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Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

ABOUT THE JOURNAL

"Aká" is a Hanunuo Mangyan term for "first born." The Occidental Mindoro State College (OMSC) believes this publication is first of its kind in the MIMAROPA Region. It is an academic, multidisciplinary and faculty and expert-reviewed journal devoted to the rapid dissemination of current research. It is published annually to document the research endeavors of the students presented in the Annual Student Research Congress.

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Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

TABLE OF CONTENTS

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

SHAPING TOMORROW: PIONEERING SUSTAINABLE FUTURE THROUGH STUDENT RESEARCH

Artemio M. Gonzales Jr., MPH, MAN
Editor-in-Chief

As higher education institution, the Occidental Mindoro State College is focused on the future, addressing tomorrow problems using the present innovation. One of the many ways OMSC is transforming the world is by involving students in sustainability efforts. Sustainability means employing an integrated, interdisciplinary approach to understand and address the complex relationships among the environment, economy, and society (Mensah, 2019). In a dynamic academe-industry landscape, there is an increasing need for sustainable solutions. The role of research and innovation policy is important to address challenge of climate change, food security, social equity, resource scarcity, and public health (Ludwig et al., 2021). Academic research institutions have a major role in guiding students toward a systematic viewpoint that promotes interdisciplinary and transdisciplinary approaches to developing sustainable solutions (Baumber, 2022).

University and college students play a key role in undertaking societal issues, as they are driven by their desire to contribute to the attainment of sustainable development (Torsdottir et al., 2023). Well, of course, in addition to the desire to complete academic obligations. Students should learn that hard-pure and soft-pure research have equal weight in generating findings that can serve as useful basis for policy and program development. Integrating sustainability concepts and constructs in student research topics will help to advance the body of knowledge in a specific field of interest. Still, it will equip the students with the necessary skills and attitude toward sustainable decisions needed in their chosen field (Trevisan et al., 2024).

Moreover, a key mandate of higher education institutions, particularly state universities and colleges, is to nurture students as incubators of innovative ideas by providing the resources, mentorship, and platforms necessary to translate their work into tangible outcomes. These innovations are not limited to just technology but also encompass social studies with the potential to create social enterprises, develop innovative policies and programs, and drive organizational change. The focus is not solely on profit and business but on enhancing the welfare and well-being of individuals and communities by addressing issues such as poverty alleviation, healthcare, education, community development, environmental conservation, and promoting equitable access to resources.

As we gear towards a future-proof institution that ensures adaptability, resilience, and sustainability, we recognize that solutions will not arise from isolated efforts but from collaborative, interdisciplinary approaches. Student research, with its inherent creativity and innovative perspectives, plays a crucial role in positioning our institution as a leader in various discipline. By promoting a culture of inquiry, we are not only producing leaders in various fields but also serving as the foundation for a sustainable and equitable future. Consequently, the

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

outcomes of research endeavors become more than theoretical exercises; they become actionable and practical solutions that contribute to the improvement of society and align with OMSC's goal of becoming a university.

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EFFECTIVENESS OF VARIOUS CONCENTRATIONS OF LIQUID *Metarhizium anisopliae* AGAINST ARMYWORM *(Spodoptera exigua)* 'HARABAS' IN ONION 'RED PINOY' VARIETY

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ABSTRACT

Onion Production costs a lot especially when it is hit by a pest such as Armyworm (Harabas). That's why we need an alternative and cheap method to eradicate them. The study was conducted to determine the effectiveness of various concentrations of liquid *Metarhizium anisopliae* against armyworm 'Harabas' in onion "Red Pinoy' variety. The experiment following the Complete Randomized Design (CRD) research design was conducted at Barangay Bayotbot, San Jose, Occidental Mindoro from December 2022 to March 2023.

The study used the experimental method of research. This study was composed of four treatments and three replications: T_0=Control (No Application), T_1=175 mL+1L water, T_2=350mL+1L water, T_3=525mL+1L water, T_4=Chemical insecticide. Analysis of variance (ANOVA) in Complete Randomized Design (CRD) used in the experiment findings of the study revealed that the application of experimental biological pesticide at 525 mL+1L water had the best effect on the mortality rate of armyworms. When it comes to the number of insects repelled, T_0 (Control) was revealed to have the most repelled number of armyworms. Meanwhile, when it comes to the percentage of damaged leaves the T_0 (control) revealed to have severely damaged plants. For the findings of the study, the researcher recommends the conduct of a similar study using liquid *Metarhizium anisopliae* on different stages of development of fall armyworm.

Keywords: *Metarhizium Anisopliae, Harabas, treatment, replication, biological, repelled*

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

INTRODUCTION

Bulb onions, also known as priority commercial crops, have the potential to create progressive and profitable markets in the province of Occidental Mindoro as well as in Ilocos, Cagayan Valley, Central Luzon, Pangasinan, Marinduque, and Oriental Mindoro. The towns of Magsaysay, Paluan, and San Jose are among those where it is frequently planted; more recently, practically all municipalities have done so. After rice, this is sown in the second cropping season. Occidental Mindoro produced the least amount, although it did bring in money for the province's onion growers (Philippine Statistic Authority, 2020).

It has been difficult, therefore, to keep the nation's onion production trend steady over the previous few years. Several factors, including the occurrence of natural disasters, a lack of farming motivation, irregular commodity flow and production leading to post-production lapses, and the prevalence of pests and diseases like armyworm *(Spodoptera exigua)*, locally known as "Harabas," can be blamed for supply fluctuations (Calica & Cabanayan, 2018).

Harabas are nocturnal pests that feed on the delicate onion leaf tissue, extending their reach to the bulbs and ultimately causing the plant's death. The armyworm larvae are too numerous to be controlled, making suppression of them appear unattainable. The Harabas typically lay 500 eggs, and after just one to three days of incubation, the hatched egg is ready to infect. In 2016, there was an armyworm epidemic in the Philippines' onion-growing regions, specifically in Nueva Ecija, Pangasinan, and Tarlac *(Spodoptera exigua (Hübner); Lepidoptera: Noctuidae).* (Navasero et al., 2017). None of the chemical pesticides like Brodan, Lannate, and Glyphosate tried were able to control the pest. This alarmed farmers, local government units, and DA-RCPC III. Some LGUs declared a state of calamity due to severe pest infestations of harabas.

Likewise, Occidental Mindoro, an onion-producing province in the MIMAROPA region, particularly in the municipality of San Jose, experienced the onslaught of armyworms in onion. Just the same, farmers in the province resorted to the use of several methods of chemical control but none of which solved the problem.

Therefore, a green muscardine is an entomopathogenic fungus that can act as a parasite of insects and kill or seriously disable them. These fungi are usually attached to the external body surface of insects in the form of microscopic bodies such as asexual, and mitosporic spores also called conidia. These characteristics are possessed by *Metarhizium anisopliae*. The spore of *Metarhizium anisopliae* can be formulated as dust and sprayable formulation. It is used to control termites, mosquitoes, leaf hoppers, and rice bugs (Irsad et al., 2023).

In this regard, the effectiveness of fermented *Metarhizium* as a biological control agent should not be limited to the control of black bugs and 12 spotted beetles. It should also be tested for other insects like Armyworms that infest onions. If this is effective, this can be another technology that would help farmers control insects without the use of chemical pesticides. It was on these foregoing premises, that the study on the effectiveness of fermented *Metarhizium anisopliae* was conducted.

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

MATERIALS AND METHODS

Research Design

This study used the experimental method of research using the layout in Complete Randomized Design (CRD) which is best suited for experiments with a small number of treatments and is the simplest design to use. There were 15 pots planted with onions and randomly arranged in the experimental layout (Figure 1).

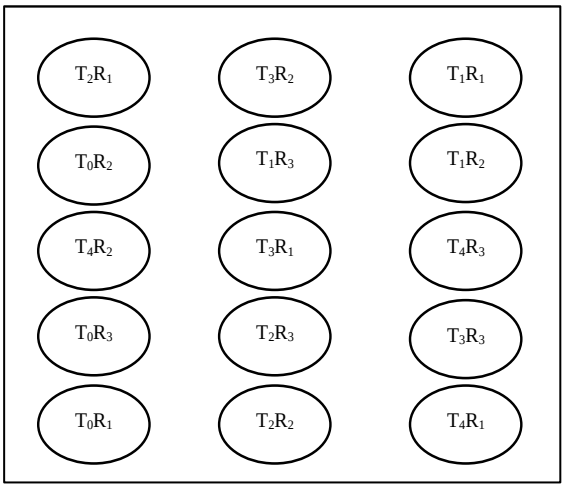

Figure 1. Experimental layout in completely randomized design (CRD).

Preparation of Liquid *Metarhizium anisopliae*

Pure culture of *Metarhizium anisopliae* was obtained from Murtha Seedling Farm, Murtha, San Jose, Occidental Mindoro. Murtha Seed Farm is a government office under the Department of Agriculture MIMAROPA which is tasked to produce a culture of *Metarihizium anisoplae* in polypropylene (PP) bags for distribution to interested farmers. The experimental fungus (250 grams) was mixed with one liter of water and fermented in four tablespoons of molasses for at least seven months. The mixture was done in a 1.5 L plastic soft drink bottle.

Cultural and Management Practices

The seedling preparation involved filling trays with soil and sowing onion seeds half an inch deep in each hole, which were then covered with a thin layer of soil. Regular watering and daily monitoring were conducted to promote seed germination. For the potting media, a mixture of equal parts garden soil and decomposed cattle manure was prepared and placed in rice sacks, arranged according to a completely randomized design (CRD) at the experimental site.

The pots, 20-25 cm deep and as wide as possible, were equipped with sufficient drainage holes and elevated slightly using stands. The soil substrate in the pots comprised 70% garden soil and 30% cattle manure, covered with white plastic mulch to facilitate the identification of fallen armyworms during the application of liquid biological pesticide. The pots were prepared with holes deep enough to accommodate seedling growth, with onion seedlings planted 15 cm x 15 cm apart, and pots spaced 1 meter apart. Transplanting occurred three to four weeks after sowing, with four seedlings per pot.

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

Seedlings, pricked when 13-15 cm high, were transplanted late in the afternoon to avoid wilting. Post-transplanting, daily watering was practiced ensuring adequate hydration for the crops. Fertilization with complete fertilizer 14-14-14 was applied three weeks after transplanting and then every two weeks. Manual weeding was carried out to reduce competition for nutrients and water.

Collection and introduction of armyworm larvae (Harabas)

A total of 150 pieces of insect larvae were collected from the field and placed in a jar to avoid stress. It was introduced in the experimental crops during the vegetative stage (60 days after sowing). Each plant was enclosed with a fine plastic net to ensure that other insects did not interfere with the larvae and to experimental crop. The inoculation of the armyworm was done at 1:30 a.m.

Application of liquid *Metarhizium anisopliae*

Application of liquid *Metarhizium anisopliae* was done one minute after the larva was introduced to the onion seedlings. Each plant received 15 mL in T_1, 29 mL in T_2, and 44 mL in T_3 of liquid *Metarhizium anisopliae*. The application was done at 1:30 a.m. three times with 12-hour intervals. A hand sprayer was used in the application of liquid *Metarhizium anisopliae.* Adjuvant spray concentrate was added into the liquid *Metarhizium anisopliae* to provide stickiness to larvae at the rate of 2 mL/L of water.

Data Gathering

The following parameters were carefully observed and recorded and served as the basis for analysis and evaluation of the efficacy of various proportions of liquid *Metarhizium anisopliae* as a biological agent.

To determine the mortality rate of armyworm larvae (Harabas), data were collected by counting the larvae every 12 hours following the application of biological pesticides. The mortality rate was calculated by counting the total number of armyworm larvae per plant before application, then dividing the number of larvae that died by the total number introduced and multiplying the result by 100%. For assessing the percentage of damaged leaves, leaves exhibiting characteristics such as grazing, small holes, and skeletonization were counted per plant throughout the experiment. The number of damaged leaves was then divided by the total number of leaves per plant and multiplied by 100% to obtain the percentage of damaged leaves. Additionally, the number of insects repelled was recorded individually by counting the armyworms repelled from pots after applying various concentrations of *Metarhizium anisopliae*.

Statistical Analysis

Data gathered in this experiment were analyzed using analysis of variance (ANOVA) in CRD at 5% and 1% levels of significance. Differences among treatment means were determined using the least significant difference (LSD) test at 5% level.

RESULTS

Results of the study show that the use of chemical pesticide against armyworm out staged the use of the experimental biological pesticide. The mortality rate of armyworm as affected by liquid Metarhizium can be achieved by increasing the rate of application. Thus, this experimental liquid botanical pesticide can perform comparatively with its chemical counterpart.

Table 1. Effect of liquid *Metarhizium anisoplae* against armyworm in onion.

TREATMENT	MORTALITY RATE	NUMBER OF REPELLED	PERCENTAGE DAMAGED LEAVES
T_0 – Control (No application)	0.00^{c}	10.00^{a}	92.07^{a}
T_1 – 175 mL M. anisopliae + 1L water	13.33^{c}	8.67^{b}	56.07^{b}
T_2 – 350 mL *M. anisopliae* + 1L water	20.00^{c}	8.00^{b}	49.03^{b}
T_3 – 525 mL *M. anisopliae* + 1L water	63.33^{b}	3.67^{c}	55.90^{b}
T_4- Chemical insecticide	100.00^{a}	0.00^{d}	41.33^{c}
F value	173.25**	98.25**	23.40**
p-value	0.00	0.00	0.00
Coefficient of Variation	11.98%	11.99%	9.48%

DISCUSSION

The study assessed the efficacy of Metarhizium anisopliae as a biological pesticide for controlling armyworms in onions, compared to a chemical pesticide. The chemical pesticide achieved a 100% mortality rate in armyworms, while *Metarhizium anisopliae* at 525 mL/L resulted in a 63% mortality rate. The biological pesticide at lower concentrations showed reduced effectiveness, with mortality rates of 20% and 13.33% at 350 mL/L and 175 mL/L, respectively, compared to the control group.

These results suggest that Metarhizium anisopliae can serve as an effective alternative to chemical pesticides, particularly when applied at higher concentrations. The significant difference in mortality rates demonstrates that while the biological pesticide is effective, it does not match the performance of chemical pesticides. This supports previous research which highlights the potential of *M. anisopliae* in pest management but also suggests that further optimization is necessary (Munywoki et al., 2022).

In terms of repelling armyworms, the chemical pesticide was the most effective, while the biological pesticide showed variable results. The statistical analysis indicates a significant difference among treatments. The repelling effect of M. anisopliae, although less pronounced, suggests that increasing its concentration could enhance its efficacy. This is consistent with findings that *M. anisopliae* spores have a repelling effect on insects, though this effect diminishes over time (Aw & Hue, 2017).

The percentage of leaf damage showed that chemical pesticides resulted in the least damage compared to the control group. Onions treated with various concentrations of the biological pesticide displayed a reduction in damage. This reduction in damage supports the

utility of *M. anisopliae* in mitigating feeding damage, in line with studies that report its effectiveness in reducing pest-induced damage (Thube et al., 2022; Silipiwe et al., 2024).

Overall, while *Metarhizium anisopliae* presents a promising alternative to chemical pesticides, its effectiveness is concentration-dependent and may require further refinement to match or exceed chemical controls. Future research should focus on optimizing the concentration and application methods to enhance both mortality and repelling effects and explore its integration into sustainable pest management strategies.

CONCLUSION

The study shows that various amounts of liquid *Metarhizium anisopliae* have comparable effects on the mortality rate, number of insects repelled, and percent of damaged leaves of onion. Lastly, it was found that there is no significant effect on the effect of various amounts of liquid *Metarhizium anisopliae* as biological pesticides against armyworms. This study recommends conduct a similar study using liquid *Metarhizium anisoplae* on different life stages of fall armyworm, revalidate the effectiveness of liquid *Metarhizium anisopliae* against armyworms in onion, using other parameters such as time of application and concentration of spores per volume, *Metarhizium anisoplae* have been recognized as comprehensive biopesticides in the management of many destructive pests. Therefore, this could be used as part of the integrated key component of IPM strategies for armyworm control. The experimental liquid if budget warrants, must undergo determination of mycotoxin content and kind.

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GROWTH AND YIELD RESPONSE OF OYSTER MUSHROOM *(Pleurotos ostreatus)* ON DIFFERENT RATIOS OF RICE HUSK AND CORNCOB SUBSTRATES

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ABSTRACT

This study investigated the growth and yield of oyster mushrooms using different substrate materials in a Completely Randomized Design utilizing four treatments: T_0 (100% sawdust), T_1 (25% rice husk + 75% corncob), T_2 (50% rice husk + 50% corncob), and T_3 (100% corncob). The experiment was conducted at Occidental Mindoro State College, College of Agriculture from June to October 2023. Polypropylene plastic bags were filled with different substrate combinations, pasteurized for 8 hours in a fabricated steel drum, and inoculated with oyster mushroom spawns. After colonization, the bags were placed in a growing house. Data were gathered from ten randomly selected fruiting bags per treatment. Results showed that 100% corncob significantly improved substrate efficiency by lowering the number of days to full inoculation and days to first flushing, increasing weight of oyster mushrooms, and biological efficiency. In addition, 100% corncob had comparable effects to 100% sawdust in terms of the number of fruits per flush and percentage marketable harvest. These findings suggest that corncob substrate, particularly 100% corncob, can be a viable alternative for oyster mushroom cultivation. It offers faster colonization, increased mushroom weight, and improved biological efficiency.

Keywords: *corncob, rice husk, colonization, spawn, oyster mushroom*

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

INTRODUCTION

Farmers like to grow oyster mushroom, however, there is a scarcity in finding a sawdust producer in their area as a substrate for growing them. Sawdust is the primary component of the mushroom oyster substrate media; it is necessary to investigate possible replacement materials. The chosen replacement substance must resemble sawdust in qualities and provide enough nutrients to sustain the development of the mushroom oyster (Rambey, et al., 2018).

According to Tesfaw et al. (2015), tropical and subtropical regions have substantial amounts of underutilized lignocellulosic by-products accessible to them. Typically, these waste items are burned or allowed to decay on the field. Growing mushrooms on readily available lignocellulosic substrate is another way to transform these unused wastes into recognized edible biomass with superior nutritional and commercial qualities. Due to their high nutrient content, agricultural wastes should not be disposed of without first being pre-treated to prevent leaching into the soil and potential harm to the ecosystem. This makes disposing of agricultural wastes a big challenge in the modern world. The most environmentally friendly solution to this issue is mushroom culture on these agricultural wastes, which lowers the level of nutrients to an acceptable range for use as manure. It enables to mushroom farmers to recycle garbage to save the environment and to get substrate materials at little or no cost (Khan et al., 2013). These wastes include rice husk, and corncob are locally available in the province of Mindoro.

Rice and corn are the first and second most-significant crops in the Philippines. In the year 2021, 19.96 million metric tons of rice and 8.12 million metric tons of corn produced. Therefore, there are 20% of rice husk and 18% of corncob produced as waste that frequently burned on the field or dumped by the side of the road by farmers and millers (Zhang et al., 2012).

About 35–40% of rice husk is made up of cellulose, 15–25% hemicellulose, and 25–25% of lignin. (Kumar et al., 2009). While corn cob contain lignocellulose, a substance required for fungus growth, they can be utilized as a substrate for planting mushrooms. Corn cobs contain 31-33% hemicellulose, 3-5% lignin and 40–44% cellulose (Wang et al., 2011). Therefore, it can be alternative to sawdust.

Occidental Mindoro, there are scattered agricultural by-products such as rice husk and corncob. Therefore, in order to minimize waste and to find alternative to sawdust, this study aimed to use locally available by-products to produce an edible mushroom.

The general objective was to conduct the effect of different substrate on the growth and yield of oyster mushroom in rice husk and corncob. Specifically, the study sought to: Determine the growth response of oyster mushroom in different substrate. Find out how oyster mushrooms respond in terms of yield on various substrates. Analyze the differences in effects of rice husk and corncob substrates on the growth and yield of oyster mushroom.

MATERIALS AND METHODS

Research Design

The study used a completely randomized design (CRD). It was done in a growing house where temperature and humidity were similar. Sampling was done randomly to avoid bias using draw lots to determine the corresponding treatments in the experimental layout.

Preparation

One kilogram (1 kg) of the substrate was placed inside the polypropylene bag. Thirty fruiting bags were prepared per experimental treatment. Only 10 fruiting bag were randomly chosen as samples. Each of the treatments was replicated three times. The substrates were filled and mixed with different mixtures (Table 1).

Table 1. Experimental treatments.

TREATMENT NUMBERS	MAJOR SUBSTRATE INGREDIENTS (78%)			SUPPLEMENTED INGREDIENTS			TOTAL
	Sawdust	Rice Husk	Corncob	Rice bran	Molasses	Limestone	
0	100%	-	-	20%	1%	1%	100%
1	-	25%	75%	20%	1%	1%	100%
2	-	50%	50%	20%	1%	1%	100%
3	-	-	100%	20%	1%	1%	100%

Source: Elsisura et al. (2022)

The process began with pasteurization, where the bags were steamed in an improvised pasteurizer—a 200L capacity steel drum—for 8 hours. After steaming, the bags were allowed to cool down, and the top of the pasteurizer was covered with an improvised lid to maintain the necessary conditions.

For the preparation of spawn, white oyster mushroom spawn was procured from a reliable source. Ten grams of this spawn were placed in each fruiting bag. Each bag was fitted with a PVC ring at the opening and then sealed with a rubber band and paper.

The incubation period commenced one week after introducing the spawn into the substrate. Fruiting was initiated once the bag was fully colonized by the mycelium.

During the fruiting phase, conditions required 80–85% relative humidity, proper light ventilation, and a temperature not exceeding 28°C. To maintain adequate moisture, the mushroom growing house was watered once daily, and the bags were kept closed to prevent moisture loss.

Cultural Method

The experiment was watered with clean water using hand sprayer twice daily. This was done to ensure the humidity level of the environment was maintained until the mushroom had taken enough water to induce production of fruiting bodies.

For harvesting, the ideal size of oyster mushrooms is indicated by an enlarged oyster mushroom body cap, at which point they are suitable for harvest. After the fruiting body was

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

fully extracted from the substrate, harvesting was completed. In order to make sure the stem was undamaged, it was done by gently twisting and pulling them from the substrates. Following the start of primordia, oyster mushrooms matured in two to four days. Harvesting intervals lasted one to two days each. Amin et al. (2007) described that the mature fruiting body could be distinguished by its cap's curve margin.

Data Gathering Procedure

The data collection for this study involved several key parameters monitored across 10 fruiting bags. The days to full inoculation were recorded, referring to the duration required for the mushroom mycelium to completely colonize the substrate from the date of spawning, with daily observations made. The days to first flushing were noted as the number of days from inoculation until the initial flush of oyster mushrooms, documented through observations post-full inoculation. The weight of oyster mushrooms per flush was measured using a digital scale, capturing the total fresh weight of mushrooms harvested per flush. The number of fruits per flush was counted, referring to the fleshy, spore-bearing bodies of the fungus, and recorded for each bunch of mushrooms harvested. The percentage of marketable harvest was calculated by:

$$Percentage\ of\ marketable\ harvest \quad = \frac{\text{Total weight of marketable mushroom}}{Total\ weight\ of\ harvested\ mashroom} \quad X\ 100$$

Finally, biological efficiency was determined:

$$Biological\ efficiency\ (BE) = \frac{\text{weight of fresh fruiting body (g)}}{\text{weight of dry substrate (g)}}\ X\ 100$$

Data Analysis

The gathered data were collated, tabulated, and analyzed using analysis of variance (ANOVA). Tukey HSD was used to detect the significant difference among the experimental treatments.

RESULTS

The table below presents the parameters tested as affected by different ratio of rice husk and corn cob for substrates.

The result of the study revealed that T3 (100% corncob) obtained the shortest days to full inoculation (mean=19), followed by T1 with 29 days and T2 with 27 days. The longest days to fully inoculate substrate was observed in T0 (100% sawdust). Likewise, T3 with 100% corncob obtained the shortest days to first flushing (mean=32 days). It is followed by 50% corncob with 49 days and 75% corncob with 52 days. The longest days to first flushing was observed in T0 with 100 sawdust.

For the yield performance of oyster mushroom, T3 with 100% corncob obtained the heaviest weight of fruit per flush, number of fruits per flush, and biological efficiency with 71g,

26, and 24%, respectively. Consequently, T3 (mean=80%) is comparable with the result of T2 (mean=84%) in terms of percent marketable harvest (Table 2).

Table 2. Growth and yield response of oyster mushroom (*Pleurotos ostreatus*) applied with different ratios of rice husk and corncob substrates.

TREATMENTS	DAYS TO FULL INOCULATION	DAYS TO FIRST FLUSHING	WEIGHT OF OYSTER MUSHROOM PER FLUSH (g)	NUMBER OF FRUITS PER FLUSH	PERCENT MARKETABLE HARVEST (%)	BIOLOGICAL EFFICIENCY (%)
T_0 (100% sawdust)	49^{c}	77^{c}	45^{b}	26^{a}	88^{a}	7^{c}
T_1 (25 % rice husk + 75 % corncob)	29^{b}	52^{b}	48^{b}	15^{b}	78^{b}	12^{b}
T_2 (50% rice husk + 50% corncob)	27^{b}	49^{b}	43^{b}	18^{b}	84^{ab}	11^{bc}
T_3 (100% corncob)	19^{a}	32^{a}	71^{a}	26^{a}	80^{b}	24^{a}

For the result of the analysis of variance, highly significant difference was observed in all the parameters as evidenced by the computed p-value ≤ 0.01, thus rejecting the null hypothesis. The different ratios of rice husk and corncob substrates had significant effects on all the growth and yield parameters of oyster mushrooms, with varying degrees of consistency as reflected in the coefficient of variation for each parameter (Table 3).

