ducks could not range.

The lack of an electric egg incubator was also a problem, especially for those who wanted to produce additional ducks and acquire quality replacement stock since mallard ducks are non-sitters. This problem was also noted by [Gutierrez \(2019\)](#), who stated that duck raisers were willing to pay a higher price in exchange for better-quality replacement stock. Still, stock availability is a major problem. Therefore, eggs were brought to hatching/sitting Muscovy ducks as an alternative. However, it is essential to understand the egg's breaking strength, especially during hatching, as discussed by [Lin, Chen, Rouvier, and Marie-Etancelin \(2016\)](#), who stated that an egg's breaking strength increases with shell thickness. The shell is the egg's outer layer and serves as a barrier against both physical impact and pathogens ([Sá e Silva, Susta, Moresco, & Swayne, 2016](#)). To address this problem, the beneficiaries requested a small electric incubator from the local government unit.

During the hot or dry season, some birds were observed to be sick. However, the respondents provided vitamins and medicine in the drinking water and repaired deteriorated parts of the pen to prevent direct sunlight from penetrating it.

The raisers also encountered fluctuating prices of fresh eggs, which became especially problematic when egg production was low because sales could not compensate for the feed cost. In general, egg weight indicates the uniformity of the shell's physical qualities and the egg's internal standard ([Wilson, 2017](#)). This led some respondents to process the eggs into salted ones to give the eggs a higher value. The problem of fluctuating prices is supported by the Department of Science and Technology-Philippine Council for Agriculture Aquatic and Natural Resources Research and Development DOST-PCAARRD (2022), which states that the duck industry faces challenges of high costs of production inputs and fluctuating prices of duck and egg products. Furthermore, the raisers tried to maintain simple farm records to assess and evaluate the productivity and viability of their livelihood project.

Table 3. Issues and problems encountered by beneficiaries in duck egg production and actions taken.

Production and management practices	Issues/problems encountered	Action/s taken
1. Housing and facilities	Limited financial capability to provide proper housing and facilities	<ul style="list-style-type: none"> Used cheap and locally available materials to construct and improve existing pens Provided enough space
2. Feeds and feeding	Insufficient financial resources to buy commercial feeds as the sole source of diet Lack of ranging area during the rice planting season	<ul style="list-style-type: none"> Ducks were ranged in the rice field during the fallow period Provided supplemental feeds like rice bran, rice middling, palay, and snails
3. Incubation, hatching, and brooding	Lack of incubators for those who intend to produce their ducklings as mallard ducks are non-sitters	<ul style="list-style-type: none"> Eggs were brought to sitting/hatching Muscovy ducks to hatch the eggs Requested electric incubator from local government unit
4. Health management	Sick birds during the hot season	<ul style="list-style-type: none"> Provided vitamins and medicine through drinking water Repaired roofing and sidings by installing laminated sacks and other cheap materials
5. Marketing	Fluctuating prices of fresh eggs	<ul style="list-style-type: none"> Eggs were processed into salted eggs when the price of fresh eggs was low Practiced record keeping

3.5. Family Income of Respondents Before and After the Intervention

The percentage increase in the family income of respondents is presented in Table 4. Before the project intervention, the average monthly income of the respondents was ₱2,083.33. It is lower than their spouses' monthly income of ₱2,175.00. Together, this corresponds to a monthly family income of ₱4,258.00.

During the six quarters of project intervention, the respondents earned an additional monthly income of ₱18,953.16 or ₱1,579.43 per family. Furthermore, the average family's income increased by 64.12%. This indicates the respondents' efficiency and dedication to nursing and rearing their mallard ducks since they recognized the vast potential of mallard duck raising in their community. One of the community's recommended interventions and plans was to use incubators and similar alternative technologies to have more animals to raise. This would allow them to optimize and maximize their profits while utilizing the knowledge and skills they obtained throughout the project. Furthermore, this would contribute to the sustainability measure to ensure that the intervention continues and that the additional monthly income from duck raising continues to aid these families.

Table 4. Percentage increase in family income after the intervention.

Respondent	No. of entrusted ducks	Monthly family income before the intervention (₱)			Additional monthly family income from the project (₱)	% Increase in family income
		Respondent	Spouse	Total		
1	74	1,700.00	1,700.00	3,400.00	3,469.36	102.04
2	56	-	5,000.00	5,000.00	1,981.78	39.64
3	50	-	1,000.00	1,000.00	1,774.23	177.42
4	33	-	1,700.00	1,700.00	1,356.09	79.77
5	33	6,000.00	1,950.00	7,950.00	1,290.60	16.23
6	35	4,800.00	3,000.00	7,800.00	1,720.96	22.06
7	33	1,500.00	2,500.00	4,000.00	1,025.52	25.64
8	36	-	1,300.00	1,300.00	1,004.29	77.25
9	33	3,000.00	1,950.00	4,950.00	1,384.70	27.97
10	33	6,000.00	2,000.00	8,000.00	1,441.49	18.02
11	33	2,000.00	3,000.00	5,000.00	837.76	16.76
12	33	-	1,000.00	1,000.00	1,666.39	166.64
Total	482	25,000.00	26,100.00	51,100.00	18,953.16	769.44
Average	40.17	2,083.33	2,175.00	4,258.00	1,579.43	64.12

4. CONCLUSION AND RECOMMENDATIONS

Poverty, food insecurity, and lack of employment opportunities in rural areas of the Philippines are currently major concerns in the country. The situation was worsened by the COVID-19 pandemic, which adversely impacted vulnerable sectors, including rural communities and families. The socioeconomic profile of the respondents corroborated these concerns as their average monthly income of 2,083.33 pesos indicated that they lived below the poverty line. This study showed that mallard duck raising and egg production is a potentially profitable and viable source of supplemental

income in a rural community in the Philippines. The study's findings showed that the participants gathered a combined total of 144,534 eggs throughout 18 months of egg production. This gave the respondents a gross income of ₱929,838.75 and a net gain of ₱341,156.89, equivalent to an average monthly net income of ₱1,579.43 per respondent after deducting total feed expenses of ₱588,681.85. Furthermore, the level of egg production was 60.33% on average and reached the highest point of 76% when the ducks were at their peak. The study also showed that the respondents' primary challenges and concerns were the fluctuating prices of fresh eggs and the rising costs of commercial feeds. The respondents addressed these issues by utilizing locally accessible resources, allowing the ducks to range freely in their rice fields, and supplementing the ducks' diet with alternatives to reduce production costs. Based on the findings generated from the study, the following recommendations were developed: (a) inclusion of mallard duck and egg production as a lucrative and profitable livelihood project in the local government unit's (LGU) annual work and financial plan to strengthen rural development, (b) extension interventions, particularly those coming from government organizations, should adhere to "appropriate" procedures before the implementation of the project - including an assessment of training and information needs, the integration and development of a site validation instrument, coordination with the LGU, dialogue with relevant stakeholders, and the utilization of extension modalities to increase the project's efficiency and effectiveness; (c) identifying and establishing product standards and disseminating market information to promote, boost, and expand the mallard duck industry.

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