Table 3. Analysis of variance on the growth and yield response of oyster mushroom *(Pleurotos ostreatus)* applied with different ratios of rice husk and corncob substrates.

PARAMETER	COMP F-VALUE	COMP P-VALUE	COEFFICIENT OF VARIATION
Days to inoculation	303.48**	<0.001	4.11%
Days to flushing	76.52*	<0.001	5.16%
Mushroom weight per flush	23.90**	<0.001	8.71%
Fruits per flush	15.38**	<0.001	14.25%
Marketable harvest	14.17**	0.01	3.08%
Biological efficiency	41.91**	<0.001	3.81%

DISCUSSION

The result for the days to inoculation coincides with the study of Samuel and Eugene (2012) where corn cobs and palm cones had the greatest mycelium running rate. They stated that the most likely reason for the increased rate of mycelium running in maize cobs and palm cones was the proper ratio of lignin, hemicellulose, and alpha cellulose.

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On the other hand, the findings indicate that using 100% sawdust required the most time to fully inoculate, making it the slowest among all treatments. This slow performance aligns with the study by Decena and Del Rosario (2022), which also found that substrates with high concentrations of coconut sawdust, either alone or mixed with rice straw, resulted in slower spawn running. The delay in spawn running is attributed to the physical characteristics of sawdust, which impedes the flow of mycelium. The data suggests that higher sawdust concentrations slow down mycelial growth, making it less effective compared to substrates like rice straw, which allow for faster mycelial penetration.

According to Dhakal et al. (2020), the growth and yield of oyster mushrooms grown on corn cobs outperformed those grown on sawdust as a substrate. Sawdust and corn cob can be combined to boost oyster mushroom production. In contrast, according to Adjapong et al. (2015), although sawdust is widely regarded as the ideal substrate for mushroom production, maize wastes either alone or in combination with rice bran have also demonstrated to be successful substrates for oyster mushroom farming. According to Erlinda et al. (2021), since the concentrations of cellulose, lignin, pentosan, and other materials fluctuate with each treatment, the mycelium grows at a varied rate. With treatments that have less lignin because a big fungus can characterize the lignin content, the mycelium grows faster.

Also, the study suggests that using 100% corncob as a substrate is highly effective in promoting the rapid development of oyster mushrooms. On the other hand, the findings indicate that using a mixture of rice husk and corncob as a substrate significantly improves the growth rate of oyster mushrooms compared to using sawdust alone. Specifically, the treatments with 25% rice husk plus 75% corncob and 50% rice husk plus 50% corncob showed similar and faster growth rates, requiring 52 and 49 days, respectively, to reach a particular growth stage. This suggests that these combinations are more effective substrates than sawdust, which, as the control, showed the slowest growth with 77 days. The poor performance of the sawdust substrate highlights its inferiority compared to the rice husk and corncob mixtures in promoting faster mushroom development. The result was supported by the study of Hultburg et al. (2023), stating that the substrate consisting solely of sawdust would result in longer fruiting body formation. The mushroom fruiting bodies could be harvested between days 35 and 45 in the said treatment. The result was supported by the study of Sanchez (2010) which Pleurotos ostreatus in commercial production requires three to four weeks from inoculation to the harvest of the first flush.

The findings reveal that mushrooms grown in 100% corncob achieved the highest mean weight of 71g, followed by 25% rice husk + 75% corncob and 100% sawdust with mean weights of 48g and 45g, respectively. Despite these variations, there was no statistically significant difference among these three treatments in terms of mushroom weight per flush. Conversely, the 50% rice husk + 50% corncob mixture resulted in the lowest mean weight of 43g, consistent with previous research suggesting that a lower concentration of rice husk is more effective for producing higher yields of nutritious oyster mushrooms (Assan & Mpofu, 2014), where they recommended of the 2% concentration of rice husk as an alternative additive to composted sawdust for producing more nutritious oyster mushrooms. This was further supported by Costa et al. (2023), claiming that if raw rice husk is selected as a substrate, the amount used should

not exceed 50% of the volume of the substrate. Otherwise, poor production and biological efficiency may result from the substrates' poor nutritional quality.

The results show that 100% corncob produced the highest number of fruits per flush, followed by 100% sawdust, with no statistically significant difference between these two treatments. In contrast, 50% rice husk + 50% corncob and 25% rice husk + 75% corncob produced the fewest fruits per flush. Muchsin et al. (2017) stated that adding rice husk to the growing medium can lead to a reduction in the quantity of mushroom fruit bodies. It is thought that the accumulation of silica, which oyster mushrooms cannot decompose, is the cause of this decline. Due to this, the mushroom's growth and development may be hampered by the presence of rice husk in the growing media, which could ultimately result in a lesser output of fruit bodies. Rice husk, according to Kumar et al. (2009), contains about 15-20% hemicellulose, 20-25% lignin and 35-40% cellulose. While there are 31-33% hemicellulose, 40–44% cellulose, and 3-5% lignin in corn cobs (Wang et al., 2011). One of the finest substrates for growing oyster mushrooms was cellulose, which has a high organic matter content (Pant et al., 2006). High lignin and phenolic content substrates inhibited cellulose's activity, whereas low lignin would increase enzyme activity, guaranteeing a higher mushroom yield and biological efficiency. This was further supported by Costa et al. (2023), stating that when rice husk is selected as a substrate, the amount used should not exceed 50% of the volume of the substrate; otherwise, poor production may result from the substrates.

The addition of corncob had a substantial effect on the number of fruiting bodies of oyster mushrooms. Corn cob had the most fruit per flush. According to Muhaeming et al., (2021), if a pinhead grows quickly, many fruit bodies will also form since each pinhead that produces a fruit body takes nutrients from the developing media. Furthermore, Chukwurah et al. (2013), forwarded that mixture, type, or usage of one or more agricultural wastes in the preparation of the farm substrates also affected the mushroom fruiting bodies' performance. Corncobs with productive fruiting bodies yielded more, which may have been caused by the substrate's cellulose, hemicellulose and lignin content (Vetayasupron, 2007).

Dhakal et al. (2020) revealed that sawdust is not effective as corn cob as substrate from oyster mushroom production when it comes to mushroom development and yield. Advised to use corn cob substrate than sawdust.

The biological efficiency, calculated as the weight of fresh mushroom fruiting bodies divided by the weight of dry substrates and expressed as a percentage, shows that 100% corncob achieved the highest efficiency at 24%. This was followed by 25% rice husk + 75% corncob with 12%, and 50% rice husk + 50% corncob with 11%, which were comparable to each other. The control, 100% sawdust, had a significantly lower biological efficiency at 7%, indicating poorer performance compared to the other treatments. From the overall result of biological efficiency reveals that corncob (24%) yielded better than other substrates which is rice husk and lowest in sawdust which agrees with results of Dhakal et al. (2020) 100% corn cob had a greater biological efficiency of 91.21% compared to 100% sawdust, which had 85.69%, when the biological efficiency was determined against the dry weight of each substrate; nevertheless, the difference was not statistically significant.

One limitation of the study is that the results are influenced by the specific characteristics of the substrates used, such as their physical properties and chemical composition, which may vary between sources and batches. For example, the observed performance of 100% corncob and its superiority in growth and biological efficiency could be attributed to its optimal lignin, hemicellulose, and cellulose ratios, which may not be consistent across different corncob sources. Similarly, the poor performance of sawdust and the less effective mixtures of rice husk with corncob might reflect limitations inherent to these substrates rather than a generalizable trend. Variations in the substrate's quality, such as differences in nutrient content or microbial contamination, could affect the outcomes and their applicability to different growing conditions or environments. Additionally, the study's findings might not be fully representative of commercial-scale production due to the controlled experimental conditions, which may not account for real-world variability.

CONCLUSION

There is a significant difference in the growth and yield of oyster mushroom applied with different ratios of rice husk and corncob substrate. The oyster mushroom grown on 100% corncob as substrate is efficient to shorten the days to full inoculation and days to first flushing. Consequently, it also improved the yield of oyster mushroom in terms of weight of oyster mushroom, number of fruits per flush, and biological efficiency.

Based on the study's findings, it is recommended to use 100% corncob as the primary substrate for optimal growth and yield of oyster mushrooms, given its superior performance in terms of biological efficiency and development speed. Additionally, experimenting with substrate combinations, such as 25% rice husk + 75% corncob or 50% rice husk + 50% corncob, can offer a balance of growth rate and yield, depending on specific production needs. The use of 100% sawdust should be minimized, as it demonstrated the lowest performance across key metrics. Further research is needed to explore the impact of different substrate sources and their qualities on mushroom production, and to test these findings in commercial-scale settings. Additionally, optimizing substrate ratios and exploring alternative additives could enhance both growth and nutritional quality of the mushrooms.

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EMPLOYEE ENGAGEMENT AND OFFICE INNOVATIONS IN GOVERNMENT OFFICES

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ABSTRACT

Engagement and innovation are the common changes faced by the government employees after the pandemic at their respective workplace. Given this case, employee engagement and office innovation as well as the relationship between the two has become prevalent topic of this discussion. This study seeks to identify the level and relatioship of employee engagement and office innovation. In pursuit of the objectives, this study employed a purposive sampling technique and a researcher-made instrument was used to conduct a face-to-face data gathering from the employees of government offices in San Jose, Occidental Mindoro. This study reveals that the level of employee engagement and office innovation was very high and also shows that office innovations is significantly and positively related to employee engagement. This suggests that office innovation can contribute to employee engagement by improving the work environment and processes, but it is not the only factor that affects employee engagement.

Keywords: *employee engagement, government employees, office innovation, purposive sampling technique, researcher-made instrument*

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INTRODUCTION

Government is the primary reason by which a state's citizens are monitored, regulated, and provided with services and protection. Every country boasts its unique form of government. Though the underlying structure might be similar, the cultural inclinations and preferences of its citizens dictate how a government operates, leading to varied functionalities. Despite the pandemic, Filipino workers continue to exhibit a strong sense of community and are eager to assist others in achieving their shared objectives. Meanwhile, 83% said they felt their work was important to the organization's aims and objectives and were always searching for ways to improve their position and contribution. The pandemic has affected employers as well, though. Participants reported being weary at work in proportion to 67% and not having enough time to do their work (De Borja, 2021).

According to the perspectives of numerous scientists, employee engagement is a person's propensity to engage in a certain labor activity, which has three components: knowledge, interest, and performance (Budriene & Diskiene, 2020). Knowing what the employee does, wanting to keep up with trends and innovation, and doing his job well enough to get the job done all contribute to an employee's engagement.

Furthermore, the working environment is the subject of conversation for the spatial part of all choices concerning the present and future. This area is where the processes that decide the physical characteristics and standards of the present and future worlds take place. Additionally, it is one of the locations where decisions and guidelines for sustainable development in the spheres of economic, social, and political life are made (Yunus & Ernawati, 2018). Innovating the work environment can significantly contribute to employee satisfaction, resulting in a good office performance.

To support this study, employee engagement and office innovations can be based on the Job Characteristics Theory (JCT) and the Innovation Diffusion Theory (IDT). According to Job Characteristics Theory (JCT), jobs can be designed to increase the core job characteristics of skill variety, task identity, task significance, autonomy, and feedback, which can lead to increased employee engagement. Thus, job characteristics such as variety, identity, significance, autonomy, and feedback can be considered as predictor variable (Faturochman, 2016). While Innovation Diffusion Theory (IDT) stated that the adaption of an innovation is influenced by its perceived relative advantage, compatibility, complexity, trialability, and observability (Sahin, 2006). Thus, factors such as perceived benefits, compatibility with the work environment, ease of use, opportunities for experimentation, and visibility can be considered as criterion variables. By using these theoretical frameworks, the study can provide insights into the factors that can improve employee engagement and office innovations in government offices.

The purpose of this study was to determine the level of employee engagement and office innovations in government offices in San Jose, Occidental Mindoro, such as job, team, supervisor, organization, interior innovations, process innovation, and records management innovation. Further, to determine how the employees engaged in the office innovations. Now, based on the researcher's initial review of related literature, it was found that no study has been conducted on the topic.

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METHODS AND MATERIALS

This study is descriptive-correlational, it focused on merely describing this research and knowing the relationship between employee engagement and office innovations of government offices. Since the goal of descriptive research is to collect data and analyze it, this study is quantitative.

To analyze the respondents of this study, Tabachnik and Fidell (2007) model was used to calculate the sample size of respondents. If N is the number of participants and k is the number of predictor variables, then the minimum ideal sample size for significant findings is $N \geq 50 + 8k$ or $N \geq 104 + k$, whichever is more significant according to this model. Because there will be nine predictor variables analyzed statistically in the investigation, $k = 9$. As a result, $N \geq 104 + 8k = 50 + 8(4) = 82$ and $N \geq 104 + k = 104 + 4 = 108$ are obtained. Consequently, a minimum sample size of 108 respondents is required for the research.

The researchers established specific criteria for respondents to be included in the study. The inclusion criteria required that participants be office workers with at least three months of experience in their respective positions and hold permanent employment status. Conversely, individuals were excluded if they were temporary or contractual employees or part-time instructors.

Purposive sampling technique was used to organize a group of employees with similar characteristics to save cost and time in data gathering. The researchers determined the level of employee engagement and organizational innovations as well as the relationship between the variables through this method.

The researcher-made instrument was used to gather the needed information. First part is the information based on employee engagement, consisting of 24 items, and the second part is information about the office innovations of office workers employed in government offices in the municipality of San Jose, Occidental Mindoro and comprises 18 items. To measure the reliability of the instrument, pilot testing was conducted in which 50 office workers from other government offices answered the questionnaire.

Upon approval, the survey questionnaires were disseminated to the respondents who were randomly chosen and assured the respondents about the confidentiality of the data gathered. Survey questionnaires are only given to the respondents who volunteered to answer the research instrument. All information was gathered, categorized, and interpreted statistically. The weighted mean and standard deviation are the descriptive statistics that was used to determine the level of employee engagement and office innovation, and Kendall's Tau-b correlation is the inferential statistics that the researchers utilized to find out if there is a relationship between employee engagement and office innovations.

RESULTS

Employees generally view their job positively (3.54±0.37). Team dynamics are also rated positively (3.59±0.36), and relationships with supervisors are particularly strong (3.64±0.35). Satisfaction with organizational aspects is somewhat lower (3.55±0.35). Overall, the results indicate a generally positive perception of the work environment, with a grand mean of 3.58±0.32 (Table 1).

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

Table 1. Level of employee engagement in government offices.

INDICATORS	MEAN	SD
Job		
My work is valued by this organization.	3.62	0.488
I have received the training I need to do my job well.	3.44	0.616
The amount of work I am expected to do is reasonable.	3.34	0.598
Before accepting this role, I planned or imagined working in a similar position.	3.31	0.662
I enjoy working here the majority of the days.	3.57	0.497
I am proud to work in this company.	3.75	0.436
I see myself working here for one year, two years, or five years.	3.67	0.530
I find my work meaningful.	3.66	0.477
Overall	3.54	0.368
Team		
The people I work with take accountability and ownership for results.	3.44	0.518
The people I work with treat me with respect.	3.59	0.494
My co-workers and I openly discuss what needs to be done to be more effective.	3.49	0.538
I consider my co-workers as my teammates who should work together cooperatively.	3.66	0.477
I extend assistance to my co-workers whenever they need help and when I am available.	3.65	0.480
Overall	3.59	0.364
Supervisor		
My supervisor helps me understand how my work is important to the organization.	3.63	0.485
My supervisor is approachable and easy to talk to.	3.72	0.470
My supervisor creates a motivating and energizing workplace.	3.61	0.508
My supervisor sets high expectations for our team's performance.	3.63	0.485
I ask my supervisor for guidance whenever tasks need to be clarified for me.	3.64	0.520
My supervisor is fair, supportive, and invested in my growth.	3.64	0.538
Overall	3.64	0.348
Organization		
The vision and goals of this organization are important to me personally.	3.59	0.494
This organization provides attractive opportunities for training and development.	3.44	0.498
There are opportunities for my advancement in this organization.	3.49	0.502
My opinions are sought on issues that affect me and my job.	3.38	0.524
I would recommend this organization as a great place to work.	3.56	0.498
Overall	3.55	0.350
Grand Mean	3.58	0.317

Scale of interpretation: 1.00-1.75 very low; 1.76-2.50 low;2.51-3.25 high; 3.26-4.00 very high

Interior innovation is rated moderately (3.39±0.41). The implementation of innovative office layouts and the use of eco-friendly materials are somewhat emphasized, though there is less focus on redesigning office spaces or experimenting with collaborative workspaces. Process innovation also shows a moderate level of implementation (3.34±0.42), with new data collection methods and process optimization being prioritized, but overall innovation remains moderate. Records management innovation is somewhat lower (3.27±0.48), with less emphasis

on advanced techniques such as AI and machine learning for record management. Overall, the results indicate a moderate level of innovation in office practices, with a grand mean of 3.33±0.39 (Table 2).

Table 2. Level of office innovations in government offices.

INDICATORS	MEAN	SD
Interior innovation		
I always look for new ways to improve and optimize office space design to meet modern businesses' evolving needs.	3.48	0.555
Our company has introduced more innovative office layout during the past five years.	3.39	0.609
I prioritize using eco-friendly materials and designs that promote a healthy work environment.	3.39	0.544
I will redesign our office space within three to five years.	3.20	0.608
I have not recently moved to new office space and have no plans to do so because our office promotes a good office environment that is hard to find in other offices.	3.32	0.609
I experimented with our company's new collaborative workspace (areas conducive to ad hoc and small group meetings).	3.25	0.628
Overall	3.39	0.413
Process innovation		
I introduce new or significantly improved data collection and data retrieval methods.	3.30	0.600
I implement new ways to streamline and optimize our processes.	3.25	0.613
I implement tracking and monitoring of office supplies that reduce waste and optimize our inventory.	3.30	0.584
I use a system for automating routine tasks, such as scheduling appointments and managing email correspondence.	3.32	0.526
I use a digital platform allowing easy access and retrieval of important files.	3.44	0.584
I regularly review our existing processes and look for ways to make them more efficient and effective.	3.44	0.553
Overall	3.34	0.419
Records management innovation		
I am examining the use of AI and machine learning for automated record management tasks.	3.11	0.674
I am identifying the most promising approaches to record management innovation in the office.	3.26	0.647
All my records-storage boxes have a complete and accurate description of their contents written on the outside.	3.26	0.661
I am assessing the cost savings and benefits of record management innovation.	3.24	0.722
I am studying advanced research and retrieval algorithms to improve data organization.	3.17	0.649
I am exploring mobile access to records for on-the-go productivity.	3.32	0.639
Overall	3.27	0.475
GRAND MEAN	3.33	0.391

Scale of interpretation: 1.00-1.75 very low; 1.76-2.50 low; 2.51-3.25 high; 3.26-4.00 very high

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

Results show that office is significantly and positively related to employee engagement employee engagement (.386; p<0.01]). Specifically, interior innovation is significantly and positively related to job (.390; p<0.01), team (.389; p<0.01), supervisor (.390; p<0.01), and organization (.546 p<0.01]). Process innovation also shows a significant and positive relation to job (.306; p<0.01]), team (.286<0.01]), supervisor (.287; p<0.01]), and organization (.423; p<0.01]). Meanwhile, records management innovation is also significantly and positively related to job (.231; p<0.01]), team (.227; p<0.01]), supervisor (.228; p<0.01]), and organization (.304; p<0.01]) [Table 3].

Table 3. Relationship between employee engagement and office innovations.

	1	2	3	4	5	6	7	8
1. Job	-							
2. Team	.728**	-						
3. Supervisor	.548**	.629**	-					
4. Organization	.536**	.522**	.712**	-				
5. Interior innovation	.390**	.389**	.390**	.546**	-			
6. Process innovation	.306**	.286**	.287**	.423**	.652**	-		
7. Records management innovation	.231**	.227**	.228**	.304**	.425**	.594**	-	
8. Employee engagement	.758**	.770**	.761**	.718**	.449**	.348**	.272**	-
9. Office innovations	.327**	.324**	.331**	.462**	.709**	.805**	.706**	.386**

*Legend: ** Correlation is significant at 0.01 level (2-tailed)*

DISCUSSION

The findings reveal that employees generally express higher satisfaction with their supervisors compared to other factors. This suggests that effective supervision plays a critical role in overall employee satisfaction. However, there is notable variability in supervisor satisfaction, indicating that individual experiences may differ significantly.

In contrast, satisfaction with team dynamics is slightly higher, which could reflect the positive impact of strong team cohesion and support on employee morale. Despite this, there remains some variability, highlighting differing experiences within team interactions.

Satisfaction with the organization overall is somewhat lower, suggesting that employees might be less content with organizational aspects beyond direct supervision and team interactions. The reduced variability in these scores indicates a more consistent perception of the organization among employees, but also points to areas where organizational improvements might be necessary.

Job satisfaction, which is slightly below the overall mean, implies that employees may have concerns about their current roles. This finding is consistent with previous research indicating that job satisfaction is a key predictor of employee engagement (Lee & Kim, 2019). The greater variability in job satisfaction scores points to diverse employee experiences and suggests that targeted improvements in job roles could enhance engagement.

Regarding innovation, the findings suggest that interior innovations are more prevalent in the office environment compared to other types of innovations, such as process or records

management innovations. This could imply a focus on improving the physical workspace to foster a more engaging environment. The relatively higher variability in records management innovation suggests that this area may receive less attention or exhibit diverse approaches among employees.

Overall, the results emphasize the importance of both the physical office environment and workplace innovations in enhancing employee engagement. The positive relationship between office innovation and engagement highlights how physical and design elements contribute to a more engaging work environment. Innovative work behaviors, which involve generating new ideas and fostering enthusiasm, are crucial for driving organizational effectiveness, particularly in the current Industry 4.0 era (Duradoni & Fabio, 2019).

This study's descriptive-correlational design is limited in several ways. First, while it provides valuable insights into the relationship between employee engagement and office innovations, it does not establish causation due to its correlational nature. Additionally, the use of purposive sampling to select office workers with specific characteristics may limit the generalizability of the findings to broader populations, as it may not fully represent the diversity of employee experiences and organizational contexts. The reliance on a researcher-made instrument, despite undergoing pilot testing, may introduce measurement biases, and the data collection method–voluntary survey participation–could lead to self-selection bias, potentially skewing the results. Furthermore, the study's focus on government offices in a specific municipality may restrict the applicability of the findings to different sectors or geographical locations. These limitations should be considered when interpreting the results and their implications for enhancing employee engagement and innovation in office settings.

CONCLUSION

The contextual interpretation of these findings emphasizes the need for targeted efforts to enhance job satisfaction, leadership, and team dynamics in government offices to foster greater employee engagement and ultimately improve organizational outcomes. Effective leadership can create a positive work environment, provide guidance and support to employees, and foster a culture of collaboration and communication. Also, innovation continues to be an important factor for organizational success in the current business environment but it must be approached strategically and balanced with risk management and employee development efforts. Thus, these findings provide an analysis that shows a relationship between employee engagement and office innovation. Engagement is a central asset in advancing innovative working and a tool to promote working innovatively. Innovation and employee engagement work together to strengthen one another because an innovative firm is more likely to inspire and foster creativity in the company's workers.

Based on the findings from the analysis, recommendations are organizations should focus on providing opportunities for employee development, promoting work-life balance, recognizing and rewarding employee contributions, encourage creativity and experimentation to enhance employee engagement and foster innovation in the workplace. By prioritizing employee well-being and creating a positive work environment, organizations can foster a culture of engagement and innovation and improve organizational outcomes.

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KAWÓ BANWA: DEVELOPMENT AND EVALUATION OF A BUDGET MONITORING INFORMATION SYSTEM FOR URBAN BARANGAYS IN SAN JOSE, OCCIDENTAL MINDORO

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ABSTRACT

The Philippine government's commitment to promoting transparent and accountable local governance led to the development of KAWÓ BANWA, a budget monitoring information system designed for urban barangays in San Jose, Occidental Mindoro. This system addresses misallocation and mismanagement of funds, often leading to delayed projects. It addresses challenges, including the need for capacity building among local government officials, limited transparency and accountability in budget processes, inadequate stakeholder engagement, and insufficient access to modern technology. KAWÓ BANWA provides a secure and user-friendly platform for streamlined budget tracking and management, utilizing Visual Basic 2022 and Microsoft Access. The researchers conducted compatibility testing to ensure adaptability to different operating environments, and an evaluation found the system to be highly effective. Implementing KAWÓ BANWA promises to improve transparency, accountability, and resource allocation to strengthen significantly local governance and public service delivery in San Jose, Occidental Mindoro.

Keywords: *budget monitoring information system, budget tracking, allocation and management, system application.*

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

INTRODUCTION

In response to the persistent challenges in local governance and the misallocation of public funds in the Philippines, the government has initiated various programs to enhance transparency and accountability. One crucial strategy involves implementing an effective budget monitoring information system at the local level, as outlined by the Department of Interior and Local Government (DILG, 2022). Despite these efforts, issues such as mismanagement persist, prompting the need for further research and practical solutions.

In this context, a notable initiative emerges in the form of the KAWÓ BANWA (Key Audit and Well-Built Operation - A Budgetary Allocation Navigation for Widespread Accounting Transactions) system, specifically designed for urban barangays in San Jose, Occidental Mindoro. The proposed system aims to streamline budget monitoring and information management, addressing critical aspects like inputting national tax allotment, expenditure programs, project implementations, program of works, and generating various reports. The development of KAWÓ BANWA is rooted in a comprehensive assessment of current practices, ensuring relevance and effectiveness through feedback from barangay officials and stakeholders.

KAWÓ BANWA utilizes Visual Studio, MS Access, and Adobe Photoshop in its creation, highlighting the integration of technology for efficiency. The proposed system is expected to enhance accuracy, transparency, and accountability in budget monitoring for urban barangays. Through real-time information access, officials and stakeholders can make informed decisions, contributing to the broader government objective of promoting good governance and improving public service delivery at the local level.

The study's objectives encompass designing the automated budget monitoring system, developing KAWÓ BANWA, evaluating its capabilities through comprehensive testing, and assessing user feedback on functionality, usability, reliability, performance, and supportability. This systematic approach aligns with the government's overarching goal of establishing sustainable and effective budget monitoring and management systems in local government units.

METHODS AND MATERIALS

Project Design

The KAWÓ BANWA: Development of a Budget Monitoring Information System for Urban Barangays in San Jose, Occidental Mindoro is a database system that enables the municipal hall personnel who serve as administrators to monitor the in and out of the budget of every barangay easily. With this system, the User or the urban barangays will have a fast and easy way to record their finances (Figure 1).

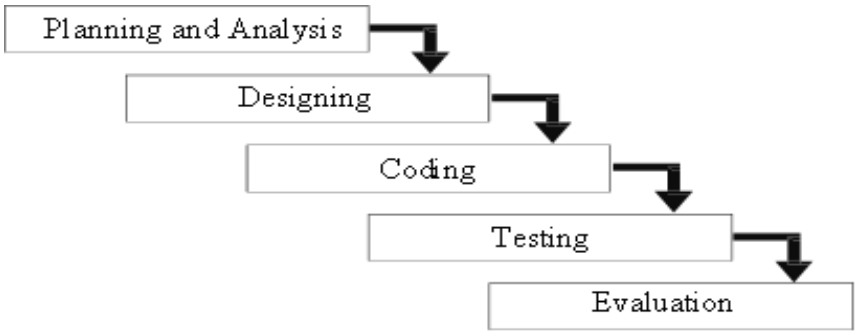

Figure 1. Flow diagram of the system.

Project Development

The software development life cycle waterfall model of KAWÓ BANWA was described below (Figure 2). First, the researchers conducted planning and analysis of what system they used and the system's scope and limitations. The researchers decided to design the KAWÓ BANWA, a budget monitoring information system that can help barangay to monitor their budgets. In coding, the researchers hired an Information Technology expert to create the system they designed. And lastly, the researchers conducted testing and dry runs before evaluating the system.

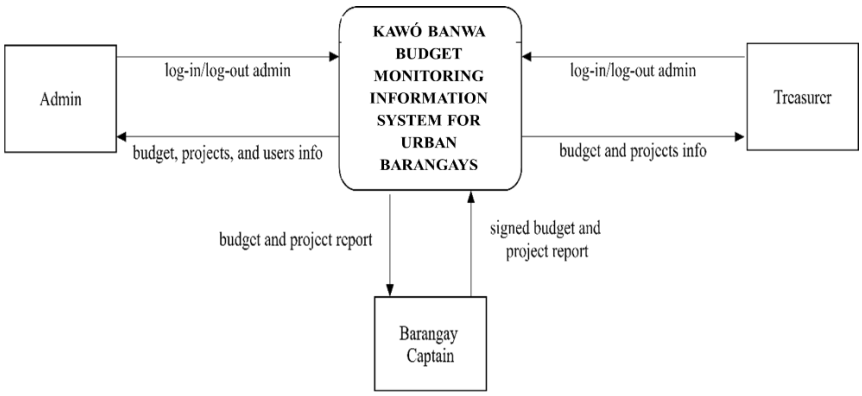

Figure 2. Waterfall Model.

Operation and Testing Procedure

The following are the procedures on how the system was operated and tested:

Operation procedure (admin)

The system's operation for administrators begins with the installation and initial sign-in, which displays the home page. Administrators can then select a page for monitoring, access user logs to review login, logout, and activity histories, and ensure system security by tracking interactions. To exit the system, administrators can either click the "Exit" button or log out, thereby securely closing their session.

Operation procedure (user)

Users start by installing the system and signing in, which brings up the home page. From there, they can select a page for editing or recording data. Users can interact directly

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

with the budget rows table by double-clicking to input or modify data. When finished, users can log out or click the "Exit" button to close the system, ensuring their data is securely saved.

Testing procedures

The system was tested across multiple configurations to ensure compatibility and performance. It operates on both 32-bit and 64-bit versions of Windows 7, 8, and 10. The system's appearance was tested on screen sizes ranging from 12" to 21" to ensure a consistent user experience. Additionally, it was evaluated for performance on devices with varying memory capacities (1 GB, 2 GB, and 4 GB) and across different screen resolutions (800 x 600, 1024 x 768, and 1366 x 768) to confirm visual accessibility and functionality across a broad range of devices.

Evaluation procedure

The evaluation of the KAWÓ BANWA system involved several stages. Initially, a preliminary assessment was conducted by the developer to ensure that the system met the expected output and specifications. Following this, a project demonstration was held, where twenty-four barangay officials, three research experts, five IT experts, and four municipal hall personnel were invited to interact with the system. Their feedback was gathered to assess the system's performance and usability. In the final evaluation phase, a survey was distributed among these respondents, who rated the system based on specific criteria.

Table 1. Likert scale, description and range distribution.

SCALE	DESCRIPTION	RANGE
5	Excellent	4.51-5.00
4	Very Good	3.51-4.50
3	Good	2.51-3.50
2	Fair	1.51-2.50
1	Poor	1.00-1.50

RESULTS

Project Design

The design of the KAWÓ BANWA system includes several key pages, each serving distinct functions. The home page (Figure 3) provides an overview of essential financial data, such as the total available budget, total allocated budget, total budget used, and total project funds. It also includes a summary tally of ongoing and approved projects, offering users a comprehensive snapshot of the barangay's financial status immediately.

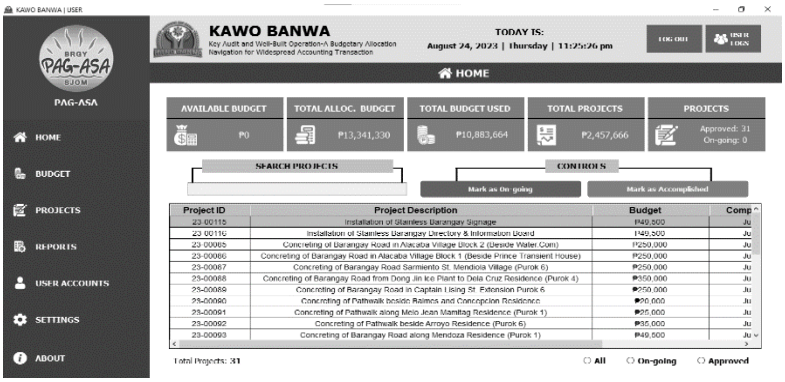

Figure 3. Home page.

The budget page (Figure 4) is more detailed, featuring a table that categorizes specific barangay expenditures. Additionally, this page includes a graph that tracks budget allocations from the current year and the three preceding years, allowing users to analyze trends in financial planning and execution. This visual representation aids in making informed decisions about future budget allocations.

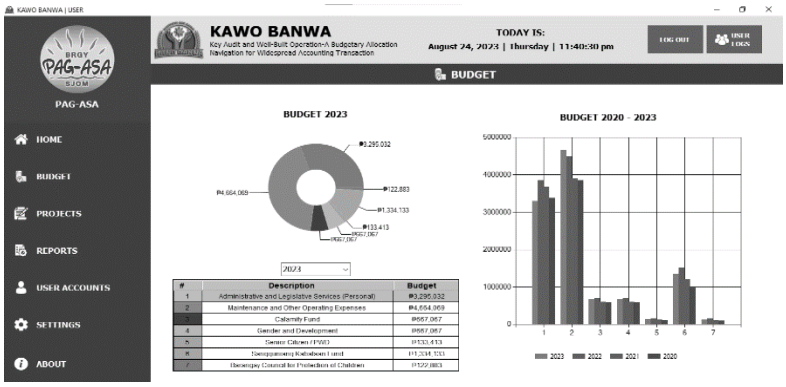

Figure 4. Budget page.

The project page (Figure 5) is organized into four sections, each corresponding to a quarter of the barangay's development fund. While administrators could monitor and print project details, users have more interactive capabilities, such as adding, editing, deleting, and printing project data. This division of functionality ensures that the system is both secure and user-friendly, providing different levels of access based on the user's role.

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

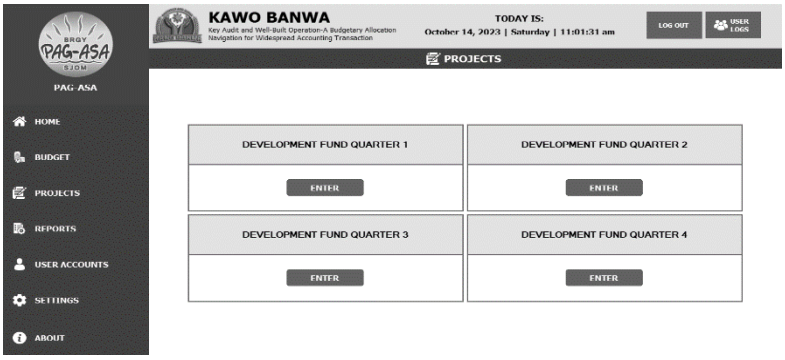

Figure 5. Project page.

The reports page (Figure 6) compiles all completed projects funded by the development funds, with options for both administrators and users to sort reports by year and print them. This feature is crucial for maintaining records and preparing documentation for audits or public dissemination.

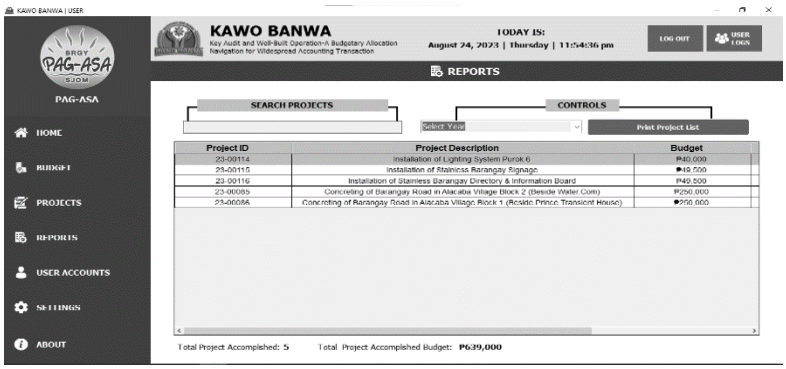

Figure 6. Reports page.

User account management is divided into two interfaces, as shown in Figures 7 and 8. The admin view (Figure 7) allows the administrator to manage user accounts by adding new users, deleting accounts, and clearing account details. In contrast, the User view (Figure 8) focuses on account settings, where users can modify their details by selecting the "Modify" option. This clear separation of roles helps maintain system security and user autonomy.

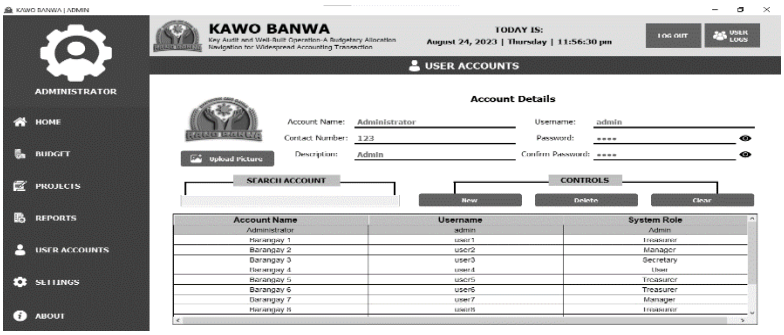

Figure 7. user accounts as admin

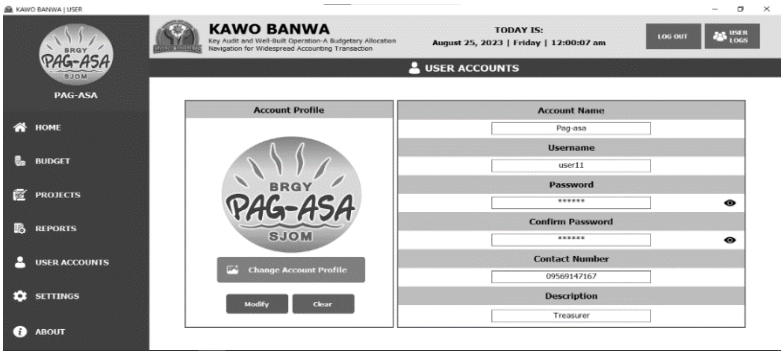

Figure 8. User account as user

The settings page (Figure 9) contains essential information about the barangay, providing a centralized location for administrative data. The About page (Figure 10) offers details about the system itself, introduces the developers, and includes a user manual, which guides users through the system's functionalities.

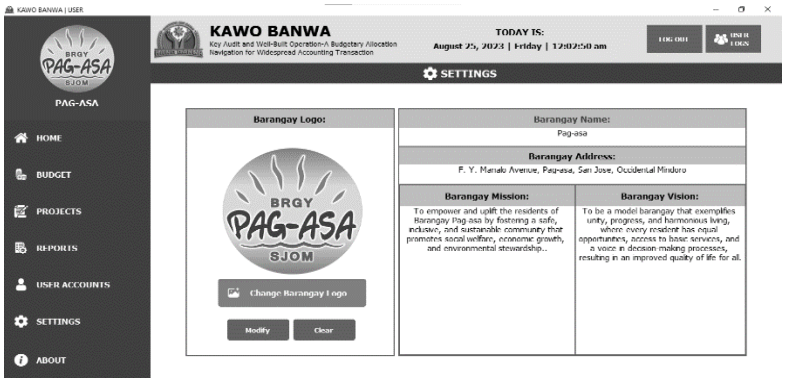

Figure. 8 Settings page

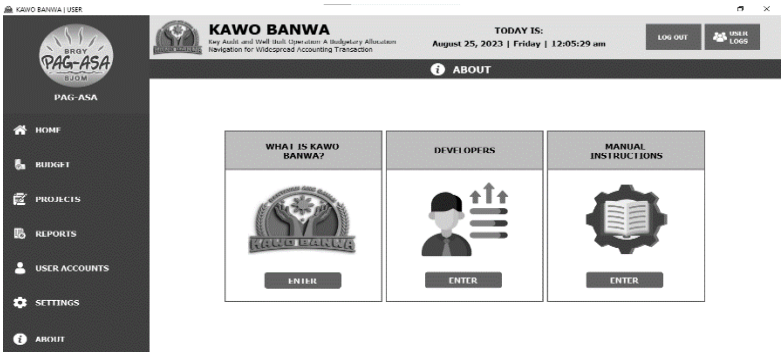

Figure 9. About page

Testing results for the system indicate that it performed successfully across various operating systems, including Windows 7, 8, and 10. The system was also tested on different monitor sizes, ranging from 12" to 21", and demonstrated compatibility across all sizes, displaying content correctly. Furthermore, the system functioned smoothly with varying memory capacities of 1 GB, 2 GB, and 4 GB, and maintained correct display across screen resolutions of

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

800x600, 1024x768, and 1366x768. These results confirm the system's robustness and versatility, ensuring it meets the diverse needs of its users (Table 2).

Table 2. Test result of KAWÓ BANWA.

COMPUTER COMPONENTS	FINDINGS
Operating system	
Windows 7	Passed, the system functioned successfully.
Windows 8	Passed, the system functioned successfully.
Windows 10	Passed, the system functioned successfully.
Monitor size	
12" monitor	Passed, the system was compatible. Displayed the content correctly.
15.5" monitor	Passed, the system was compatible. Displayed the content correctly.
17" monitor	Passed, the system was compatible. Displayed the content correctly.
21" monitor	Passed, the system was compatible. Displayed the content correctly.
Memory capacity	
1 GB	Passed, the system run successfully.
2 GB	Passed, the system run successfully.
4 GB	Passed, the system run successfully.
Screen resolution	
800x600	The system was displayed correctly.
1024x768	The system was displayed correctly.
1366x768	The system was displayed correctly.

Project Evaluation

The functionality of the system (4.40 ±0.10) was assessed with a high level of operational effectiveness. Usability (4.56 ±0.17) demonstrated the system's user-friendly interface and ease of use. Reliability (4.35 ±0.12) indicated consistent and stable performance across various conditions. The system's performance (4.52 ±0.09) reflected its efficiency and responsiveness, while supportability (4.53 ±0.04) highlighted the ease of maintenance and the availability of technical support. Overall, the project achieved a grand mean score of (4.47 ±0.10), placing it within the "Very Good" category according to the evaluation criteria.

Table 3. Summary of evaluation results.

INDICATORS	MEAN	SD
Functionality	4.40	0.10
Usability	4.56	0.17
Reliability	4.35	.0.12
Performance	4.52	0.09
Supportability	4.53	0.04
Grand Mean	4.47	0.10

Legend: 1.00-1.50 Poor 1.51 – 2.50 Fair 2.51 – 3.50 Good 3.51 – 4.50 Very Good 4.51 – 5.00 Excellent

DISCUSSION

The KAWÓ BANWA system is designed as a budget monitoring information system specifically for urban barangays in San Jose, Occidental Mindoro. It facilitates efficient tracking of financial activities and was developed using web development tools such as Visual Basic 2022, Microsoft Access, and Adobe Photoshop. Operating offline, the system ensures accessibility even in areas with limited internet connectivity. Municipal hall personnel manage the system, while barangay officials use it for financial record-keeping.

An evaluation of the system, conducted with 36 randomly selected respondents including barangay officials, IT experts, and municipal hall personnel, assessed its functionality, usability, reliability, performance, and supportability. The results indicated strong performance and consistent user experiences (Paz & Pow-Sang, 2015). Usability was particularly well-regarded, with users finding the system intuitive and easy to use, suggesting a high level of satisfaction and potential for widespread adoption (Fink et al., 2023). Supportability was also positively evaluated, reflecting efficient access to assistance and increased user confidence in resolving issues (Blanc et al., 2024).

The system's performance was rated highly, with users satisfied with its speed, accuracy, and responsiveness, which are crucial for maintaining productivity (Fortier & Michel, 2003). Functionality was generally well-received, though there is room for enhancement to better meet user expectations (Fleischmann et al., 2016). Reliability, while slightly lower, was still commendable, indicating that the system performs consistently without failure (Breznická et al., 2023). Overall, the evaluation results underscore positive user perceptions and the system's effectiveness in budget monitoring for urban barangays. Further refinements could enhance functionality and user satisfaction, ensuring the continued success and relevance of the KAWÓ BANWA system.

Despite the positive outcomes of the KAWÓ BANWA system evaluation, several limitations should be noted. First, the study's sample size of 36 respondents, although diverse, may not fully represent the broader population of users across all urban barangays. This limited sample could affect the generalizability of the findings. Additionally, the study primarily focused on user feedback and did not include a longitudinal analysis of the system's performance over time. This lack of long-term evaluation may overlook potential issues that could arise with extended use. Another limitation is the system's offline operation, which, while beneficial in areas with limited internet access, may not fully address the needs of users in regions with reliable internet connectivity. Lastly, the study did not explore the impact of varying levels of technical expertise among users on their experience with the system. Future research could address these limitations by incorporating a larger and more diverse sample, conducting longitudinal studies, and exploring the implications of online functionality and user expertise on system performance.

CONCLUSION

The evaluation of the KAWÓ BANWA budget monitoring system produced positive outcomes, with an overall rating reflecting commendable excellence and validating its effectiveness in improving budget monitoring for urban barangays. The system's strengths and

user-driven recommendations highlight opportunities for targeted enhancements, such as transitioning to an online server. This change would align with user expectations for improved speed and accessibility, broadening KAWÓ BANWA's market application and increasing its usability. Nonetheless, the system's offline nature limits real-time updates and collaborative capabilities. Furthermore, access is restricted to authorized personnel within their respective cooperatives, which could hinder broader stakeholder engagement. Despite these limitations, KAWÓ BANWA remains a robust solution for transparent and efficient budget management, with ongoing user feedback and planned enhancements ensuring its continued success and relevance.

To address these limitations, it is recommended that future iterations of the system incorporate online capabilities to facilitate real-time updates and collaboration. Expanding access permissions to include a broader range of stakeholders could also enhance transparency and engagement. Furthermore, continuous user feedback should be integrated to guide ongoing refinements and ensure the system's sustained success and relevance. Despite these constraints, KAWÓ BANWA remains a robust solution for transparent and efficient budget management, with its potential for further development promising significant benefits.

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RESEARCH ARTICLE

VARIOUS RETTING PROCESS AND THE QUALITY OF SALUYOT FIBER IN MAMBURAO, OCCIDENTAL MINDORO

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ABSTRACT

This study aimed to assess the quality of saluyot fiber using running water and stagnant water in its retting processes. The quality is a broad concept, and the researchers limit it in terms of the saluyot fiber's tensile strength h, temperature resistance, color, absorbency, and sustainability. After the various retting processes have been applied and the quality has been assessed, differences in the quality will also be determined. It was an experimental research design under a quantitative approach where the investigation was carried out at Mamburao, Occidental Mindoro with nine participants who were chosen to evaluate the quality of the experiments.

The researchers utilized a researcher-made questionnaire with 4-Point Likert scale for rating and interpretation for temperature resistance, absorbency, and sustainability based on the available resources and adapted a standardized questionnaire for the two remaining variables which are tensile strength, and color. The researcher-made questionnaire passed through the process of content validity and reliability tests before it was handed out to the participants. In this study, they also utilized several statistical tools for treating the collected data which includes the mean and t-test. The findings of this study revealed that the retting process using running and stagnant water gives a good quality of the saluyot fiber.

The result of this study shows that there is a significant difference between the quality of saluyot fiber extracted when retting in running water and stagnant water in terms of tensile strength, temperature resistance, color, absorbency, and sustainability.

Keywords: *sustainable fiber processing, natural fiber quality, retting techniques, local fiber utilization, agricultural sustainability*

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INTRODUCTION

The Philippines, a leading global producer of abaca fiber, faces a significant challenge in its textile sector. Although the country dominates the export market for natural fibers, holding approximately 87% of the global share (Señeris, 2024), it continues to import synthetic materials such as rayon and polyester for domestic textile production. This reliance on synthetic imports raises concerns about the long-term viability and economic benefits of current practices.

A promising alternative is the local fiber saluyot (Corchorus olitorius), which is abundant but underutilized in the textile industry. This study aims to explore the potential of saluyot as a viable substitute for synthetic materials by evaluating its fiber quality and examining various retting procedures. Key properties such as tensile strength, temperature resistance, color, absorbency, and sustainability will be assessed, as these factors influence fiber quality after harvest and ginning (Tahir et al., 2011). The study will contribute to understanding whether saluyot can support a more self-sufficient and resilient textile industry in the Philippines, aligning with the findings of Ahmed & Sarkar (2022), who highlighted the potential benefits of integrating local fibers into regional production systems.

The research focuses on saluyot from Sitio Dapi, Barangay Payompon, Mamburao, an area known for its abundant saluyot cultivation due to its paddy fields. This investigation builds on an existing collaboration between the Dapi Women Producers Cooperative (DMWPC) and the Operations Management Program of the college. By addressing the research gap in local fiber utilization, this study aims to provide insights into enhancing the sustainability of the textile industry and contributing to economic resilience.

MATERIALS AND METHODS

Research Design

This study employed an experimental research design with a quantitative approach to evaluate the quality of saluyot fiber subjected to different retting conditions. The focus was on the fiber's tensile strength, temperature resistance, color, absorbency, and sustainability. The experiment involved two treatments: retting saluyot stems in running water and in stagnant water. Both treatments were conducted simultaneously, using the same location and duration.

To assess the quality of saluyot fiber through retting in running and stagnant water, the following materials were used: two bundles of saluyot, two bamboo splits, four bamboo poles, a bamboo raft, and tannin-free plant materials.

The experiment followed a systematic retting process, which included the following steps: harvesting the saluyot plants, sorting the harvested stems, defoliating and desiccating the stems, binding the partially dried stems, submerging the stems in water, extracting the fiber, and drying the fiber.

Study Site

The research was conducted in Sitio Dapi, Barangay Payompon, Mamburao, Occidental Mindoro. This area is known for its saluyot production and is home to the Dapi-Mamburao Women Producers Cooperative, established in 2019 through a collaboration between Occidental

Mindoro State College and other governing agencies. The cooperative promotes saluyot-based products under the One Town, One Product initiative.

Sample

Saluyot fiber is a newly discovered type of fiber. The assessment of this shall involve experts from the field to give relevant judgment and results to the final output. In this study, the researchers have identified 10 participants to assess and evaluate the quality of saluyot fiber. The participants of this study were two (2) consumers or producers that use fibers in the creation of their products, two (2) environmental experts from the Department of Environmental and Natural Resources, two (2) government regulators from the Department of Trade and Industry, two (2) from the Municipal Agriculturist, and two (2) tailors. The researchers chose these participants for they have the qualities needed in the assessment and evaluation of the final output from the experiment. Hence, they are assured that these individuals will provide them with the most relevant assessment from the conducted experiment.

Research Instrument

A survey questionnaire was utilized to collect the necessary data. The questionnaire included a researcher-made instrument with a 4-point Likert scale for rating temperature resistance, absorbency, and sustainability, and standardized instruments for assessing tensile strength and color. The researcher-made questionnaire was not subjected to content validity and reliability tests, as it was used specifically for this experimental study. Ratings were on a scale from 1 to 4, with 4 indicating "excellent" and 1 indicating "poor".

Data Collection

The researchers personally visited the participants to obtain consent and distribute the survey questionnaires. Completed questionnaires were collected four days after distribution. Participants were assured of the confidentiality of their responses. The collected data were tabulated, analyzed, and interpreted.

Ethical Consideration

The researchers gave the participants assurance that whatever information they would provide would be treated as a very confidential matter. Study participation was entirely voluntary. The research evaluators' total anonymity was respected. The evaluators were made aware of their right to maintain their confidentiality. To make the evaluation form easier to understand, the researcher was able to provide any clarifications. The researchers exclusively had access to the data. Specific information on the questionnaires could not be linked to specific individuals. Access to the data was limited only to the researcher.

Data Analysis

SPSS was used for analysis after the obtained data was entered into Microsoft Excel. Mean was employed to examine and contrast data, form findings about the topic under

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

research, and draw conclusions. To ascertain the variations in the retting procedure, the t-test was applied. It was determined that a p-value of.05 or less was statistically significant.

RESULTS

The evaluation of saluyot fiber quality across various attributes–tensile strength, temperature resistance, color, absorbency, and sustainability–revealed nuanced differences based on the retting conditions. Saluyot fiber retted in running water (3.22±1.20) was rated as "good" for tensile strength, outperforming the fiber retted in stagnant water (2.89±0.78), which also received a "good" rating but with lower tensile strength. Regarding temperature resistance, both retting conditions yielded "good" ratings, with running water (2.56±0.73) and stagnant water (3.11±0.93) demonstrating satisfactory performance. In terms of color, fiber retted in stagnant water (3.44±0.73) was rated higher compared to running water (2.89±0.93), with both ratings categorized as "good." For absorbency, fiber retted in running water (2.11±0.78) was rated as "average," indicating moderate moisture absorption, while stagnant water (3.11±0.78) received a "good" rating, signifying better absorbency. Lastly, both retting conditions received "good" ratings for sustainability, with running water (3.11±1.17) and stagnant water (3.33±0.87) showing commendable sustainability. Overall, the study found significant differences across the retting conditions for all evaluated attributes (p-value <.001) [Table 1].

Table 1. Difference in the quality of saluyot fiber using running and stagnant water in the retting process.

PARAMETER	RUNNING WATER (M±SD)	STAGNANT WATER (M±SD)	T(Q)	P	COHEN'S D
Tensile strength	3.22±1.20	2.89±0.78	23.452	<.001	0.326
Temperature resistance	2.56±0.73	3.11±0.93	17.000	.000	0.657
Color	2.89±0.93	3.44±0.73	16.994	<.001	0.657
Absorbency	2.11±0.78	3.11±0.78	13.035	<.001	1.282
Sustainability	3.11±1.17	3.33±0.87	15.642	<.001	0.213

** The significance level was defined as a p-value of .05 or below.*

DISCUSSION

The findings indicate that saluyot fiber retted in running water demonstrates good quality in terms of tensile strength. This result suggests that the fiber exhibits substantial resistance to tensile stress, which is crucial for applications requiring durability, such as textiles and ropes. Fibers with higher tensile strength are desirable for their ability to withstand greater mechanical forces. This observation aligns with the study by Kusić et al. (2020), which underscores the importance of retting processes, such as exposure to sodium hudroxide, in enhancing tensile strength.

Regarding temperature resistance, the quality of saluyot fiber retted in running water is also rated as good. Elevated temperatures can degrade natural fiber components such as cellulose, hemicellulose, and lignin, affecting the fiber's mechanical and thermal properties. Methods to improve temperature resistance, such as the selective removal of hemicelluloses

and lignin, have been explored to enhance the fiber's thermal stability (Neto et al., 2021). Additionally, the thermal resistance of insulation materials like saluyot fiber varies with type and thickness, which is relevant for its application in industries requiring thermal insulation (Le & Pásztory, 2023).

In terms of color, saluyot fiber retted in running water is rated as good. Previous research by Cruz et al. (2017, 2020) highlights the significance of color in fiber quality, emphasizing the importance of producing fibers with desirable coloration for the textile industry. The study confirms that running water retting preserves the fiber's quality in terms of color, aligning with industry standards and minimizing issues such as medullation, which can cause itching (Pinares et al., 2019).

For absorbency, the quality of saluyot fiber retted in running water is rated as average. The hydrophilic properties of natural fibers, such as jute, are essential for applications requiring moisture absorption (Sujon et al., 2020). While the absorbency of saluyot fiber in running water is moderate, further research may explore methods to enhance its moisture absorption capacity.

In terms of sustainability, saluyot fiber retted in running water is rated as good. Natural fibers are inherently sustainable due to their low cost, renewability, biodegradability, and eco-friendly characteristics (Thyavihalli Girijapa et al., 2019). The increasing use of natural fiber-based composites reflects their sustainability and high-performance potential. Compared to synthetic fibers, natural fibers offer advantages such as abundance, cost-effectiveness, and environmental benefits (Jhanji Dhir, 2022).

The study also assessed saluyot fiber retted in stagnant water, finding it to be of good quality in terms of tensile strength and temperature resistance. These results support previous findings by Sisti et al. (2017) but contrast with Lee et al. (2014), which found no significant effect of water flow rate on fiber quality. This discrepancy underscores the need for further investigation into the impact of different retting conditions on fiber properties.

A limitation of this study is its focus on only two retting processes–running and stagnant water–without exploring other potential methods. Future research should address this gap by examining additional retting techniques to further understand their effects on fiber quality attributes such as tensile strength, temperature resistance, color, absorbency, and sustainability.

CONCLUSION

The tensile strength of the saluyot fiber was found to have the highest mean when retted in running water while the absorbency in this process got the lowest mean. This study concluded that retting in running water produces an average to good quality of saluyot fiber more specifically in terms of absorbency. While retting in stagnant water produces good quality of saluyot fiber. Lastly, it was noted that there is a significant difference between the two processes.

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EFFECTIVENESS OF INTERACTIVE SIMULATION IN IMPROVING THE PERFORMANCE IN SCIENCE OF THE GRADE 8 STUDENTS OF OCCIDENTAL MINDORO STATE COLLEGE

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ABSTRACT

This study evaluates the effectiveness of interactive simulations, specifically Physics Education Technology (PhET) simulations, in teaching science. PhET simulations are offline applications designed to provide dynamic and engaging representations to enhance student learning.

A quasi-experimental design was employed, utilizing a pre-test and post-test approach with the DepEd Science 8 self-learning module (SLM) in the Caraga Region. The study involved 50 Grade 8 students from Occidental Mindoro State College during the 2022-2023 academic year. Students were divided into two groups: one experienced conventional teaching methods, while the other used interactive simulations. Both groups participated in two learning sessions and then completed a test on the particle nature of matter.

The test results indicated that the performance of students in both the conventional and interactive simulation groups was comparable. Statistical analysis showed no significant difference between the two groups' scores, suggesting that both teaching methods were equally effective in helping students understand the subject matter.

The study finds that interactive simulations and conventional teaching methods yield similar outcomes in terms of student understanding. Despite the engaging nature of interactive simulations, they did not demonstrate a significant advantage over conventional methods. This suggests that both approaches are effective and may be used interchangeably or in combination to support science education.

Keywords*: Physics education technology (PhET) simulation, conventional teaching strategy, interactive simulation teaching strategy*

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INTRODUCTION

In today's era, science stands as a central element, as emphasized by Shana and Abulibdeh (2020), whose primary objective in education is to equip every Filipino student with a pragmatic grasp of scientific principles and their relevance to daily life. This approach aims to foster the essential scientific knowledge, skills, attitudes, and values vital for comprehending and tackling societal issues routinely.

However, according to Mullis et al. (2020), the trends in International Mathematics and Science Study (TIMSS) reports that the Philippines only scored 249 in science which is significantly lower than other participating countries in science assessments in the year 2019. Only 13% of all the Filipino students who joined were on the low benchmark which means they had a limited understanding of scientific concepts and foundational science facts, while 87% of the population participating did not even reach the low benchmark.

Hannel and Cuevas (2018) pointed to an outdated approach to information transfer and course discussion that may affect the students' interest and engagement. To improve on this, Bonifacio (2013) suggested that ICT-assisted education encourages students to learn more, provides them with opportunities to work cooperatively with other students, and supports the growth of different intelligences. In the latest study on grade 10 students at Occidental Mindoro State College basic education laboratory found that synchronous modality yields higher improvement in terms of scores than asynchronous mode of learning. Thus, based on the outcomes of the post-test the difference is not noticeable as the mean is interpreted as satisfactory in both modalities. Whereas, they recommend that teaching may involve intervention on one of the groups to measure if the performance of students alleviate, intervention such as simulations and gamifications (Smiderle et al., 2020).

With all the primary issue in Philippine science education is apparent in the notably low TIMSS score, lagging significantly behind global averages. Mullis et al. (2020) highlights the problem is due to an outdated teaching approach, prompting suggestions for remedies. Overall, the problem underscores the necessity for a comprehensive revaluation and innovative measures to bring about meaningful improvement in science education in the Philippines.

Considering these problems experienced by the teachers and students, computer simulations can successfully enhance conventional teaching (Rutten et al., 2012; Nickl et al., 2022). The utilization of interactive simulation-based activities from Physics Education Technology (PhET) can help students better understand science ideas. PhET provides free interactive math and science simulations to enhance learning (Smart,2014). These exercises and simulations allow students to participate in acts that would be impractical in a real-world setting (Bowen & DeLuca, 2015).

The purpose of this study was to examine the effectiveness of PhET Interactive Simulation in improving students' academic performance in science, taking into account the conceptual challenges students have with abstract chemistry concepts and the issues stated by the researchers above (Jones & Roseman, 2013).The introduction of your research paper should explain what the research problem is all about which includes a very brief discussion of what has been done from previous research in relation to your problem and the gap you are

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

trying to address. Likewise, the purpose of why you have conducted your research must be highlighted in this section including the contribution of the article.

MATERIALS AND METHODS

Research Design

This study adopted a quasi-experimental research design. According to Maciejewski (2018), quasi-experimental is the most useful design in situations where conducting a true experiment would be unethical or impractical. In this case, a quasi-experiment allows researchers to investigate the same causal relationship without having to deal with ethical concerns. Although quasi-experiments have lower internal validity than true experiments, they frequently have higher external validity because they can use real-world interventions rather than artificial laboratory settings.

It is considered as an appropriate means in achieving the main objective of the study whereas, control groups are not randomized; the non-equivalence dependent variable in study is more regulated, efficient and targeted. It aids to determine if there is a significant difference in improving students' performance in the particle nature of matter using traditional teaching strategy and interactive simulation.

Research Site

This study was conducted at Occidental Mindoro State College – San Jose Campus, Quirino St, San Jose, Occidental Mindoro during the Academic Year 2022-2023.

Respondents of the Study

The respondents of this study were the Grade 8 students of Occidental Mindoro State College – San Jose Campus for the Academic Year 2022-2023. The researchers chose them for the study because they studied the particle nature of the matter in the third quarter of the mentioned academic year. The researchers used purposive sampling technique in the selection of the respondents.

There were 25 respondents who participated in each setup, with a total of 50 participants selected by the researchers using random sampling.

Research Instrument

The researchers adopted a pre-test and post-test in DepEd Science 8 Self-Learning Module (SLM) of Caraga Region, as the study's primary instrument. The researchers cited three different test types: pre-test, quizzes, and post-test. To identify the students' prior knowledge in relation to the subject that is taught, 15 items for the pre-test were given to Grade 8 students that include test items regarding the particle nature of matter. Addition to that, in order to evaluate their understanding about the particle nature of matter, the Grade 8 students took 15 items for the post-test.

To help students understand the topics better, two quizzes were added after discussing each theme. The first quiz looked at the properties of matter with 15 questions, and the second quiz covered the physical changes of matter, also with 15 questions. This careful approach not

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

only assessed the students thoroughly but also got them actively thinking about what they learned.

A key part of the study's method was using the Physics Educational Technology (PhET), an interactive simulation made by the University of Colorado Boulder (Wieman et al. 2010). This tool, made for teaching physics and chemistry in high school and college, uses visual aids, demonstrations, and drawings to enhance the learning experience.

Data Collection

To assess the students' prior knowledge, a pre-test was administered before the intervention. This pre-test was designed to determine whether both groups possessed similar competency levels regarding the topic. Following the pre-test, the instructional intervention was implemented, with one group receiving conventional teaching and the other being taught using interactive simulations. Both groups were instructed by the same researcher to maintain consistency in the delivery of content.

The topic of study, "The Particle Nature of Matter," was covered uniformly in both groups over two learning sessions. These sessions were conducted sequentially for Grade 8 students at Occidental Mindoro State College-San Jose Campus during the third grading period of the academic year 2022-2023.

After the first learning session, a quiz was administered to both the conventional and interactive simulation groups to evaluate their understanding of the material. The same process was repeated following the second session, with an identical set of tests given to both groups to ensure a fair comparison between the teaching strategies.

Ethical Consideration

Before commencing the study, ethical approval was obtained from the relevant authorities at Occidental Mindoro State College-San Jose Campus. A formal communication letter was signed by the school principal, granting permission to conduct the research on-site. This letter also ensured that the study adhered to all institutional and ethical guidelines.

To protect the rights and welfare of the participants, strict measures were implemented to maintain confidentiality and anonymity. All student data was anonymized, and no identifying information was recorded or disclosed at any stage of the research. Participants and their guardians were informed about the study's purpose, procedures, and potential risks, and informed consent was obtained from both students and their guardians before participation.

Furthermore, the study was designed to minimize any potential harm or disruption to the students' regular educational activities. The researchers ensured that all data collection processes, including pre-tests, interventions, and post-tests, were conducted with respect for the students' time and well-being. Data was securely stored and accessible only to the researchers involved in the study.

Data Analysis

The researchers employed several statistical tools to evaluate the students' performance. Frequency, percentage, mean, and standard deviation were calculated to describe the overall level of student performance. To assess the improvement in scores, the dependent sample t-test was utilized, using the pre-test scores as the baseline for comparison. The paired t-test was conducted to examine the homogeneity of the groups by comparing the pre-test and post-test scores within each group. Additionally, the independent sample t-test was applied to determine any significant differences in performance levels between students taught using the interactive simulation and those taught through conventional teaching methods.

These statistical analyses were integral to determining whether the interactive simulation method led to a significant improvement in student scores compared to conventional teaching strategies.

RESULTS

Students' performance levels before the conventional and interactive simulation teaching interventions

The results indicate that both the conventional method (7.36±2.35) and the interactive simulation (7.96±1.47) largely did not meet expectations. However, the interactive simulation performed slightly better, showing a higher percentage of satisfactory scores (36%) compared to the conventional method (4%). Overall, neither method achieved very satisfactory or outstanding results (Table 1).

Table 1. Students' performance levels before the conventional and interactive simulation teaching interventions.

SCORE	CONVENTIONAL		INTERACTIVE SIMULATION	
	f	%	f	%
0 – 7	13	52.00	12	48.00
8 – 9	11	44.00	4	16.00
10 – 11	1	4.00	9	36.00
12 – 13	0	0.00	0	0.00
14 – 15	0	0.00	0	0.00
Total	25	100.00	25	100.00
Conventional (Mean Score±SD)			7.36±2.35	
Interactive Simulation (Mean Score±SD)			7.96±1.47	

Legend:0-7=Did not Meet Expectations; 8-9=Fairly Satisfactory; 9-10=Satisfactory; 11-12=Very Satisfactory; 13-15=Outstanding

Significant differences in student performance before the conventional and interactive simulation teaching interventions

The t-test results suggest that there is a statistically significant difference between the mean scores of the conventional method (7.36 ± 2.35) and the interactive simulation (7.96 ±

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

1.47), with a t-statistic of 1.087 and a p-value of 0.001. This indicates that there is a significant difference between the two groups.

Table 2. Significant differences in student performance before the conventional and interactive simulation teaching interventions.

VARIABLE	MEAN±SD	T- STATISTIC	P- VALUE
Conventional	7.36±2.35	1.087	0.001
Interactive simulation	7.96±1.47		

Legend: p-value < 0.05 = Significant

Students' performance levels after the conventional teaching strategy and interactive simulation intervention

The results show that the interactive simulation method performed better overall compared to the conventional method. The mean score for the interactive simulation (9.16±1.37) was satisfactory, while the conventional method (8.64±2.13) is fairly satisfactory performance. A higher percentage of participants in the interactive simulation achieved satisfactory or very satisfactory scores compared to those in the conventional method.

Table 3. Students' performance levels after the conventional teaching strategy and interactive simulation intervention.

SCORE	CONVENTIONAL		INTERACTIVE SIMULATION	
	f	%	f	%
0 – 7	6	24.00	5	20.00
8 – 9	13	52.00	9	36.00
10 – 11	4	16.00	7	28.00
12 – 13	2	8.00	4	16.00
14 – 15	0	0.00	0	0.00
Total	25	100.00	25	100.00
Conventional (Mean Score±SD)			8.64±2.13	
Interactive Simulation (Mean Score±SD)			9.16±1.37	

Legend:0-7=Did not Meet Expectations; 8-9=Fairly Satisfactory; 9-10=Satisfactory; 11-12=Very Satisfactory; 13-15=Outstanding

Comparison of pre-test and post-test scores for conventional and interactive simulation methods

The t-test results show a significant improvement in scores from pre-test to post-test for both methods. The conventional method improved from a mean score of 7.36 ± 2.35 to 8.64 ± 2.13, with a t-statistic of 3.669 and a p-value of 0.001, indicating a significant improvement. The interactive simulation also showed a significant improvement with a t-statistic of 3.928 and a p-value of 0.001, though the exact pre-test and post-test means for this method aren't provided. Both methods demonstrated effective outcomes with significant changes in performance.

Table 4. Comparison of pre-test and post-test scores for conventional and interactive simulation methods.

VARIABLE	MEAN±SD	T- STATISTIC	P- VALUE
Conventional			
Pre-test	7.36±2.35	3.669	0.001
Post-test	8.64±2.13		
Interactive simulation			
Pre-test	7.96±1.47	3.928	0.001
Post-test	9.16±1.37		

Legend: p- value < 0.05 = Significant

Significant differences in student performance between conventional and interactive simulation teaching methods

Given the t-statistic of 0.917 and a p-value of 0.364 for the comparison between the conventional teaching strategy and the interactive simulation, the results indicate that there is no statistically significant difference between the two methods.

Table 5. Significant differences in student performance between conventional and interactive simulation teaching methods.

VARIABLE	MEAN±SD	T- STATISTIC	P- VALUE
Conventional	8.64±2.13	0.917	0.364
Interactive simulation	9.16±1.37		

Legend: p-value < 0.05 = Significant

DISCUSSION

The study evaluates the effectiveness of conventional teaching methods versus interactive simulation-based activities in enhancing students' performance in science, specifically focusing on the Particle Nature of Matter. Data from both experimental and control groups were analyzed, with the experimental group using PhET interactive simulations and the control group receiving conventional teaching.

The pre-test results showed that neither teaching method met the expected performance standards. However, students displayed a basic understanding of the topic, likely due to prior exposure to fundamental scientific concepts. This highlights the challenge of assessing students' knowledge and underscores the importance of considering the broader educational context (Cole et al., 2020; Dunton & Co, 2019; Singer et al., 20023).

Initial comparisons of mean scores revealed no significant difference between the two teaching methods, suggesting similar effectiveness in facilitating initial comprehension. This finding aligns with previous research by Raymond et al. (2016), which emphasizes the need for careful group comparison to ensure study validity.

In the post-test, both groups showed improvements, with the interactive simulation group achieving a slightly higher mean score. Despite this difference, the overall performance levels between the two groups were not significantly different. This indicates that while

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

interactive simulations may enhance student engagement, their effectiveness in terms of overall learning outcomes is comparable to that of conventional teaching methods (Hannel & Cuevas, 2018).

The study's findings resonate with previous research on the potential of interactive simulations to deepen conceptual understanding (Banda & Nzabahimana, 2021). However, it is essential to acknowledge that both teaching methods have their strengths and limitations, and their effectiveness may vary depending on factors such as subject matter, student demographics, and instructional context.

While interactive simulations offer promising opportunities for enhancing science education, their integration into teaching practices should be considered alongside conventional methods. By leveraging the strengths of both approaches, educators can create engaging and effective learning environments that cater to the diverse needs of students and promote meaningful learning experiences. Thus, teachers remain a crucial source of knowledge in instructing students and communicating information (Murray, 2021).

This study employed learning sessions, pre-tests, and post-tests as its primary data collection methods to assess student performance, utilizing both conventional teaching and interactive simulation strategies to explore their impact on science learning. As a quasi-experimental study, it examined causal relationships between variables, though it lacked random assignment of participants to different groups, making comparisons challenging due to potential confounding variables such as gender or socioeconomic status. Consequently, while the study sheds light on the effectiveness of teaching strategies, caution is warranted in attributing observed differences solely to the treatments administered.

This study, as a quasi-experimental design, faced limitations including the lack of random assignment to different groups, which introduces potential confounding variables such as gender or socioeconomic status. Additionally, the study's reliance on pre-tests and post-tests may not fully capture the exact effects of the teaching methods on long-term learning and retention. The findings should be interpreted with caution, as the observed differences may be influenced by factors beyond the teaching methods alone.

CONCLUSION

In conclusion, the study found that neither conventional teaching methods nor interactive simulations initially met the expected performance standards. However, both approaches demonstrated comparable effectiveness in improving students' science performance, as evidenced by the t-test results. Both methods resulted in relatively satisfactory performance levels, with the conventional teaching approach showing notable improvement. Although interactive simulations facilitated deeper engagement and enhanced conceptual understanding, they did not produce statistically significant differences compared to conventional methods. Therefore, integrating both strategies thoughtfully is crucial for developing effective learning environments tailored to students' needs.

To optimize educational outcomes, educators should consider blending conventional teaching with interactive simulations to leverage the strengths of both methods. Additionally,

further research should explore long-term impacts of these teaching strategies on student retention and conceptual mastery to provide more comprehensive insights.

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PROSOCIAL BEHAVIOR AND ACADEMIC ACHIEVEMENT OF THE COLLEGE OF TEACHER EDUCATION STUDENTS OF OCCIDENTAL MINDORO STATE COLLEGE

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ABSTRACT

This study examines the relationship between prosocial behaviors and academic achievement among students at the College of Teacher Education, Occidental Mindoro State College-San Jose Campus. The primary objective was to determine whether levels of prosocial behavior correlate significantly with academic performance, and to explore potential differences based on demographic variables such as age, sex, year level, and program. A descriptive research design was employed, involving a sample of 103 students from various education programs for the academic year 2022-2023. Data were collected using the bifactor model of the 16-item new prosociality scale and academic performance records. The analysis revealed that while prosocial actions did not show a significant correlation with academic achievement ($r = 0.158$, $p = 0.111$), prosocial feelings were positively associated with academic performance ($r = 0.267$, $p = 0.006$). Significant differences were observed in prosocial behaviors based on year level and academic program, with first-year students showing lower levels of prosocial actions and feelings compared to their senior peers. Additionally, students in the Bachelor of Elementary Education program exhibited higher levels of prosocial behaviors than those in other programs. No significant differences were found based on age or sex. These findings suggest that while specific prosocial actions may not directly impact academic success, greater emotional sensitivity and empathy are beneficial. The study highlights the importance of fostering prosocial feelings and recommends targeted interventions to enhance student support, promote empathy, and address the unique needs of various student groups. Future research should consider longitudinal studies and include diverse educational contexts to validate and expand upon these findings.

Keywords: *prosocial behavior, prosocial action, prosocial feelings, academic achievement*

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INTRODUCTION

Students exhibit a range of positive behaviors, including helping, sharing, caring, donating, and volunteering, collectively referred to as prosocial behavior (Eisenberg et al., 2013). Prosocial behavior, a complex construct, is foundational to positive mental traits and is essential for fostering healthy personalities and facilitating interpersonal interactions (Gou, 2017). Initially defined in contrast to "antisocial" behavior, prosocial actions are recognized by society as beneficial and counteract disruptive and aggressive tendencies (Kruglanski & Stroebe, 2012).

In educational contexts, the significance of prosocial behavior for academic achievement has been extensively investigated (Latorre-Cosculluela et al., 2022). Numerous correlational studies have demonstrated a strong association between prosocial behavior and academic success across gender and grade levels (Oberle & Schonert-Reichl, 2013). Consistent findings link prosocial tendencies in children to favorable academic outcomes, highlighting its role as a predictor of success and its contribution to positive peer relationships and learning behaviors (Wentzel, 2012). Notably, prosocial behavior continues to be a significant predictor of academic achievement even when controlling for personality traits and intelligence quotient (Gerbino et al., 2017).

Among college students, particularly those transitioning from parental support, prosocial behavior plays a critical role in influencing interpersonal relationships, mental well-being, school satisfaction, and social adjustment (Padilla-Walker & Nielson, 2015). Its importance is heightened within the demanding academic environment of colleges, where academic setbacks can have significant consequences for both individuals and institutions (Senter, 2023). Prosocial behavior acts as a psychological buffer, helping students manage feelings of isolation, anxiety, helplessness, and competitive pressures associated with rigorous academic and social experiences (Lu et al., 2022).

Although previous research has explored the relationship between prosocial behaviors and academic achievement in various contexts, there is a notable gap in understanding this relationship among college students, particularly within the College of Teacher Education (Aytaç & Kartal, 2016). Existing studies have primarily focused on the impact of prosocial behavior on the academic success of adolescents and the factors influencing such behavior (Gupta & Thapilyal, 2015). Given the pivotal role educators play in shaping the future of society, examining the prosocial behaviors of Teacher Education students is of particular importance due to their future responsibilities in nurturing and guiding young minds (Longobardi et al., 2021).

Therefore, this study aims to investigate the relationship between prosocial behaviors and academic achievement among students in the College of Teacher Education at Occidental Mindoro State College-San Jose Campus. Specifically, it seeks to determine whether students' levels of prosocial behavior are significantly correlated with their academic performance. Additionally, the study will explore potential differences in prosocial behavior based on demographic variables such as age, sex, year level, and program, as these factors are theorized to influence students' engagement in prosocial behaviors

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

MATERIALS AND METHODS

Research Design

This study employed a descriptive research design to examine the relationship between prosocial behavior and academic achievement. The design also aimed to explore how individual student profiles might influence this relationship and to identify any significant differences when students were categorized based on demographic factors.

Study Site

The research was conducted at Occidental Mindoro State College-San Jose Campus, located on Rizal Street in San Jose, Occidental Mindoro, during the Academic Year 2022-2023.

Respondents of the Study

Participants were selected from the College of Teacher Education at Occidental Mindoro State College-San Jose Campus for the Academic Year 2022-2023. Out of 424 enrolled students, 103 were chosen as respondents. The sample included 34 students from the Bachelor of Elementary Education (BEEd) program, 42 from the Bachelor of Secondary Education (BSEd) program, 12 from the Bachelor of Technological and Livelihood Education (BTLEd) program, and 15 from the Bachelor of Physical Education (BPEd) program. Proportional stratified random sampling was employed to ensure representation from each program, accounting for the varying sizes of student populations and achieving balanced participation.

Research Instrument

Data were collected using questionnaires. The Bifactor Model of the 16-item New Prosociality Scale, developed by Kanacri et al. (2021), was used to assess the extent of students' prosocial behavior. This scale included 12 items measuring prosocial actions and 4 items assessing prosocial feelings. The reliability coefficients for the prosocial action and prosocial feelings sections were 0.91 and 0.87, respectively, indicating high internal consistency and reliability.

Data Collection

A formal request for permission to conduct the study was submitted to the dean of the College of Teacher Education. Alongside this request, a validated checklist for collecting data on respondent profiles and academic achievements was developed. Data collection was carried out through face-to-face distribution of survey questionnaires by the researchers. The importance of accurate and honest responses was emphasized, and terms in the questionnaire were explained to ensure participants' understanding.

Ethical Considerations

Participants were informed that their participation was voluntary and that they could choose whether to complete the questionnaire. The confidentiality and anonymity of all participants were strictly maintained, with personal details and academic records protected.

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

Data were coded, and access was restricted to the researcher to uphold ethical standards and ensure the integrity of the research.

Data Analysis

Data were organized and analyzed using statistical software, including Microsoft Excel and the Statistical Package for Social Sciences (SPSS). Descriptive statistics such as frequency and percentage were used to present the demographic profile and academic achievement of the respondents. Prosocial behavior was analyzed using mean and standard deviation. Pearson Product Moment Correlation was employed to test the relationship between prosocial behavior and academic achievement. One-Way Analysis of Variance (ANOVA) was used to assess significant differences between prosocial behavior and academic achievement. The hypothesis was tested at a 0.05 level of significance. The Tukey Honestly Significant Difference test was applied to identify the minimum difference required for statistical significance and to pinpoint specific differences among the variables.

RESULTS

The result reveals that the majority of respondents (67.00%) are 20 years old or younger, while 33.00% are 21 years old or older. In terms of gender distribution, 33.00% of respondents are male, and 67.00% are female. Regarding academic year, 32.04% are first-year students, 34.95% are second-year students, and 33.01% are third-year students. For academic programs, 33.01% are enrolled in the Bachelor of Elementary Education (BEEd) program, 40.78% are pursuing a Bachelor of Secondary Education (BSEd), 14.56% are in the Bachelor of Physical Education (BPEd), and 11.65% are studying Bachelor of Technological and Livelihood Education (BTLEd) [Table 1].

Table 1. Demographic profile of the students (n=103).

DEMOGRAPHIC PROFILE	FREQUENCY (F)	PERCENTAGE (%)
Age		
20 years old and below	69	67.00%
21 years old and above	34	33.00%
Sex		
male	34	33.00%
female	69	67.00%
Year Level		
1st year	33	32.04%
2nd year	36	34.95%
3rd year	34	33.01%
Program		
BEEd	34	33.01%
BSEd	42	40.78%
BPEd	15	14.56%
BTLEd	12	11.65%

The data reveals that students exhibit a high level of prosocial behavior (4.13±0.56) and feelings (4.19±0.72). They frequently engage in helping others, sharing resources, and volunteering, and show strong empathy and emotional sensitivity. The highest scores are associated with helping and sensing others' discomfort, indicating robust prosocial tendencies. However, lending money or resources is slightly less frequent but still rated highly (Table 2).

Table 2. Extent of prosocial behavior of the students.

INDICATORS	MEAN	SD
Prosocial Action		
I am pleased to help my friends/schoolmates in their activities	4.22	0.83
I share the things that I have with my friends	4.26	0.82
I try to help others	4.35	0.74
I am available for volunteer activities to help those who are in need	4.02	0.89
I help immediately those who are in need	4.09	0.78
I do what I can to help others avoid getting into trouble	4.18	0.79
I am willing to make my knowledge and abilities available to others	4.26	0.75
I try to console those who are sad	4.07	0.86
I easily lend money or other things	3.55	1.00
I try to be close to and take care of those who are in need	4.17	0.81
I easily share with friends any good opportunity that comes to me	4.20	0.77
I spend time with those friends who feel lonely	4.12	0.83
Overall Mean	4.13	0.56
Prosocial Feelings		
I am emphatic with those who are in need	4.14	0.86
I intensely feel what others feel	4.07	0.87
I easily put myself in the shoes of those who are in discomfort	4.24	0.91
I immediately sense my friends' discomfort even when it is not directly communicated to me	4.31	0.85
Overall Mean	4.19	0.72

Legend: 1.00 - 1.49 - Very Low;1.50 - 2.49 - Low; 2.50 - 3.49 - Moderate; 3.50 - 4.49 - High; 4.50 - 5.00 - Very High

Result shows that the majority of students fall into the "Very Satisfactory" (51.5%) and "Satisfactory" (45.6%) academic levels. The overall mean academic achievement is 89.25±1.88, indicating a generally satisfactory level of performance. (Table 3).

Table 3. Level of academic achievement of the students.

LEVEL OF ACADEMIC ACHIEVEMENT	FREQUENCY (N)	PERCENTAGE (%)
Outstanding (95 - 100)	0	0.0
Very Satisfactory (90 - 94)	53	51.5
Satisfactory (85 - 89)	47	45.6
Fairly Satisfactory (80 - 84)	3	2.9
Unsatisfactory (79 & below)	0	0.0
Mean±SD	89.25±1.88	

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

Result shows that the relationship between prosocial action and academic achievement is not significant (r = 0.158, p = 0.111), indicating no strong correlation. However, there is a significant positive relationship between prosocial feelings and academic achievement (r = 0.267, p = 0.006), suggesting that higher levels of empathy and emotional sensitivity are associated with better academic performance (Table 4).

Table 4. Relationship between prosocial behavior and academic achievement.

PROSOCIAL BEHAVIOR	ACADEMIC ACHIEVEMENT		
	n	r	p-value
Prosocial Action	103	0.158	0.111
Prosocial Feelings	103	0.267	0.006

Legend: p-value < 0.05 – Significant

The analysis reveals significant differences in prosocial behavior and feelings based on year level and program, but not by age group or sex. Specifically, first-year students' prosocial action (3.93±0.43) and prosocial feelings (3.89±0.75) exhibit significantly lower levels of prosocial behavior and feelings compared to their second-year's prosocial action (4.06±0.61) and prosocial feelings (4.13±0.76) and third-year's prosocial action (4.38±0.55) and prosocial feelings (4.54±0.47). Additionally, students in the BEEd program show higher levels of prosocial action (4.29 ± 0.47) and feelings (4.42 ± 0.47) compared to those in other programs. No significant differences were found based on age (p = 0.132 for prosocial action; p = 0.032 for prosocial feelings) or sex (p = 0.354 for prosocial action; p = 0.732 for prosocial feelings) [Table 5].

Table 5. Comparison of prosocial action and prosocial feelings by age group, sex, year level, and program.

VARIABLE	PROSOCIAL ACTION			PROSOCIAL FEELINGS		
	Mean±SD	t	p-value	Mean±SD	t	p-value
Age group						
20 years old and below	4.07±0.56	-1.519	0.132	4.09±0.78	-2.183	0.032
21 years old and above	4.25±0.56			4.38±0.54		
Sex						
Male	4.05±0.59	-0.932	0.354	4.15±0.74	-0.344	0.732
Female	4.16±0.55			4.21±0.71		
Year Level						
1st year	3.93±0.43	6.183	0.003	3.89±0.75	7.748	0.001
2nd year	4.06±0.61			4.13±0.76		
3rd year	4.38±0.55			4.54±0.47		
Program						
BEEd	4.29±0.47			4.42±0.47		
BSEd	4.00±0.56	3.750	0.013	4.17±0.73	4.669	0.004
BPEd	4.35±0.62			4.23±0.88		
BTLEd	3.84±0.60			3.56±0.78		

DISCUSSION

The demographic analysis of this study reveals a significant presence of respondents aged 20 years and below, which aligns with the common trend of students enrolling in tertiary education immediately after completing secondary school. Additionally, the predominance of female respondents reflects the global trend of higher female enrollment in higher education institutions (Johnson et al., 2016). The diverse academic levels represented among respondents, spanning various years of study, and the distribution across programs such as Bachelor of Elementary Education, Bachelor of Secondary Education, Bachelor of Physical Education, and Bachelor of Technological and Livelihood Education highlight the interdisciplinary nature of contemporary universities (Galán-Muros et al., 2023; Fensham et al., 2012).

The prosociality test results for the College of Teacher Education students at Occidental Mindoro State College (San Jose Campus) reveal a high level of prosocial behavior, suggesting a strong sense of empathy and compassion among the student population. This finding is consistent with research emphasizing the importance of these qualities within teacher education programs (Noddings, 2012). The positive responses to empathic feelings reflect students' inclination towards altruistic actions, supported by the correlation between heightened prosocial feelings and a greater willingness to engage in such behaviors (Batson et al., 2014). Furthermore, the respondents demonstrated a satisfactory level of academic achievement.

However, the small percentage of students with a "fairly satisfactory" level of academic achievement underscores the variability in student performance. While intelligence is a key factor influencing academic success, other factors such as academic self-efficacy, cognitive and learning styles, goal orientation, and motivation also play crucial roles (Cassidy, 2012). Recognizing this variability is essential for educational institutions to provide targeted support and resources to students facing academic challenges (Lodge et al., 2018).

The study found a significant and positive correlation between prosocial feelings and academic achievement, suggesting that students with positive social emotions tend to perform better academically. Conversely, no significant correlation was observed between prosocial actions and academic achievement, indicating that while positive social emotions are associated with better academic performance, engaging in specific prosocial actions may not directly impact academic success. This supports the notion that emotional and social factors can influence academic performance (Latorre-Cosculluela et al., 2022).

The results also indicate that prosocial behaviors tend to increase with age during adolescence and early adulthood. Higher prosocial feelings among students aged 21 years and above suggest that as students mature, they develop a greater sense of empathy and concern for others (Eisenberg, 2014). However, no statistically significant difference in prosocial actions was observed between the two age groups, implying similar levels of willingness to engage in prosocial actions across ages.

Although no statistically significant differences were found in the extent of prosocial behavior between male and female students, the results align with Social Role Theory, which posits that women are more likely to engage in caring and nurturing activities (Eagly & Wood,

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

2012). This theory is supported by the slightly higher mean prosocial behavior scores for female students compared to their male counterparts.

Significant differences were observed in prosocial actions and feelings among students at different year levels. Specifically, mean scores for both prosocial actions and feelings increased from first-year to third-year students. This indicates that students in higher year levels exhibit greater willingness to engage in prosocial behaviors and report stronger prosocial emotions compared to those in lower year levels (Poepsel & Schroeder, 2018).

Lastly, significant differences were found in prosocial actions and feelings based on the students' enrolled programs. This suggests that the type of educational program may influence students' engagement in prosocial actions and their expression of prosocial emotions. These findings support Social Identity Theory, which posits that individuals derive a sense of identity and self-esteem from their group memberships, which can shape their behaviors and attitudes, including prosocial behavior (Sotnik et al., 2023).

Despite its contributions, this study has several limitations that should be acknowledged. First, the sample was drawn from a single institution, which may limit the generalizability of the findings to other educational settings or geographical locations. The use of self-reported questionnaires to measure prosocial behavior and academic achievement may also introduce response biases, as participants may provide socially desirable answers or misunderstand some questions. Additionally, the cross-sectional nature of the study prevents the establishment of causal relationships between prosocial behavior and academic achievement. Future research should consider longitudinal designs and include multiple institutions to enhance the generalizability and depth of the findings. Finally, while the study examined various demographic factors, other potential influences on prosocial behavior and academic achievement, such as socio-economic status or family background, were not explored, which could provide additional insights into the observed relationships.

CONCLUSION

The findings of this study provide a detailed profile of students within the College of Teacher Education, revealing a predominantly female student body enrolled in the Bachelor of Secondary Education program. These students exhibit commendable levels of prosocial behavior, including both actions and feelings. Academic performance is generally satisfactory, with a notable positive correlation between prosocial feelings and academic achievement. However, a negative correlation was observed between prosocial actions and academic performance. Age and sex did not significantly influence prosocial behavior, though variations were found across different year levels and academic programs.

These insights suggest the need for tailored interventions within the college. It is recommended that the institution implement targeted programs to further develop prosocial behaviors, provide specialized academic support services, and promote empathy through social-emotional learning initiatives. Customized interventions should address the specific needs of different student groups. Ongoing research is essential to adapt strategies to evolving student demographics and needs, ensuring a responsive and effective educational

environment. Other colleges and academic programs should consider these findings to identify and address the unique needs and behaviors of their student populations.

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SATISFACTION AND COMPETITIVE STATE ANXIETY OF THE SAN JOSE FOOTBALL ACADEMY ATHLETES

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ABSTRACT

This study examines the relationship between athletes' satisfaction and competitive state anxiety among football athletes at the San Jose Football Academy in Occidental Mindoro. Utilizing a descriptive-correlational research design, data were collected from 50 athletes using the Athlete's Satisfaction Scale and the Competitive State Anxiety Scale. The findings indicate high levels of satisfaction among athletes, particularly with coaching and team performance, yet varying levels of competitive state anxiety, with moderate cognitive anxiety and low somatic anxiety observed. Notably, no significant correlation was found between overall athlete satisfaction and competitive state anxiety. However, a significant negative correlation was found between satisfaction with coaching and somatic anxiety ($r = -0.35$, $p < 0.05$), indicating that athletes who were more satisfied with their coaching experienced lower levels of physical anxiety symptoms. The study highlights the complexity of anxiety in sports, emphasizing the need for comprehensive interventions that go beyond enhancing satisfaction to effectively manage competitive state anxiety among athletes. These findings provide valuable insights for coaches and sports psychologists aiming to optimize both athlete satisfaction and performance under competitive conditions.

Keywords: *competitive state anxiety, football players, cognitive anxiety, satisfaction of athletes*

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INTRODUCTION

Recent research has increasingly focused on the complex relationship between athletes' satisfaction and competitive state anxiety. Athletes' performance in competitive sports is influenced by various factors, including physical ability, technical skills, and psychological aspects. Among these psychological factors, athletes' satisfaction and competitive state anxiety are recognized as critical determinants of athletic performance and overall well-being (Weinberg & Gould, 2015).

Athletes' satisfaction is defined as the degree to which athletes find their sporting experiences fulfilling, enjoyable, and aligned with their needs (Riemer & Chelladurai, 1998). Research indicates a positive correlation between higher levels of satisfaction and increased motivation, commitment, and performance (Curran et al., 2015). Satisfaction also enhances team loyalty, support, and interpersonal relationships, which are crucial for team cohesion. Therefore, ensuring athletes' satisfaction with their roles and responsibilities is vital for maintaining their commitment and engagement.

Competitive state anxiety, on the other hand, refers to the temporary emotional state characterized by apprehension, nervousness, and tension experienced before or during competition (Ford et al., 2017). This anxiety often begins as cognitive state anxiety, involving pre-competition worries and mental strain, and can escalate to somatic state anxiety, characterized by physiological arousal, if not managed effectively. Excessive competitive state anxiety can impair athletic performance by affecting concentration and decision-making abilities (Woodman & Hardy, 2003). This anxiety is prevalent among athletes and can negatively impact their performance when they perceive the demands of the sport as exceeding their perceived capabilities.

The San Jose Football Academy, located in San Jose, Occidental Mindoro, is a relatively new organization. Consequently, there is a lack of research on the relationship between athletes' satisfaction and competitive state anxiety within this context. The primary objective of this study is to examine the relationship between athletes' satisfaction and competitive state anxiety among football athletes at the San Jose Football Academy.

MATERIALS AND METHODS

Research Design

This study utilized a quantitative research methodology with a descriptive-correlational design. Correlation studies are used to analyze the statistical relationships between two variables with minimal consideration of confounding factors. This design is well-suited for identifying connections between variables and determining whether changes in one variable are associated with changes in another. The study aimed to investigate the significant relationship between athletes' satisfaction and competitive state anxiety among athletes at the San Jose Football Academy.

Study Site

The research was conducted at the Occidental Mindoro Sports Complex, Bagong Sikat, San Jose, Occidental Mindoro, where the San Jose Football Academy holds its games and practices during the school year 2023-2024.

Respondents of the Study

The study sample consisted of 50 athletes from the San Jose Football Academy. Purposive sampling was employed to select respondents based on their affiliation with the academy, allowing for the investigation of the relationship between athletes' satisfaction and competitive state anxiety among these athletes.

Research Instrument

Data were collected using questionnaires consisting of two main components: the Athlete's Satisfaction Scale and the Competitive State Anxiety Scale. The Athlete's Satisfaction Scale, developed by Caliskan et al. (2016), is a 16-item questionnaire designed to assess satisfaction with performance. The Competitive State Anxiety Scale, developed by Martens et al. (1990), is an 18-item questionnaire used to measure competitive state anxiety. Respondents rated their experiences on a 5-point Likert scale, ranging from 1.00 ("Very low") to 5.00 ("Very high").

Data Collection

Approval for the study was secured from the President of the San Jose Football Academy. Following this, the researchers personally administered survey questionnaires to the football athletes. To ensure a smooth and effective data collection process, the researchers coordinated with the academy to schedule convenient times for questionnaire distribution and collection, aiming to minimize disruption to the athletes' training and competition schedules. Questionnaires were distributed during practice sessions and other designated times, with clear instructions provided to the participants to facilitate accurate and complete responses. To achieve a high response rate, the researchers implemented a tracking system to monitor completed questionnaires and followed up with participants as necessary. After data collection, the completed questionnaires were securely stored, with each assigned a unique identification number to ensure anonymity and accurate data management. The collected data were then prepared for analysis to explore the relationship between athletes' satisfaction and competitive state anxiety.

Data Analysis

Descriptive and inferential statistics were used to analyze the data. Mean values were calculated to describe levels of competitive state anxiety and sports performance among athletes. Pearson product-moment correlation was employed to examine the relationship between athletes' satisfaction and competitive state anxiety. Statistical analyses were conducted using specialized software to ensure accuracy and precision.

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

RESULTS

The data reveals that athletes exhibit high satisfaction with coaching aspects (mean = 4.72) and team performance (mean = 4.52), while satisfaction with teammates is somewhat lower (mean = 4.27). The overall grand mean indicates positive feedback across all areas (mean = 4.58) [Table 1].

Table 1. Level of athlete's satisfaction.

INDICATORS	MEAN
Coach	
1. The manner in which my skills are (were) employed.	4.84
2. The coach's choice of plays during competitions.	4.92
3. The level of considering athlete's idea about the game strategies.	4.46
4. The style used during games	4.62
5. How the coach reads the game and makes (made) adjustments during the competitions.	4.88
6. The level to which my skills are (were) employed.	4.46
7. The degree to which my role on the team matches (matched) my preferred role.	4.68
8. Relationship between the coach and the captain.	4.88
Composite Mean	4.72
Team Performance	
1. The team's win/lose record in the year.	4.34
2. The extent to which the team is meeting (has met) its goals for the year.	4.58
3. Eliminating the failures that can affect the team performance.	4.22
4. The level of taking precautions to reach the team to the highest performance.	4.68
5. The level of giving opportunity to the athlete to show complex performance in games	4.80
Composite Mean	4.52
Teammates	
1. The level of the athlete's cooperation with each other and commitment to each other.	4.60
2. The helping level of the athlete to ease the adaptation of the new joining athlete.	4.34
3. The level of all athletes to hide teammates' weakness or mistakes.	3.88
Composite Mean	4.27
Grand Mean	4.58

Legend: 1.00-1.50 - Very Low; 1.51-2.50 - Low; 2.51-3.50 - Moderate; 3.51-4.50 - High; 4.51-5.00 - Very High

The data reveals that respondents exhibit a moderate level of cognitive anxiety (mean = 3.72) and a low level of somatic anxiety (mean = 2.65). The overall grand mean indicates a moderate level of competitive state anxiety (mean = 3.19) [Table 2].

Table 2. Level of competitive state anxiety of the respondents.

INDICATORS	MEAN
Cognitive Anxiety	
1. I am concerned about this performance.	4.28
2. I have self-doubts	3.62
3. I am concerned that I may not do as well in this competition as I could do.	3.84
4. I am concerned about losing or doing poorly.	4.12
5. I am worried about performing well.	3.34
6. I'm concerned about performing poorly.	3.82
7. I'm worried about reaching my goal.	3.38
8. I'm concerned that others will be disappointed with my performance.	3.68
9. I'm concerned I won't be able to focus.	3.44
Composite mean	3.72
Somatic Anxiety	
1. I feel nervous.	3.38
2. I feel scared.	2.48
3. My body feels tense.	3.18
4. I feel tense in my stomach.	2.26
5. My body feels light.	2.98
6. My heart racing	2.82
7. I feel my stomach sinking.	2.00
8. My hands are clammy.	2.50
9. My body feels tight.	2.26
Composite Mean	2.65
Grand Mean	3.19

Legend: 1.00-1.50 - Very Low; 1.51-2.50 - Low; 2.51-3.50 - Moderate; 3.51-4.50 - High; 4.51-5.00 - Very High

Table 3 revealed that there is no significant association between the level of athletes' satisfaction and the level of overall competitive state anxiety ($r = -0.096$, $p = 0.505$). However, a significant negative correlation was found between coach satisfaction and somatic anxiety ($r = -0.342$, $p = 0.015$). The correlation between coach satisfaction and cognitive anxiety was not significant ($r = 0.141$, $p = 0.329$), nor were the correlations between team performance satisfaction and cognitive anxiety ($r = -0.162$, $p = 0.262$) and teammates satisfaction and cognitive anxiety ($r = -0.149$, $p = 0.301$). Similarly, the correlations between team performance satisfaction and somatic anxiety ($r = 0.027$, $p = 0.851$) and teammates satisfaction and somatic anxiety ($r = 0.272$, $p = 0.056$) were not significant. While no significant relationship was found between athletes' overall satisfaction and competitive state anxiety, the significant association observed between coach satisfaction and somatic anxiety suggests that satisfaction with the coach plays a key role in reducing somatic anxiety among athletes (Table 3).

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

Table 3. Correlation between the level of athlete's satisfaction, and competitive state anxiety of the respondents.

ATHLETE'S SATISFACTION	COMPETITIVE STATE ANXIETY					
	Cognitive Anxiety		Somatic Anxiety		Overall Competitive State Anxiety	
	r	p-value	r	p-value	r	p-value
Coach	0.141	0.329	-0.342	0.015		
Team performance	-0.162	0.262	0.027	0.851	-0.096	0.505
Teammates	-0.149	0.301	0.272	0.056		

Legend: p-value <0.05 – Significant

DISCUSSION

The findings of this study provide valuable insights into the relationship between athletes' satisfaction and competitive state anxiety. The data indicate that athletes at the San Jose Football Academy generally express high levels of satisfaction across various domains, including their coaches, team performance, and relationships with teammates. This overall satisfaction reflects positive perceptions of the coaching staff's guidance, confidence in the team's abilities, and a strong sense of camaraderie and cooperation within the team. Such high satisfaction levels highlight the academy's dedication to promoting both individual and team excellence.

However, the study also reveals varying levels of competitive state anxiety among athletes, particularly in the cognitive and somatic dimensions. Athletes report elevated cognitive state anxiety, characterized by significant concerns about their performance, which suggests a high degree of mental stress and investment in competition. Additionally, there is moderate apprehension regarding their ability to perform well, potentially indicating some lack of confidence. Overall, athletes experience considerable cognitive anxiety during competitions (Gabrys & Wontorczyk, 2023). In terms of somatic anxiety, athletes report moderate levels of physiological symptoms, such as tension, though sensations like a "sinking feeling" in the stomach are less frequently reported. This indicates a moderate level of competitive state anxiety, with athletes experiencing noticeable but not overwhelming physical and mental anxiety during competitions (Panza et al., 2020).

The most critical finding of the study is the lack of a significant correlation between athletes' satisfaction levels and their experience of competitive state anxiety. This suggests that even though athletes may report high satisfaction with their coaches, team, and overall experience, this does not necessarily result in reduced anxiety levels during competition. These findings are consistent with the work of Mottaghi et al. (2013), which similarly found that satisfaction with coaching did not significantly impact overall anxiety levels among athletes. This underscores the complexity of anxiety in sports, which can be influenced by multiple factors beyond satisfaction, such as individual differences, performance expectations, and situational pressures.

Practically, these findings suggest that interventions aimed solely at enhancing athlete satisfaction may not be sufficient to reduce anxiety levels during competition. Coaches,

trainers, and sports psychologists should consider adopting a more comprehensive approach that addresses the multifaceted nature of anxiety in sports (Martín-Rodríguez et al., 2024). Techniques such as cognitive-behavioral strategies, relaxation training, and performance visualization may be more effective in helping athletes manage anxiety (Rowland et al., 2021; Tossici et al., 2024).

While this study provides valuable insights into the relationship between athletes' satisfaction and competitive state anxiety, it is important to acknowledge certain limitations. First, the study's sample size was relatively small, consisting of only 50 athletes from a single football academy, which may limit the generalizability of the findings to other sports or larger populations. Additionally, the use of self-reported questionnaires introduces the potential for response bias, as athletes may have answered in socially desirable ways rather than providing completely honest responses. The cross-sectional nature of the study also limits the ability to draw conclusions about causality; the observed relationships between variables are correlational and do not establish direct cause-and-effect dynamics. Finally, the study did not account for potential confounding variables, such as individual differences in personality, prior experience with anxiety, or varying levels of competition intensity, which could have influenced the results. Future research should consider addressing these limitations by incorporating larger, more diverse samples, longitudinal designs, and controlling for additional factors that may impact the relationship between satisfaction and competitive state anxiety.

CONCLUSION

This study has highlighted that athletes at the San Jose Football Academy generally experience high levels of satisfaction in various aspects, including coaching, team performance, and relationships with teammates. However, this satisfaction does not appear to significantly reduce competitive state anxiety, which remains prevalent among the athletes, particularly in cognitive and somatic forms. These findings suggest that while satisfaction is an important factor for overall well-being and team cohesion, it may not be sufficient on its own to address the complex issue of competitive state anxiety.

Given these insights, it is recommended that the San Jose Football Academy and similar organizations adopt a more holistic approach to athlete development. This approach should include not only efforts to maintain high levels of satisfaction, but also targeted interventions aimed at managing anxiety. Techniques such as cognitive-behavioral therapy, mindfulness training, and relaxation exercises could be integrated into the training programs to help athletes better cope with the psychological pressures of competition. Additionally, individualized support should be offered to athletes who exhibit higher levels of anxiety, addressing their specific needs and helping them build confidence in their abilities. Future research should also explore other potential factors influencing competitive state anxiety, such as personality traits and external pressures, to develop more comprehensive strategies for enhancing both mental and physical performance in sports.

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JOB SATISFACTION AND INTENTION TO STAY AMONG HEALTH WORKERS IN SELECTED GOVERNMENT HOSPITALS IN OCCIDENTAL MINDORO

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ABSTRACT

This study was conducted to determine the relationship between the job satisfaction and intention to stay among health workers in selected public hospital in Occidental Mindoro. A total of 227 health workers participated in the study. The data gathered were analyzed using descriptive statistics such as mean and Spearman rho rank correlation coefficient. The demographic profile of the respondents exhibited majority of the women, aged between 30-39, with college degree, married, earning between P22, 001–P43,000, had been working for less than 5 years, working 12-13 hours and have 6 hours of sleep. The findings showed that the overall level of job satisfaction among health workers are "satisfied" and among its components in MSQ. The results indicated a very low intention to leave and moderately intention to stay. There is a negative correlation between the level of job satisfaction and intention to stay among the health workers in selected public hospital in Occidental Mindoro.

Keywords: *job satisfaction, intention-to-stay, health workers, government hospitals*

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INTRODUCTION

The shortage of health workers has been a major problem worldwide today because of its potential effects on healthcare. The attempt to fill the require positions leads to increase competition in the recruitment and retention of health workers globally. Considering this increase global competition, it is important to determine and understand the factors that influence recruitment and retention of the healthcare workforce. It is especially crucial for a source country like the Philippines (Legaspi, 2019). Health workers play an important role in protecting others, alleviating suffering, and saving lives. Unless medical staffs are safe, no country, hospital, or clinic can guarantee the safety of patients. Infections among health workers can lead to layoffs when they are most needed. This health crisis highlights the extent to which protecting health workers is the key to ensuring the normal functioning of health care systems and society (Pappa et al., 2020). These are well known stressors of work context that can be identify as psychosocial factors of work. Therefore, studies have been report the presence of psychiatric symptoms in a population without mental illnesses, such as depression, anxiety, post-traumatic stress and aggravation in those suffering from mental illness. It is evident that poor working environment has serious psychosocial effects on health workers as they are directly link to the working conditions (Carbajal, 2020).

Base on the 2015 census of population, there are nearly half a million or to be exact 488,800 health professionals in the Philippines. It is estimated that less than one percent of all employed Filipinos living in the Philippines are working as health professionals. Among all health professionals in the country, the majority are nurses (59%), about 1 in 9 is medical doctors (12%), and 1 in 10, a midwife (11%). In addition, Philippine hospitals are understaffed. According to a national survey released in 2018, three out of four local administrative units lack health care workers. The average ratio of health workers to the population in the Philippines is 1 in 5,000. However, in geographically isolated areas it is between 1 and 20,000 (University of the Philippines Population Institute and Demographic Research and Development Foundation, Inc., 2020).

Job satisfaction is a recognized factor that influences the decision of health workers to stay in their current workplace (Al Hamdan et al., 2017). Structural factors contributing to burnout among Filipino nurses, such as low salaries, delayed benefits, understaffing, overwork, and job insecurity (Alibudbud, 2023). However, is this generalization applicable to Filipino nurses who were reportedly satisfied with their job but still sought opportunities elsewhere and especially abroad? It has also been suggested to look into and compare the job satisfaction and turnover intention of public and private hospitals (Legaspi, 2019). Health workers in the Philippines are struggling to care for patients or quit this line of a profession that results in understaff (Alibudbud, 2022).

Up to the knowledge of the researcher, there is no recorded study done in in selected public hospital in Occidental Mindoro about the level of job satisfaction and intention to stay of health professionals. Therefore, conducting this study will be able to give evidence on the pooled prevalence as well as major factors of job satisfaction among health professionals. The aim of this systematic review shall determine the pooled prevalence of job satisfaction of health professionals in public facilities. Furthermore, the findings of this study will be used as

input to policymakers in the job satisfaction of health professionals in in selected public hospital in Occidental Mindoro.

MATERIALS AND METHODS

Research Design

A cross-sectional survey design was employed in this investigation. The researchers collected the data needed for the study at one point in time to give a snapshot picture (Connelly, 2016) of the job satisfaction and intention to stay of health workers.

Study Site

This study was conducted in selected public hospitals in Occidental Mindoro such as San Jose District Hospital, Occidental Mindoro Provincial Hospital, and San Sebastian District Hospital. According to the list of regulated health facilities in the region of MIMAROPA as provided by the DOH Center for Health Development, there are only three (3) government-owned, all classified as level 1 hospitals in Occidental Mindoro. Only one (1) of which is located in Sablayan, namely the San Sebastian District Hospital. The other two are situated in Mamburao and San Jose which are the Occidental Mindoro Provincial Hospital and the San Jose District Hospital, respectively. Currently, the only access of the residents to basic healthcare services are those provided by their sole district hospital - a level 1 hospital - capable only of accommodating patients who need minor assistance and supervision and not those requiring critical care for there are no intensive care units (ICU) under this type aside from clinical laboratories, ambulance, and blood service facilities. Residents whose medical concerns require critical care and serious attention are left with no other choice but to travel from far- flung areas to hospitals located in the developed towns which are approximately 70 to 80 kilometers or four to five hours away from their place of origin.

Respondents of the Study

The respondents of this study were the 227 health workers of identified government hospital in Occidental Mindoro. The researchers used Raosoft formula in determining the number of sample through conveniently available pool of respondents. It is the most commonly used sampling technique as it is incredibly prompt, uncomplicated, and economical. In this case, all health workers that are readily available are part of the sample.

Research Instrument

The demographic questionnaire was used to generate the information needed to the study. The researchers used the demographic profile and Minnesota Satisfaction Questionnaire – Short Form (Weiss et al., 1967). The Minnesota Satisfaction Questionnaire (MSQ) is designed to measure an employee's satisfaction with his or her job. The MSQ provides more specific information on the aspects of a job that an individual find rewarding than do more general measures of job satisfaction. The MSQ is also useful in exploring client vocational needs, in counseling follow-up studies, and in generating information about the reinforces in jobs. The MSQ can be administered to groups or to individuals, and is appropriate for use with individuals who can read at the fifth grade level or higher. All three forms are gender neutral. Instructions for the administration of the MSQ are given in the booklet. This form consists of 20 items from the long-form MSQ that best represent each of the 20 scales. Factor analysis of the 20 items resulted in two factors--Intrinsic

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and extrinsic satisfaction. Scores on these two factors plus a general satisfaction score may be obtained. The short-form MSQ uses the same response categories used in the 1977 long form. Normative data for the three scales for six selected occupations are in the manual. The MSQ employs a five-point Likert scale with responses ranging from (1) "very dissatisfied," (2) "dissatisfied," (3) "neutral," (4) "satisfied," to (5) "very satisfied." MSQ-SF has its internal consistency of a=0.77.

Data Collection

Data for this study were collected from May to October 2023. Permission was first obtained from the Human Resource Office of a selected public hospital in Occidental Mindoro to access employee records and numbers. Once approved, the researchers proceeded with recruitment and personally distributed self-administered questionnaires. Informed consent was obtained, and participants were reminded they could contact the researcher for any questions regarding the study. Respondents were allowed to take the questionnaires home and were asked to return them within seven days. Extensions were granted upon request. Contact details were provided for retrieval coordination, and a maximum of one month was allotted for data collection at each institution.

Ethical Consideration

Participants were informed of the study's purpose and their right to refuse participation, with assurances of confidentiality through the use of unique codes. No harm or mistreatment occurred during the study. Informed consent was obtained, allowing the distribution of online questionnaires based on respondents' availability, and participation was voluntary with the option to withdraw at any time.

Data Analysis

Data collected were entered in Microsoft Excel and were analyzed with SPSS for descriptive and inferential statistics. Descriptive statistics used included percentages and frequencies for demographic profile. Weighted mean was computed for job satisfaction and intention to leave/stay of the respondents. Spearman rho rank correlation coefficient was utilized to test the relationships between the samples' job satisfaction to and intention to leave/stay of the respondents. Fisher's t test was utilized to determine the significance of correlations. A p value of equal to or less than .05 was considered statistically significant.

RESULTS

Profile of the Health Workers in a Public Hospital in Occidental Mindoro

Out of 227, the health workers responded in the study mostly aged 30-39 (40.5%), the workforce is largely female (73.6%) and diverse in education, with many college graduates (54.2%). Most are married (61.2%) and earn between P22,001 - P43,000 (53.7%), suggesting a middle-income range. Many have 5 years or less experience (45.8%), indicating a relatively young or high turnover workforce. Most work in regular wards (47.1%), focusing on general patient care. They typically work long hours (67.4% for 12-13 hours), possibly indicating a demanding environment. Concerningly, a significant portion sleep ≤6 hours daily (51.9%), potentially affecting well-being (Table 1).

Table 1. Profile of the respondents (n = 227).

PROFILE	FREQUENCY	PERCENTAGE
Age		
21 – 29 years old	46	20.3
30 – 39 years old	92	40.5
40 – 49 years old	49	21.6
50 – 59 years old	26	11.5
60 – 69 years old	14	6.2
Sex		
Male	60	26.4
Female	167	73.6
Highest Educational Attainment		
Graduate school	4	1.8
Professional degree holder	36	15.8
College graduate	123	54.2
Vocational graduate	63	27.8
High school graduate	1	0.4
Marital Status		
Married	139	61.2
Single	85	37.4
Widowed	3	1.3
Average Monthly Salary		
P10,000 and below	52	22.9
P10,001 - P22,000	36	15.9
P22,001 - P43,000	122	53.7
P43,001 - P76,000	17	7.5
Length of Service		
5 years or less	104	45.8
6 - 9 years	64	28.2
10 - 14 years	27	11.5
15 - 19 years	6	2.6
20 - 24 years	2	0.9
25 - 29 years	11	4.8
30 years and above	14	6.2
Area of Assignment		
Emergency room	46	20.3
Operating room	35	15.4
Outpatient department	39	17.2
Regular ward	107	47.1
Average Work Duration		
8 – 9 hours	42	18.6
10 – 11 hours	0	0
12 – 13 hours	153	67.4
> 13 hours	32	14

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

Daily Sleep Duration		
≤4 hours	19	8.4
5 hours	18	7.9
6 hours	99	43.6
7 hours	58	25.6
≥ 8 hours	33	14.5

Level of Job Satisfaction of the Health Workers in Selected Government Hospitals in Occidental Mindoro

The results shows that the respondents are satisfied (mean = 3.55 ± 0.804) in their workplace. Further, in each component MSQ, it shows that the respondents are intrinsically (mean = 3.56 ± 0.832), extrinsically (mean = 3.54 ± 0.839), and generally (mean = 3.53± 0.961) satisfied with their workplace (Table 2).

Table 2. Level of job satisfaction of the health workers in selected government hospitals in Occidental Mindoro.

JOB SATISFACTION		MEAN	SD
Intrinsic Factors			
1. Being able to keep busy all the time.		3.56	0.96
2. Chance to work alone on the job.		3.63	0.98
3. Having he chance to do different things from time to time.		3.46	1.20
4. Chance to be "somebody" in the community.		3.44	1.22
5. Being able to do things that don't go against my conscience.		3.46	1.05
6. The way my job provides for steady employment.		3.50	1.20
7. Chance to do things for other people.		3.87	1.08
8. Chance to tell people what to do.		3.52	1.22
9. Chance to do something that makes use of my abilities.		3.61	1.21
10. Freedom to use my own judgment.		3.51	1.09
11. Chance to try my own methods of doing the job.		3.53	1.09
12. The feeling of accomplishment I get from the job.		3.63	1.17
	Weighted mean	3.56	0.83
Extrinsic Factors			
1. The way my boss handles his/her workers.		3.61	1.03
2. Competence of my supervisor in making decisions.		3.70	1.01
3. The way company policies are put into practice.		3.59	0.99
4. My pay and the amount of work I do.		3.56	1.14
5. Chances for advancement on this job.		3.41	1.11
6. The praise I get for doing a good job.		3.36	1.11
	Weighted mean	3.54	0.84
General Satisfaction			
1. The working conditions		3.56	1.06
2. The way my co-workers get along with each other		3.51	1.12
	Weighted mean	3.53	0.961
OVERALL SATISFACTION		3.54	0.804

Legend: very satisfied: 4.2-5.00; satisfied: 3.4-4.19; neutral: 2.6-3.39; dissatisfied: 1.8-2.59; very dissatisfied: 1.0-1.79.

Degree of Intention to Stay in their Job of the Health Workers in Selected Government Hospitals in Occidental Mindoro

The result shows that the respondents have a very low intention to leave (mean = 1.75 ± 0.804) and a moderate intention to stay (mean = 3.07 ± 0.694). However, the respondents are uncertain (mean = 2.00 ± 1.16) to stay in their workplace when there is any circumstance or chance to happen (Table 3).

Table 3. Degree of intention to stay in their job of the health workers in selected government hospitals in Occidental Mindoro.

INTENTION TO LEAVE/STAY	MEAN	SD
Intention to Leave		
1. I would like to leave my present employer	1.72	0.912
2. I plan to leave my present employer as soon as possible	1.78	0.925
Overall Intention to Leave	1.75	0.859
Intention to Stay		
1. I plan to stay with my employer as long as possible	4.14	1.15
2. Under no circumstances will I voluntarily leave my present employer	2.00	1.16
Overall Intention to Stay	3.07	0.694

Legend: highly intended: 4.2-5.00; moderately intended: 3.4-4.19; uncertain: 2.6-3.39; low intended: 1.8-2.59; very low intended: 1.0-1.79.

Relationship Between the Level of Job Satisfaction of Health and the Degree of Intention to Stay in Selected Government Hospitals in Occidental Mindoro

Result shows that there is a weak negative correlation between job satisfaction and intention to leave ($r = -0.25$, $p > 0.01$) of the respondents in their current workplace. It means that if the respondents are satisfied with their workplace, they do not have the intent to leave their workplace. On the other hand, job satisfaction is not correlated to their intention to stay (Table 4).

Table 4. Correlation between job satisfaction and intention to stay.

Job Satisfaction	Intention to Leave		Intention to Stay	
	r	p value	r	p value
Intrinsic Factor	-0.22	0.001	0.00	0.998
Extrinsic Factor	-0.27	>0.001	0.14	0.828
General	-0.20	0.002	0.009	0.891
Overall Satisfaction	-0.25	>0.001	0.008	0.904

DISCUSSION

The study examined various demographics of healthcare workers, revealing a predominant age group of 30-39, a majority of females, and a diverse educational background, with many being college graduates. Most were married and earned middle-income salaries. A significant proportion had relatively short work experience, possibly indicating a young

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

workforce or high turnover. They mainly worked in regular wards, often enduring long shifts, with a concerning portion reporting insufficient sleep. Smith et al. (2023) conducted a survey among healthcare workers to gauge their job satisfaction levels and the contributing factors. The findings revealed a satisfaction among healthcare workers with both intrinsic and extrinsic factors, echoing the conclusions drawn by Geleto et al. (2015), who studied health workers in selected government hospitals in the Harari region of eastern Ethiopia and found a general satisfaction with their jobs. The overall high job satisfaction among healthcare providers, including nurses and physicians, was notably linked to factors such as salary, working environment, and workload.

Overall, they expressed satisfaction with their workplace, both intrinsically and extrinsically. While they showed low intent to leave, there was uncertainty about staying if circumstances changed. Interestingly, job satisfaction was weakly negatively correlated with the intention to leave, suggesting that higher satisfaction reduces the desire to leave, though it doesn't influence the intention to stay.

These results align with Olaniyan et al.'s (2019) study, which indicated that health workers were disinclined to leave their current employers, and with Kim and Cho's (2016) findings, suggesting a tendency among healthcare staff to remain with their present employers rather than seeking better opportunities elsewhere. Interestingly, our study also revealed a degree of ambivalence among health workers regarding staying in their current workplace when presented with alternative opportunities. This sentiment is mirrored in the research of Sapar and Oducado (2021) in mixed government and public hospitals, where a significant proportion of healthcare workers, particularly nurses, expressed uncertainty about their commitment to their current workplace. Similarly, Filipino nurses in a study conducted in the province of Samar (Labrague et al., 2017) demonstrated indecision about staying or leaving their organizations.

However, while Kim et al. (2021) found that healthcare providers in Zambia were generally satisfied with their jobs, they exhibited a lower intention to stay despite a comparatively better health system than Uganda. This contrasts with the findings of Babalola and Awasum (2021) in selected hospitals in Kenya, where healthcare workers expressed an intention to continue working in their current positions due to job satisfaction. These varying perspectives underscore the complex interplay of factors influencing healthcare workers' job satisfaction and retention across different contexts.

This research has several limitations. Firstly, it was conducted exclusively among nurses and midwives in three mid-level hospitals in the Philippines. Therefore, caution should be exercised when applying the findings broadly. Furthermore, our study's cross-sectional design prevents us from establishing causal relationships between variables or tracking changes over time, potentially leading to biased results. The ongoing pandemic may also influence nurses' job satisfaction and turnover intentions differently. Additionally, relying on self-administered questionnaires introduces the possibility of self-reporting bias and social desirability. Despite these limitations, our research has contributed to a deeper understanding of nurses' job satisfaction and commitment to remaining in local healthcare settings.

CONCLUSION

The study found that healthcare workers expressed overall satisfaction with their workplace, including intrinsic and extrinsic factors. Despite this satisfaction, there was a degree of uncertainty about staying if circumstances changed, indicating a need for further exploration into factors influencing retention. Interestingly, while job satisfaction was weakly negatively correlated with the intention to leave, it did not significantly impact the intention to stay. Given the positive overall satisfaction and specific components of workplace satisfaction, continue efforts to enhance workplace conditions. Regularly assess and address intrinsic and extrinsic factors to sustain a positive work environment.

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RESEARCH ARTICLE

MATERNAL SELF-EFFICACY IN INFANT CARE AMONG FIRST-TIME MOTHERS IN MANSALAY, ORIENTAL MINDORO

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ABSTRACT

Becoming a first-time mother is a significant transition, and maternal self-efficacy (MSE) is regarded as a key predictor of maternal functioning. This study assesses the level of maternal self-efficacy in infant care among first-time mothers in Mansalay, Oriental Mindoro.

A descriptive-correlational research design was employed. The study involved a sample of 227 first-time mothers from Mansalay, Oriental Mindoro. Data were collected through questionnaire interviews.

The first-time mothers responded in this study were confident in taking care of their infant. It showed that the respondents were confident in doing care taking procedures and situational beliefs while moderately confident in identifying evoking behaviors of the infant and reading behaviors or signaling from their infant.

It has been found that demographic profile of the respondents such as maternal age, educational attainment, marital status, income class, sex of the child, age of the child, father currently living with the child and partner's employment status have no significant relationship with MSE.This means that majority of the respondents are confident in infant care and confirm the importance of MSE in the transition to motherhood, the complexity of different factors that may have an impact as first-time mothers.

Keywords: *maternal self-efficacy, infant care, motherhood, first-time mothers*

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INTRODUCTION

Motherhood is considered to be a significant phase in a woman's life. Motherhood brings increased responsibilities and an even bigger challenge to acquire the necessary parenting knowledge and skills upon acceptance of the maternal role. Despite the positive aspects, it is found that many first-time mothers or primiparous women find it difficult to manage motherhood with the tasks of taking care of the baby while juggling work or study (Watts et al., 2015). Owing to the lack of previous experience, first-time mothers usually have more difficulties adjusting to the physical, social, emotional, and psychological challenges of motherhood (Leahy-Warren & McCarthy, 2011). One important aspect that plays a role in the development of parenting behaviors is maternal self-efficacy. Social learning theorist Albert Bandura (1997) originally defined self-efficacy as a person's belief in one's capacities to perform specific tasks toward the attainment of goals. He further discussed that since individuals can understand their potential, self-efficacy can be a reliable predictor of a person's motivation to accomplish performance tasks or goals in many contexts.

Various studies also indicated other significant factors affecting the level of self-efficacy among mothers. Shorey et al. (2014) indicated in their study among Singaporean primiparas in the early postnatal period that the main predictors of maternal self-efficacy include age, family income, and social support. A cross-sectional study conducted in South Korea found that working mothers who serve as primary caregivers tend to have higher maternal self-efficacy than those who do not and that social support from spouses contributes significantly to a higher level of maternal self-efficacy among working mothers (Song et al., 2022). Lara et al. (2017) also assert that adolescent mothers tend to have a lower level of maternal self-efficacy, which leads to a lack of confidence in fulfilling their maternal responsibilities.

The Municipality of Mansalay in the Province of Oriental Mindoro is a second-class municipality with around 60,000 inhabitants located in the southernmost portion of the province. The Rural Health Unit (RHU) recorded a total of 261 first-time mothers in 2021 and 234 in 2022, with the majority of first-time mothers from the barangays of B. del Mundo, Poblacion, and Sta. Teresita. The local health office identified the youngest age for a first-time mother to be 14 years old and the oldest to be 42 years old.

The purpose of this study is to determine the level of maternal self-efficacy in infant care of first-time mothers in the identified municipality. The lack of local studies has posed the need to conduct a study to provide sample information for understanding the different factors that relate to maternal self-efficacy and early infant care. In particular, the study will aid the local health office in identifying programs and interventions that can improve pre-and post-natal care among first-time mothers being catered to by the local health office.

MATERIALS AND METHODS

Research Design

The researcher employed a descriptive-correlational research design, which is suited for achieving the study's purpose and objectives. Descriptive research is research that aims to provide a glimpse of the existing situation. A correlational study seeks to uncover correlations

between variables and to forecast future events based on current information. This study includes the assessment of first-time mothers to determine the level of maternal self-efficacy in infant care in terms of care-taking procedures, evoking behaviors, reading behaviors, or signaling, and situational beliefs about related variables.

Study Site

The study was conducted in the sixteen barangays in Mansalay, Oriental Mindoro, specifically at Brgy. B. del Mundo, Poblacion, Cabalwa, Sta. Brigida, Roma, Wasig, Don Pedro, Bonbon, Maliwanag, Manaul, Balugo, Budburan, Villa Celestial, Sta. Maria, Waygan, and Sta. Teresita.

Respondents of the Study

The population proportion will be used in the study to determine the sample size. Considering the percentage of first-time mothers in the earlier research (Azmoude et al., 2015). With anticipated percentage freauency of 82%, with a 95% confidence interval, a 5% margin of error, a design effect of 1, a sample size of 227 first-time mothers is necessary for this study. Mothers having postpartum check-ups, EPI check-ups and house-to-house interview was approached through convenience.

Research Instrument

A variety of background information, including maternal age, civil status, income level, educational attainment, occupation, infant gender, infant age, partners' occupation and if father is currently living with the child was gathered to determine the sample's representativeness. Maternal age is measured in years and is defined as the mother's age at the time of the late pregnancy stage. Unmarried (single or cohabiting) and married statuses will be noted in the civil register. The 2017 Philippine income cluster was used to measure income levels (Albert et al., 2018). The mother's level of education was referred to as her educational achievement (never been to school, elementary level, elementary graduate, high school level, high school graduate, vocational, college level, college graduate).

The attitudes of the mothers about their level of self-efficacy in caring for their children was assessed using the PMP S-E tool (Barnes & Adamson-Macedo, 2007). The focus of this measure is on 20 characteristics that are divided into four subscales: caretaking procedures, evoking behaviors, reading behaviors or signaling, and situational beliefs. The respondent rates each aspect on a five-point Likert scale, with 1 representing strong disagreement and 5 representing strong agreement. As a result, the total score might range from 20 to 80, with a Cronbach's alpha of 0.78 indicating that a higher score indicates a higher degree of MPSE (Aliabadi et al., 2013).

Data Collection

A letter of request was given to the Municipal Health Officer and barangay captains to seek their approval prior to the conduct of the study. After securing approval, the letter of request was also presented to the rural health midwives from the three barangays where the

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

study will be conducted. Through a survey interview with a questionnaire, data was collected. During scheduled postpartum, expanded program on immunization clinic visits in the barangay health facility and house-to-house visit, the postpartum moms was approached. A questionnaire designed in the local dialect was used to collect information during the structured interview. This allowed participants who were unable to read to respond freely and completely comprehend the questions.

Ethical Consideration

Participation in the study was voluntary, and the mothers were informed that they had the option of answering the questionnaire or not. The research participants' complete anonymity was respected. Before conducting the interview, the researchers obtained informed consent from the mothers. Participants were informed of the study's objectives and methodology. The researcher carefully reads the informed consent form to ensure that the respondent understands the study's purpose, the length of participation, and the risks and benefits of participating. The first-time mothers who agreed to participate in the study filled out a formal consent form. The researcher was open to any clarifications that would help people understand the statement in the research instrument. The questionnaire was coded and listed on a separate sheet; the code from the list was then matched after data collection. Specific information from the questionnaires could not be linked to specific people. Access to the data was restricted to the researcher.

Data Analysis

The demographic profile was computed using frequency and percentages. Contrary to Bandura's (1977) previous advice, the maternal self-efficacy scores for each item were analyzed using a weighted mean and classified into one of the following groups: highly confident (4.20-5.00), confident (3.40-4.19), moderately confident (2.60-3.39), not confident (1.80-2.59), and highly not confident (1.00-1.79). Kendall's tau was used in the study to analyze four subscales of maternal parenting self-efficacy, with self-efficacy being the outcome variable and sociodemographic and associated variables serving as explanatory variables. A correlational analysis was conducted to determine the relationship between sociodemographic characteristics and maternal parenting self-efficacy, with .05 level of significance.

RESULTS

Demographic Profile of First-Time Mothers

Most of the study's respondents are between the ages of 20 to 29 (42.3%) and have mostly reached high school (26.4%). Additionally, it shows that most of the respondents (42.3%) were self-employed, 45.4% were living together or cohabiting, had a partner who had no work (31.7%). And belonged to the middle-income class (42.7%). More than half of the respondents have a female child (54.6%), are aged 7 months above (79.3%), and are currently living with their father (65.6%). The data shows that most of the respondents were in early adulthood (Table 1).

Table 1. Demographic profile of the respondents (n=227)

PROFILE	FREQUENCY	PERCENTAGE
Maternal Age (years)		
≤ 19	20	8.8
20-29	96	42.3
30-34	79	34.8
35-39	29	12.8
≥ 40	3	1.3
Educational Attainment		
elementary level	38	16.7
elementary graduate	45	19.8
high school level	60	26.4
high school graduate	25	11.0
vocational course	25	11.0
college level	19	8.4
college graduate	10	4.4
graduate level	5	2.2
Marital Status		
married, living together	42	18.5
married, not living together	79	34.8
live-in /cohabiting	103	45.4
widowed	3	1.3
Income Class		
poor	48	21.1
low income (but not poor)	54	23.8
lower middle class	97	42.7
middle class	28	12.3
Employment Status		
no work/plain housewife	53	23.3
full-time worker	41	18.1
part-time worker	37	16.3
self-employed	96	42.3
Sex of the Child		
male	103	45.4
female	124	54.6
Age of the child		
3 months up to less 6 mos.	34	15.0
6 months	13	5.7
7 months above	180	79.3
Currently living with the father of the child		
yes	149	65.6
no	78	34.4
Partner's employment status		
no work	72	31.7
full-time worker	35	15.4
part-time worker	66	29.1
self-employed	54	23.8

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

Level of Maternal Self-Efficacy in Infant Care of the Respondents

The results show that the first-time mothers in the study were confident in caring their infants (mean=3.77±.15). Furthermore, they are confident in doing care taking procedures (mean=4.02 ±.32), situational beliefs (mean=4.17±.37) and moderately confident in identifying evoking behaviors of the infant (mean=3.74±.29) and reading the behavior and signals coming from their infant (mean=3.14±.24) [Table 2].

Table 2. Maternal self-efficacy in infant care.

MATERNAL SELF-EFFICACY IN INFANT CARE	MEAN	SD
Care Taking Procedures		
1. I am good at keeping my baby occupied	3.93	.69
2. I am good at feeding my baby	3.94	.52
3. I am good at changing my baby	4.33	.67
4. I am good at bathing my baby	3.89	.59
Weighted mean	4.02	.32
Evoking Behavior		
1. I can make my baby happy	4.33	.47
2. I can make my baby calm when he/she has been crying	3.06	.66
3. I am good at soothing my baby when he/she becomes upset	3.66	.77
4. I am good at soothing my baby when he/she becomes fussy	4.09	.68
5. I am good at soothing my baby when he/she continually cries	4.02	.71
6. I am good at soothing my baby when he/she becomes more restless	2.97	.70
7. I am good at getting my babies attention	4.01	.57
Weighted mean	3.74	.29
Reading Behavior/Signaling		
1. I believe that I can tell when my baby is tired and needs to sleep	4.68	.47
2. I believe that I have control over my baby	4.71	.46
3. I can tell when my baby is sick	2.74	.46
4. I can read my baby's cues	2.39	.55
5. I am good at understanding what my baby wants	2.32	.70
6. I am good at knowing what activities my baby does not enjoy	2.03	.80
Weighted mean	3.14	.24
Situational Beliefs		
1. I believe that my baby responds well to me	3.12	.84
2. I believe that my baby and I have a good interaction with each other	4.59	.52
3. I can show affection to my baby	4.81	.40
Weighted mean	4.17	.37
Maternal self-efficacy in infant care	3.77	.15

Legend*: highly confident (4.20-5.00); confident (3.40-4.19); moderately confident (2.60-3.39); not confident (1.80-2.59); highly not confident (1.00-1.79)*

Correlation between Demographic Profile and Maternal Self-Efficacy in Infant Care

Data presented in table 3 illustrates that there is no significant correlation between maternal age (r=.023, p-value = .650), educational attainment (r=.007, p-value=.885), marital status (r=.008, p-value=.884), incomes class (r=.73, p-value=.146), sex of the child (r=.015, p-value=.785), age of the child (r=.047, p-value=.070), father currently living with the child (r=.45, p-value=.405) and partner's employment status (r=.004, p-value=.943) with the maternal self-efficacy of the first-time mothers.

Table 3. Correlation of respondent's profile and maternal self-efficacy in infant care.

Profile	Maternal Self-Efficacy in Infant Care	
	r	p value
Age	.023	.650
Educational attainment	.007	.885
Marital status	.008	.884
Income class	.73	.146
Employment status	.091	.070
Sex of the child	.015	.785
Age of the child	.047	.385
Currently living with the father of the child	.45	.405
Partner's employment status	.004	.943

** Correlation is significant at the 0.05 level (2-tailed)*

DISCUSSION

The study was designed to determine the level of maternal self-efficacy in infant care among first-time mothers in Mansalay, Oriental Mindoro. The study's overall findings indicated that respondents were confident in their maternal self-efficacy. It also revealed that there is no significant relationship between the respondents' demographic profile and maternal self-efficacy.

Results shows that first-time mothers can be confident regardless of their age, marital status, educational attainment, income class, employment status, sex of the child, age of the child, father currently living with the child and partners' employment status. Each mother has unique experiences, backgrounds, personalities that may influence their confidence in rearing/ caring their infant. Individual differences can enhance the confidence of first-time mothers without being influenced by their demographic profile. Providing first-time mothers with childcare education can boost their confidence in their role and childcare behaviors during the early postpartum period (Shafaie et al., 2017). The level of support from family, friends or other health professionals may play more significant role in shaping maternal self-efficacy than demographic factors. Nilsson et al. (2013) also concluded in their study that a woman's sense of empowerment stemmed from a presence and trusting relationship with experts and partners. A mother with strong support networks may feel more confident in their parenting abilities regardless of their demographic background. Another, mothers often gain confidence

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

in understanding their children's needs and responding appropriately while adjusting to motherhood and building the parent-child bond (Zheng et al., 2018). However, there are factors that may also contribute or affect a mother's confidence in caring for their child.

First-time mothers may have access large source of health information through various sources such as online resources and parenting classes which can enhance their confidence in infant care. Demographic variable may not directly impact access to these resources. Access to online resources can boost confidence in first-time mothers by giving empirical and trustworthy parenting information (Alamiyah, 2020). Online platforms enable mothers to seek peer support and build ties within the online community (Kean, 2021). Furthermore, online tools help moms quickly learn new things and overcome the problems of early parenthood (Newhouse, 2016). Overall, online tools give first-time mothers with useful knowledge, support, and a sense of community, which can boost their confidence in their parenting skills.

Cultural beliefs can boost first-time mothers' confidence by offering them a sense of support and affirmation. Mothers feel more empowered and effective in their roles when cultural values and traditions are recognized and respected (Gao et al., 2010). Furthermore, cultural beliefs might influence women's expectations and perceptions of motherhood, allowing them to depend on their cultural history for support and advice (Reihani et al., 2016). Embracing cultural ideas and customs can help first-time mothers feel more powerful and effective in their new role, regardless of their demographic profile.

Previous experiences with infants such as caring for younger siblings or exposure to child care may have impact to their confidence. In the research by Maehara et al. (2016), states that women with prior experience caring for babies had higher maternal confidence scores than those without such experience. It also found that mothers who exclusively breastfed had significantly higher confidence levels. While in the study of Caroli and Sagone (2014), highlighted that primiparous women, unlike those who have already experienced motherhood, have a personal experience influenced by the prospect of assuming a completely new role and caring responsibilities.

The primary limitation of this study is its cross-sectional design and the level at which maternal infant rearing self-efficacy and sociodemographic factors were assessed. This study does not claim that its findings are representative of all Filipino women. Because the women in this study are first-time mothers concentrated in one municipality, it is difficult to say that the sample fully represented all of the province's sociocultural groups. Another limitation of this study was its cross-sectional design, which means that the relationships between maternal infant rearing self-efficacy and socio-demographic variables did not necessarily indicate causal relationships. To summarize, whether an intermediary link in a causal relationship with a mother's caring practices over time warrants further investigation and evaluation.

CONCLUSION

The study reveals that most respondents are early adults, self-employed, and confident in maternal infant care. Demographic factors have no significant impact on this confidence. First-time mothers are confident in infant care due to various factors. Recommendations include collaborating with health offices for seminars, providing social support, encouraging

education, and researching interventions to enhance maternal self-efficacy among disadvantaged groups. Strengthened public health efforts are necessary to improve maternal self-efficacy, aligning caregivers' understanding with infants' needs. Further research is required to explore intervention efficacy in prolonging infant care duration.

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RESEARCH ARTICLE

SOURCES OF INFORMATION OF COASTAL COMMUNITIES IN SAN JOSE, OCCIDENTAL MINDORO TOWARDS DISASTER RISK PREPAREDNESS

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ABSTRACT

This study determine the sources of information used by coastal communities in San Jose, Occidental Mindoro for disaster risk preparedness. A survey questionnaire was distributed to residents in seven coastal barangays: Caminawit, Pag-Asa, Barangay 4, Barangay 5, San Roque, Bubog, and San Agustin, with a total of 382 respondents selected through proportional probability sampling. Data were collected using an adapted survey instrument. The results indicate that the majority of respondents are young adults, predominantly female, and have lived in the coastal communities for 10 to 18 years. Radio, social media, and face-to-face interaction are frequently used sources of information, whereas print media is used less often. Practices related to prevention and mitigation, as well as disaster rehabilitation and recovery, are performed occasionally, while disaster preparedness, response, and early recovery practices are more commonly implemented. The study finds that age and sex significantly influence disaster preparedness practices, and sources of information are significantly related to these practices. It is recommended that authorities increase efforts in prevention, mitigation, and disaster rehabilitation and recovery to enhance overall disaster preparedness in these communities.

Keywords: *disaster preparedness, sources of information, coastal communities*

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

INTRODUCTION

Governments, organizations, communities, and people may better respond to and deal with the immediate effects of a disaster, regardless of whether it is caused by natural disasters or human-induced ones, by taking a number of proactive steps. Reducing the loss of life and livelihood is the goal. Simple actions like preparing for search and rescue missions, establishing early warning systems, creating contingency plans, or storing supplies and equipment may have a big impact. According to Carleton and Hsiang (2016), disaster risk preparedness come within the purview of homeland security. Numerous national challenges are addressed in this subject, such as immigration and border access, terrorism, naturalcatastrophes, essential infrastructure, and public health emergencies. Professionals create recovery plans for a variety of situations in each of these categories.

Coastal regions are becoming more vulnerable to both natural and man-made threats. A crucial first step in lowering catastrophe risk in a community and enhancing its resilience to natural and human-caused disasters is conducting an assessment of community resilience (Burton, 2015). According to Lloyd et al. (2013), the creation and use of adaptive administrative methods to lessen and solve the particular circumstances existing in coastal regions have received more attention recently as a result of the rapidly changing climate.

In line to help the coastal communities for better information dissemination towards disaster risk management and preparedness, in 2010, a law has been passed entitled "Philippine Disaster Reduction and Management Act (RA 10121). The Act changed the country's approach to catastrophes from one of reaction to one of preparedness. Through the creation of the National Disaster Risk Management Framework, RA 10121 offers a thorough, all-hazard, multi-sectoral, interagency, and community-based approach to disaster risk management. A National Disaster Risk Management Plan (NDRMP), which will serve as the master plan for strategies, organization, tasks for interested agencies and local government units, and other guidelines in dealing with disasters or crises, is currently being designed, developed, and implemented. They aspire to accomplish with this strategy a cohesive, coordinated, effective, and responsive catastrophe risk management at all levels.

To this, the researchers would like to find out the sources of information of coastal communities and how it affects their disaster risk preparedness and management to their respective barangays. In addition, the researchers are eager to determine if the residents' location have influence to their level of knowledge and practice for risk disaster preparedness such as their age and length of residency. This paper revolves among the coastal communities of San Jose, Occidental Mindoro particularly in Barangay Pag-Asa, Barangay Caminawit, Barangay San Agustin, Barangay 4, Barangay 5, Barangay Bubog and Barangay San Roque—the seven coastal communities of San Jose, Occidental Mindoro. These barangays were also prone to multiple hazards such as typhoons, storm surge, tsunami and earthquake.

MATERIALS AND METHODS

Research Design

A Descriptive-Correlational Design was employed in this study to identify the sources of information of coastal communities in San Jose, Occidental Mindoro towards disaster risk

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

preparedness. Descriptive design was used to determine the profile and sources of information of the coastal communities in San Jose, Occidental Mindoro. Moreover, Correlational design was applied to test the relationship between the socio-economic profile and disaster risk preparedness practices of coastal communities and relationship between sources of information and disaster risk preparedness practices of coastal communities as well.

Study Site

The researchers have conducted the study to the coastal community of San Jose, Occidental Mindoro naming the seven barangays; Barangay Caminawit, Barangay Pag-Asa, Barangay 4, Barangay 5, Barangay San Roque, Barangay Bubog, and Barangay San Agustin (Bubog- 10,223, Barangay 5- 1,882, Barangay 4- 1,133, Caminawit- 11,810, San Roque- 15,316, Pag-Asa- 12,317, San Agustin- 7,060). These are the barangays that are suitable for the conduct of study. Municipal Risk Reduction and Management Office (MDRRMO) of San Jose, Occidental Mindoro stated that these are the barangays that are prone to different natural hazards such as typhoons, storm surge, earthquakes, and flashfloods.

Respondents of the Study

The researchers set the criteria for proportional probability selection of the participants of Barangay Bubog, Barangay 5, Barangay 4, Barangay Caminawit, Barangay San Roque, Barangay Pag-Asa, and Barangay San Agustin. The researcher came up with these seven Barangays because these are the official barangays included to coastal community of San Jose. The total population of all coastal communities is 59,741 residents. 59,741 population with 95% confidence rate and 5% margin of error= 382 respondents. 382 of 59,741 is .64%. Therefore, .64% or 0.0064 of each population of each barangay is: Barangay Bubog has 65 respondents, Barangay 5 has 12 respondents, Barangay 4 has seven respondents, Barangay Caminawit has 76 respondents, Barangay San Roque has 99 respondents, Barangay Pag-Asa has 78 respondents, and Barangay San Agustin has 45 respondents with a total number of 382 respondents checked by proportional probability sampling.

Research Instrument

In this study, the researchers used a survey questionnaire. The researchers have adapted survey questionnaire from two studies authored by Collett (2014) and Pesimo et al. (2019). The researchers have sent a letter of permit to use the instrument through an e-mail to the authors of the two studies. The questionnaires are qualified for the study to apply. These two studies formulated their research questionnaires in assessing the coastal communities and disaster risk preparedness. This instrument consists of questions to ask individuals that are organized in three parts:

Part one, the profile, which includes the demographic profile, the respondents furnish the following information: name, which is optional; age; sex, and length of residency; also, to know where they belong in the barangay in which the study was conducted.

Part two, the source of information, the respondents have the chance to rate the statements according to how they used the following sources of information: social media,

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

radio, print media, and face-to-face interaction by checking their chosen answer. These set of questions are related to the disaster risk preparedness and management that the respondents have experienced through the aid of different sources of information. This has told how frequent these respondents have encountered the given indicators.

The part three are the practices toward disaster risk preparedness, and there are four categories: prevention and mitigation, disaster preparedness, disaster response and early recovery, and disaster rehabilitation and recovery.

Data Collection

During the administration of the instruments, the respondents were informed that their privacy and identity would be kept confidential and that the data collected would be used only for research purposes and to support the development of the study. The researchers went to the assigned barangays to distribute the questionnaire to the respondents in the selected population. Then, the researchers clarified some terms to the respondents so that the respondents could answer the questionnaire with full knowledge and answer honestly to their responsibility in the study.

Ethical Consideration

The researchers guaranteed primarily the quality and credibility of the data. Furthermore, to ensure the authenticity of the study the researchers avoid influencing or tampering with data and information by their own biases. Confidentiality of the personal information of the respondents is a form of respect that the researchers of the present study strictly adhere to.

Data Analysis

The characteristics of the respondents were ascertained using descriptive statistics, such as percentage, frequency, mean, and range. Frequency in using Source of information of coastal communities in San Jose, Occidental Mindoro towards disaster risk assessed using weighted mean analysis were also observed. Kendall's Tau-B was used to this study to correlate the relationship between the profile and disaster practices and source of information towards disaster practices. Through this, the researchers were able to define the relationship among variables.

RESULTS

The result shows that the residents in coastal communities surveyed is at the age of 12-25 years old is 186 (88.7%). Moreover, the respondents of the study were composed of 217 females (57%) and 165 males (43.19%). Majority of the respondents residing in coastal community belongs to 10-18 years length of residency (39.5%).

Table 1. Profile of the respondents (n=382).

PROFILE	FREQUENCY	PERCENTAGE
Age		
12-25 years old	186	48.7%
26-35 years old	70	18.3%
36-50 years old	68	17.8%
51 years old and above	58	15.2%
Sex		
Male	165	43.19%
Female	217	56.81%
Length of residency		
10-18 years	151	39.5%
19-30 years	147	38.5%
31-45 years	46	12.0%
46 years and above	38	9.9%

Social media is the most frequently used source of information, with a mean score of (mean=3.87), reflecting its importance for timely updates and perceived reliability during emergencies. Radio is also important, with a mean score of (mean=3.46), particularly for community-based information. Print media, with a mean score of (mean=3.00), is used less often and seen as less reliable for disaster information. Face-to-face interaction, with a mean score of (mean=3.55), is considered a reliable method for disseminating information, especially through local barangay practices (Table 2).

Table 2. Level of frequency upon using source of information.

INDICATORS	MEAN
Social Media	
1. I am inclined to read posts from others when the subject is related to current events, disasters, emergences, public health issues and global events.	3.96
2. I believe local government offices, such as public health and emergency management, should use social media to communicate with the community about issues and emergencies that directly impact the community.	3.98
3. I more likely to find out about breaking news, issues, and emergencies from social media posts than I am from the television, radio, telephone calls, or face-to-face communication.	3.86
4. I spend more time using social media than I do listening to the radio or watching television.	3.78
5. I believe active social media users provide more complete, unbiased, and useful information related to an emergency than the media and government provides to the public in a time of need.	3.78
Overall Weighted Mean	3.87

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

Radio	
1. I have gained information about disaster risk in our community through the use of radio.	3.55
2. Our barangay establish community radio for better information dissemination to our *purok*.	3.16
3. Radio is much efficient and reliable tool as source of information compare to other sources.	3.49
4. We have at least one (1) radio inside our household for us to listen for further announcements and reports about upcoming events.	3.53
5. By using radio, we are regarded with important announcements ahead of time, during a disaster and after a disaster.	3.56
Overall Weighted Mean	3.46
Print Media	
1. Print media messages are contextually correct.	3.09
2. Print media messages play a significant appealing role in crisis communication.	3.05
3. Print media amplify natural disasters.	2.93
4. Newspaper never left out in order to gain information about disaster risk management.	3.03
5. Print media is reliable among all other sources for disaster risk management.	2.92
Overall Weighted Mean	3.00
Face to face interaction	
1. Our barangay assigns barangay member or *tanod* from each *purok/ sitio* to disseminate information from the Barangay.	3.58
2. Face-to-face interaction with other people such as authorities before, during and after a disaster is the most reliable practice to gain information.	3.65
3. Our barangay never failed to give us announcements and reminders whenever a disaster might strike us through house-to-house strategy of disseminating information.	3.66
4. Our barangay uses devices such as megaphones and speakers to inform the public regarding disaster.	3.45
5. Our barangay gather us together for a seminar and training for us to become knowledgeable about disaster risk practices.	3.39
Overall Weighted Mean	3.55
Grand Weighted Mean Sources of Information	3.47

Legend: 1.00-1.50 - rarely; 1.51-2.50 - occasionally; 2.51-3.50 - sometimes; 3.51-4.50 - often; 4.51-5.00 - always

Prevention and mitigation (mean = 3.32) practices are conducted sometimes, indicating that while some efforts like hazards mapping are frequent, other activities such as early warning system installations need improvement. Disaster preparedness (mean = 3.50) is generally emphasized, with frequent training and planning activities in place. Disaster response and early recovery (mean = 3.55) are handled often, showing effective management in

evacuations and relief efforts. Disaster rehabilitation and recovery (mean = 3.37) practices are carried out sometimes, suggesting a need for enhanced post-disaster planning and support. Overall, practices towards disaster risk preparedness have a mean score of (3.43), indicating that these practices are generally performed often across the different categories (Table 3).

Table 3. Disaster risk preparedness practices of coastal communities in San Jose, Occidental Mindoro.

INDICATORS	MEAN
Prevention and Mitigation	
Conduct of inventory, vulnerability and risk assessment for critical facilities and infrastructures.	3.37
Conduct of hazards mapping and assessments at town/city to barangay level.	3.41
Procurement and establishment of equipment and facilities for early warning.	3.30
Installation of localized disaster early warning systems.	3.23
Establishment of community based early warning systems for various hazards.	3.29
Overall Weighted Mean	3.32
Disaster preparedness	
Conduct of Trainings and simulation exercises on disaster preparedness and response.	3.57
Customization of the capacity building activities for disaster risk managers and key decisions makers.	3.45
Development of local disaster risk reduction and management plan.	3.56
Conduct of risk assessments, contingency planning, knowledge management and training activities	3.47
Establishment of the disaster risk reduction and management operations center.	3.47
Overall Weighted Mean	3.50
Disaster response and early recovery	
On time evacuation of affected communities.	3.62
Integration and coordination of search, rescue and retrieval operations.	3.58
Delivery of short-term needs or disaster relief; e.g. foods, water and medicines.	3.57
Provisions of adequate temporary shelter needs.	3.62
Conduct of tsunami and psychological stress debriefings especially to children.	3.34
Overall Weighted Mean	3.55
Disaster rehabilitation and recovery	
Post-disaster needs assessments are conducted.	3.40
Formulation of strategic plan for disaster affected areas is coordinated.	3.31
Identification, formulation and implementation of the needed assistance and programs are identified.	3.38
Identification and provision of suitable relocation sites for affected population.	3.40
Conduct of trainings for social preparation for host communities and those that will be relocated to reduce conflict.	3.34
Overall Weighted Mean	3.37
Practices towards Disaster Risk Preparedness	3.43

Legend: 1.00-1.50 - rarely; 1.51-2.50 - occasionally; 2.51-3.50 - sometimes; 3.51-4.50 - often; 4.51-5.00 - always

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

Age (r=.130; p-value = .001) and sex (r=.12; p-value = .004) are significantly associated with disaster risk preparedness practices, respectively, indicating that older individuals and different genders tend to engage more in these practices. Length of residency shows a positive correlation (coefficient = .065) but is not statistically significant (p-value = .099). Overall, age and sex play a notable role in influencing disaster preparedness practices, while length of residency does not have a significant effect (Table 4).

Table 4. Relationship between profile and practices towards disaster risk preparedness.

PROFILE	DISASTER RISK PREPAREDNESS PRACTICES	
	r	p-value
Age	.130**	.001
Sex	.121**	.004
Length of residency	.065	.099

***. Correlation is significant at the 0.01 level (2-tailed).*

Social media shows a small but statistically significant positive correlation with disaster risk preparedness practices (r = .097, p-value = .007). Radio and print media both exhibit moderate positive correlations (r = .324, p-value < .001 and r = .262, p-value < .001, respectively), suggesting a significant association with improved preparedness. Face-to-face interaction demonstrates the strongest positive correlation (r = .592, p-value < .001), indicating that direct communication significantly enhances disaster risk preparedness practices (Table 5).

Table 5. Relationship between sources of information and practices towards disaster risk preparedness.

SOURCE OF INFORMATION	DISASTER RISK PREPAREDNESS PRACTICES	
	r	p-value
Social media	.097**	.007
Radio	.324**	<.001
Print media	. 262**	<.001
Face-to-face interaction	.592**	<.001

***. Correlation is significant at the 0.01 level (2-tailed).*

DISCUSSION

The study found that the most common participants were teenagers aged 12 to 25, who demonstrated a strong understanding of various information sources and disaster risk preparedness practices. The majority of respondents were female, consistent with findings from the United Nations Office for Disaster Risk Reduction (2015), which highlight women's involvement in disaster risk reduction programs.

Social media is frequently used for disaster information, though its impact is smaller compared to other media. Radio and face-to-face interactions are highly valued, particularly

for timely announcements and community training. Print media is used less frequently, with mixed perceptions about its reliability and effectiveness.

Hazard mapping and assessments are conducted regularly, but the installation of localized early warning systems is less common. Disaster preparedness activities, such as training and plan development, are well-implemented. In disaster response, practices like timely evacuations and providing temporary shelters are effective, though psychological stress debriefings are less frequent. Rehabilitation and recovery practices are performed occasionally, with post-disaster needs assessments and relocation plans being less frequent. The study underscores the critical role of early warning systems and the need for clear, tailored communication to ensure community preparedness. Effective disaster risk reduction strategies are essential for minimizing harm and financial losses (Liu et al., 2020; Ahsan & Khatun, 2020). Community radio is increasingly important for providing information and warnings, particularly in coastal areas (Nasif et al., 2020; Alexander, 2016).

However, the study has limitations. The sample may not fully represent the diversity within coastal communities, and self-reported data could be subject to bias. Additionally, the cross-sectional nature of the study limits the ability to assess changes in disaster preparedness over time. Future research should address these limitations and explore longitudinal approaches to gain a more comprehensive understanding of disaster preparedness in coastal communities.

CONCLUSION

The study reveals that the majority of participants from coastal areas are aged 12 to 25, with a higher number of females compared to males. Most residents have lived in coastal areas for 10 to 18 years. Information sources in these communities are frequently utilized, with radio being a primary medium for timely announcements. Face-to-face interaction is highly valued, as it enhances information gathering and disaster preparedness. The study also indicates that timely evacuations and temporary shelters are well-regarded.

Age, gender, and location significantly influence residents' knowledge and preparedness for disasters, while length of residency does not. The findings show a significant relationship between sources of information and disaster risk preparedness practices, with social media, radio, print media, and face-to-face interaction all playing roles in information dissemination. The study recommends that authorities and coastal communities focus more on social media, radio, and face-to-face interactions, as these methods are most effective and widely used. Additionally, disaster rehabilitation and recovery should be prioritized to ensure comprehensive support for residents.

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FRAGILITY CURVES PREDICTION OF SELECT BUILDINGS WITH SOFT-STORY AND RE-ENTRANT CORNER IRREGULARITIES IN SAN JOSE, OCCIDENTAL MINDORO

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ABSTRACT

Since buildings are designed for different needs, this leads to significant irregularities. Predominantly, their response to ground motions concerned their resilience during seismic events. Considering different performance objectives, this research bridged the gap in determining the as-constructed irregular buildings' response against ground motions adapting ASCE provisions in a localized setting. The buildings first underwent finite element modeling considering the as-built plan, structural specifications, and spectral accelerations of Occidental Mindoro. Performing nonlinear static analysis resulted in the pushover curves and subsequently generated the fragility curves by the log-normal distributions of the spectral displacements. Polynomial curve fitting developed the best-fit fragility curves and produced mathematical models. The calibrated models resulted in a very strong correlation (R^2 = 0.9994 and RMSE = 0.0321) between the input and the output variables. In addition, a 0.3794 RMSE value resulted in the validation of the predicted models to the code-based fragility curves, giving a very high correlation. Further, for the Ms. 7.1 earthquake, the Hotel A and the Hotel B were expected to be 27.61% and 44.72% damaged, with 33.14% and 33.104% serviceable after the disaster. Thus, based on member checks, Hotel A (soft-story) and Hotel B (re-entrant) buildings were susceptible to magnitude five and beyond earthquakes.

Keywords: *Spectral Acceleration, Nonlinear Static Analysis, Pushover Curves, Fragility Curves, Prediction Model*

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INTRODUCTION

Approximately 90 percent of the world's earthquakes occur along the Pacific Ocean's Pacific Ring of Fire perimeter, where the Philippines and other neighboring countries like Japan are renowned for their high volcanic activity (Roque et al., 2023). Large destructive earthquakes seldom occur, but undoubtedly, they occur without caution (Paton et al., 2015). The same higher magnitude earthquakes were recorded throughout the Philippine archipelago, including the Mindoro earthquake in 1994, which had 7.1 magnitude and was just as high as the formidable earthquake that struck Western Japan in January 2024 measuring 7.6 in magnitude, recording the epicenter in Ishikawa Prefecture (Shelly, 2024). Conversely, since Mindoro province is situated at the point where the Palawan Continental Block (PCB) intruded into the Philippine Mobile Belt (PMB) during the early Miocene, it has experienced various degrees of seismic events, with about 18 earthquakes occurring annually (DOST-PHILVOLCS, 2018). The most destructive Mindoro earthquake (Ms. 7.1) hit the province in November 1994 caused by tectonic movements along the Philippine Fault Zone and the newly identified Aglubang River Fault in Occidental Mindoro, which affected 22,452 families, with 77 confirmed casualties and 430 injured individuals and harmed 1,530 houses, with 6,036 being partially damaged. Subsequently, on December 5, 2023, Lubang, Occidental Mindoro, experienced a 5.9 magnitude earthquake. Similarly, on April 29, 2023, a 5.2 magnitude earthquake shook Looc town in the province, damaging a condemned building and a residential house (DOST-PHIVOLCS, 2023).

Thus, daily exposure to critical infrastructures impaired by earthquakes increases personal risk (Freddi et al., 2021). United Nations (UN) designed Sustainable Development Goals (SDGs), which served as the groundwork for this research to set up flexible infrastructure (SDG 9) and SDG 11 (build a safe and sustainable community for all) (United Nations, 2016). Given the history of past seismic events in Occidental Mindoro Province, it was evident that irregular structure, either in plan (re-entrant) or vertical elevation (soft-story), was recognized as the considerable cause of earthquake failure, especially in seismic zones (Siva, Abraham, & Kumari, 2019). Buildings with irregularities, predominantly vertical (Dya & Oreeta, 2015) or plan configurations (Krishnan & Thasleen, 2020) became susceptible to powerful earthquakes. Hence, systematically assessing the structural integrity of both regular and irregular buildings was crucial for effectively enhancing infrastructure resilience (SDG 9) and overall performance and safety (SDG 11).

While several related studies have focused on the seismic vulnerability of buildings with an irregular shape (Mouhine & Hilali, 2022), producing fragility curves (Smiroldo, Fasan, & Amadio, 2023) based on assumptions regarding building geometry (Mouhine & Hilali, 2022), these studies may not accurately reflect the actual behavior of buildings during earthquakes, as they lacked precise, as-constructed building data. Hence, this study was conducted to analyze the fragility curve since structures with soft-story (Hotel A) and re-entrant irregularities (Hotel B) have been identified as high-risk typologies in the event of an earthquake. Studies on fragility curves (Bsaylon, 2018), pushover-based fragility curves (Bhosale, Davis, & Sarkar, 2017), and code-based fragility curves (Biglari et al., 2023) played a direct role in minimizing economic losses and the risk of earthquake casualties. The researchers aimed to predict potential damage a structure might sustain during seismic

events, and their utility extends to pre-earthquake scenarios, aiding in proactive measures for better preparedness and design considerations (Nazri, 2017). The study addressed the need for proactive risk assessment and mitigation strategies by developing fragility curves and a performance-based design simulation for Occidental Mindoro, analyzing physical condition of two buildings with soft-story and re-entrant irregularities using SeismoBuild software. It generates pushover curves aligned with performance objectives, predicts fragility curves through nonlinear static analysis, and validates results with polynomial curve fitting and code-based fragility curves. The goal is to estimate collapse probability, this study offers a roadmap for future developments, fostering a built environment that not only meet the needs of its residents but also safeguards their safety and well-being to support the province's aspirations for safer and more disaster resilient urbanization by understanding the vulnerability of buildings with soft stories and re-entrant irregularities.

MATERIALS AND METHODS

Research Design

The researchers used modeling and assessment procedures using quantitative approach to assess the building's performance against the set ground motions and generate the fragility curves. The seismic analyses were created using Seismobuild and examined and interpreted based on the results of the nonlinear static analysis (pushover analysis). Moreover, calibration and validation of the prediction models were assessed based on the R-squared and the root mean squared error (RMSE) values to interpret the correlation between the input variables (spectral displacements) and the output variables (probability of collapse).

Study Site

The study focused on San Jose, Occidental Mindoro, specifically the buildings of Hotel A located at Brgy. 6, Mabini St. and the Hotel B at Liboro St., which are prone to ground shaking due to three active faults within Occidental Mindoro's perimeter. The two buildings were selected based on the availability of the as-built plan, structural specifications, and access to the building perimeter.

Data Collection

To provide a clearer view of the performance-based design of a fragility curves prediction of buildings with soft-story and re-entrant irregularities in San Jose Occidental Mindoro, the researchers sought buildings with vertical and plan irregularities, particularly soft-story and re-entrant corners before gathering the ground motion data from the Spectral Acceleration Map of the Philippines (SAMPH) from DOST-PHIVOLCS. Data presents the input spectral acceleration of Occidental Mindoro. The researchers described the physical conditions of the select buildings (soft-story; Hotel A) and (re-entrant irregularities; Hotel B) through a rapid visual screening procedure (RSVP). The researchers adapted the process as provided in the FEMA P-154 manual and assessed building loads based on the building use, category, and floor area as referred to the National Structural Code of the Philippines (NSCP) 2015, the

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updated structural code of the country to determine the beam's uniformly distributed loads, the slabs' area load, and the building's self-weight (Table 1).

Table 1. Spectral acceleration table of short and long periods acceleration in terms of gravity considering its performance levels and return periods.

PERFORMANCE OBJECTIVES	SHORT PERIOD (Acceleration in g)	LONG PERIOD (Acceleration in g)	RETURN PERIOD (years)	REFERENCES	EQUIVALENT MAGNITUDE Booth, C. (2007)
Operational Level (OL)	0.40	0.20	72	NSCP 2015	<5.0M-5.5M
Immediate Occupancy (IO)	0.60	0.30	225	JICA-DPWH	5.5M-6.0 M
Life Safety (LS)	0.76	0.38	975	SAMPH	5.5M -6.5M
Collapse Prevention (CP)	1.9	0.70	2475	SAMPH	<6.5M – 8.5M

Ethical Consideration

The building owner of two selected buildings were informed about the sole purpose of seismic assessment and simulation, as well as its implication. The researchers provided them with clear information regarding the process and the pertinent findings relevant to them. Furthermore, the building plans collected are only utilized for this research, and the rights of the people whose irregular buildings were being simulated and evaluated are confidential.

Research Procedures

The researchers created the building models within the SeismoBuild software interface for simulation, considering the parameters for the reinforced concrete members. The researchers utilized the nonlinear static analysis based mainly on ASCE 41. The researchers developed pushover curves based on the set performance objectives. The researchers also identified the maximum base shear each select building could resist in each damage limit state: OL, IO, LS, and CP. Eight analyses of varying $\pm X \pm eccY$ and $\pm Y \pm eccX$ were considered in the study.

The researchers predicted the pushover-based fragility curves. The log-normal distribution of the spectral displacements was first done for each pushover curve to generate its equivalent fragility curve per damage level, making 64 curves for the two buildings. This aimed to predict the best-fit curves for each performance objective, giving four curves for the soft-story building and four for the re-entrant irregular building. The researchers considered the risk analysis for each select building based on member chord rotations and forces per nonlinear static analysis and predicted fragility curves.

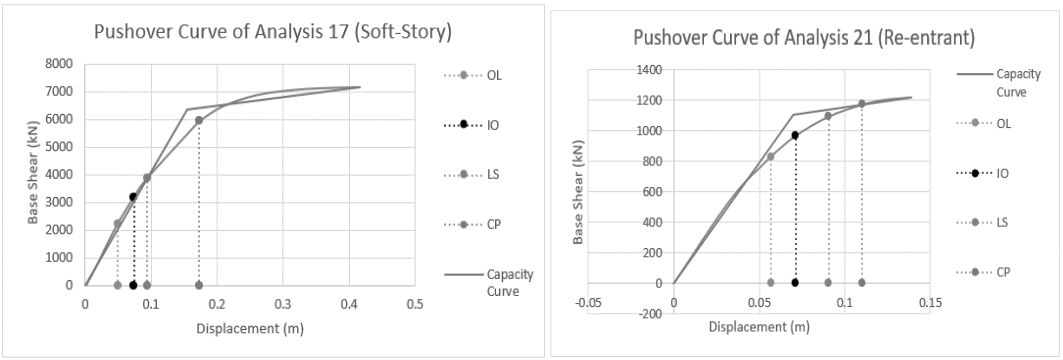
Data Analysis

The nonlinear static analyses were conducted using the SeismoBuild software. The resulting pushover curves were interpolated using Microsoft Excel to obtain the maximum base shear. The same software generated one hundred and twenty-eight (128) fragility curves utilizing the log-normal distribution of the pushover curve data. From these curves, the best-fit polynomial models were calibrated. These prediction models were then assessed and

validated with the resulting coefficient of determination, R^2, and root mean square error, RMSE. The calibration and validation were obtained using the MATLAB software.

RESULTS

Thirty-two (32) pushover curves were obtained from the nonlinear static analysis for each irregular building. Representative pushover curves depict the building's response to ground motions, dividing the building behavior into ductile and plastic. Figure 1a illustrates that the soft-story building displayed ductile behavior at OL, IO, and LS damage, while plastic behavior was observed at the CP damage level. In contrast, Figure 1b shows that the damage levels for the re-entrant building were divided such that at OL and IO levels, the building is ductile, while at LS and CP, the building displayed a plastic behavior (Figure 1).



(a) (b)

Figure 1. Representative pushover curves of irregular buildings: (a) soft-story and (b) re-entrant.

From the pushover curves, the maximum base shears were evaluated relative to the target displacements. The results show the governing maximum base shear at each corresponding target displacement per damage level. Analysis 19 (-X+eccY) governed the eight analyses of varying $\pm X \pm eccY$ and $\pm Y \pm eccX$ while Analysis 21 (+Y+eccX) governed the re-entrant building (Table 2).

Table 2. Target displacement and base shear from the pushover analysis.

PERFORMANCE OBJECTIVE/DAMAGE LEVEL	SOFT-STORY (ANALYSIS NO. 19)		RE-ENTRANT (ANALYSIS NO. 21)	
	Target Displacement (m)	Base shear (kN)	Target Displacement (m)	Base shear (kN)
Operational level	0.0485	2336.845	0.052	2518.961
Immediate occupancy	0.0727	3289.421	0.079	3545.200
Life safety	0.092	3953.620	0.099	4294.137
Collapse prevention	0.170	6034.104	0.183	6454.675

Since the pushover curves represent the building's behavior against earthquakes, it was prevalent that the fragility curves be generated to predict the probability of collapse of the select structures. A polynomial curve fitting governed the regression techniques as it gave higher correlations between variables. Result illustrates the data trends, the prediction models, and the validation data (Figure 2).

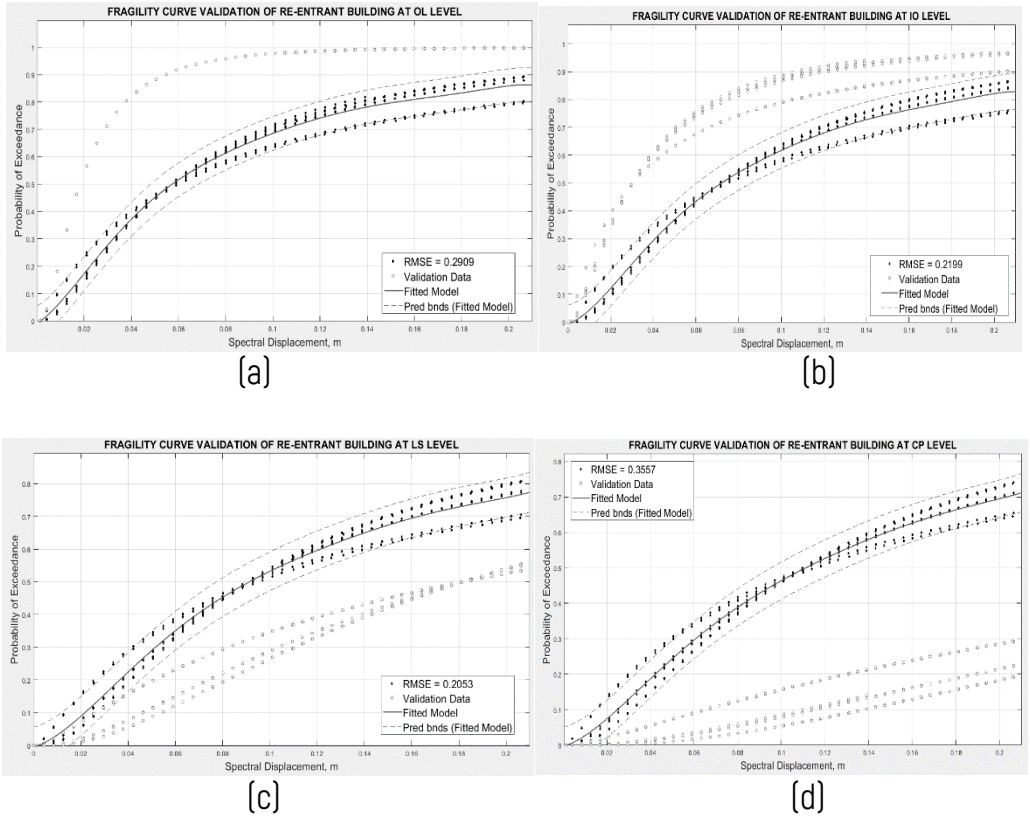


Figure 2. Fragility curves calibration and validation of re-entrant building at (a) OL, (b) IO, (c) LS, and (d) CP.

Conversely, the mathematical models were described by polynomial curves. The recursive equation is presented in Equation 1, where $P(S_d)$ signifies the probability of collapse, pn signifies the polynomial coefficients, and S_d signifies the spectral displacement. Result shows the coefficients of the mathematical model (Table 3).

$$P(S_d) = \sum_{0}^{n} p_n \, (S_d)^{n-1} \qquad (Eq. 1)$$

Table 3. Fragility curve recursive equation coefficients.

COEFFICIENT ID (pn)	SOFT-STORY BUILDING				RE-ENTRANT BUILDING			
	OL	IO	LS	CP	OL	IO	LS	CP
p10	57520							
p9	-163900	127600						
p8	194100	-226100			-2280000	-1651000		
p7	-126600	164800	2826		1822000	1350000	99440	74010
p6	5052	-63420	-3759		-586000	-449100	-72280	-54200
p5	-12910	13610	1875	59.34	96530	77690	20590	15630
p4	2152	-1525	-409.4	-49.37	-8402	-7318	-2843	-2203
p3	-237.3	50.41	23.85	8.766	316.5	326.2	172	138.9
p2	17.96	7.539	5.56	2.648	5.441	2.142	2.291	1.878
p1	-0.0094	-0.0141	-0.0244	-0.0298	-0.00887	-0.0041	-0.0055	-0.0041

Legend: OL - Operational Level Damage; IO - Immediate Occupancy Damage; LS – Life Safety Damage; CP - Collapse Prevention Damage

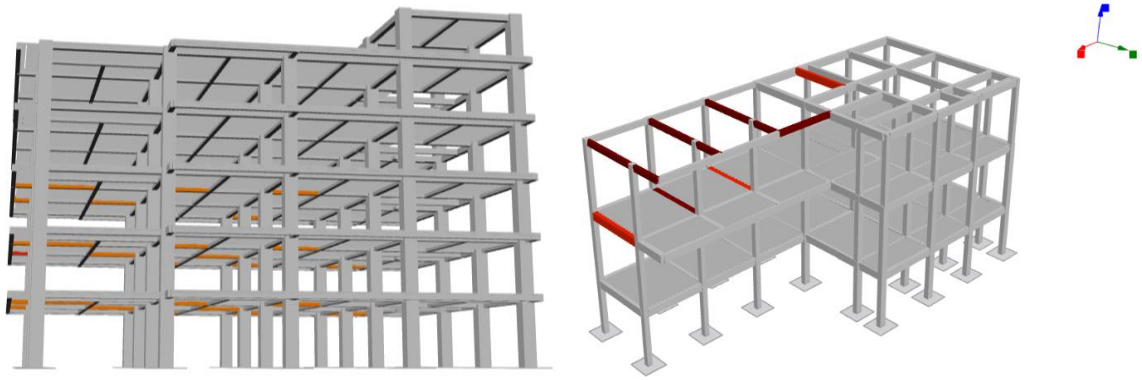
Predominantly, the prediction models were validated using the code-based fragility curves, and the validation data are shown in Figure 2 above. Measuring the coefficient of determination, R^2, and the root mean squared error, RMSE, gave the interpretation of the mathematical models (Table 4).

Table 4. Coefficient of determination and RMSE values of the prediction models.

CRITERIA	SOFT-STORY BUILDING				RE-ENTRANT BUILDING			
	OL	IO	LS	CP	OL	IO	LS	CP
R^2	0.9994	0.9986	0.9968	0.9930	0.9854	0.9844	0.9848	0.9859
RMSE (Calibration)	0.0051	0.0092	0.0147	0.0215	0.0312	0.0322	0.0300	0.0266
RMSE (Validation)	0.0427	0.0111	0.2591	0.3793	0.2909	0.2199	0.2053	0.3557
Interpretation	VH	VH	VH	VH	VH	VH	VH	VH

Legend: OL - Operational Level Damage; IO - Immediate Occupancy Damage; LS – Life Safety Damage; CP - Collapse Prevention Damage, VH – Very High

Subsequently, risk analyses of the select buildings were considered in the study. The risk assessment was based on two (2) categories: structural member response to the nonlinear static analysis and the probability of collapse based on the prediction models obtained. Figure 3 exemplifies the location of the structural member failure of the respective select buildings.



(a) (b)

Fig 3. Location of structural member failure per member shear forces of (a) soft-story building at OL and (b) re-entrant building at CP.

Conversely, a recorded 7.1 magnitude earthquake of equivalent spectral acceleration has been considered to quantify the probability of damage to the select buildings. Based on the results upon being subjected to ground motions, the building is expected to have a 27.61% complete collapse, with a 49.04% chance to evacuate the occupants to safety and a 33.14% chance of being operable after the event. At this point, there is a 58.61% chance that the structural frame of the soft-story building reached its yielding capacity. In comparison, there is a 50.959% probability that beams have larger cracks attributed to being flexural members. Bond failures of concrete and reinforcement are also expected at this level (Figure 4a). The results show from the predicted fragility curves that there is a 44.72% chance that the re-entrant building will collapse, where imminent danger should be avoided due to the unstable structural frame. A probability of 48.67% is the chance that the occupants can evacuate from the building, away from the danger of partial

collapse of columns as expected. After the earthquake, there is a 33.104% probability that the re-entrant building is operable (Figure 4b).

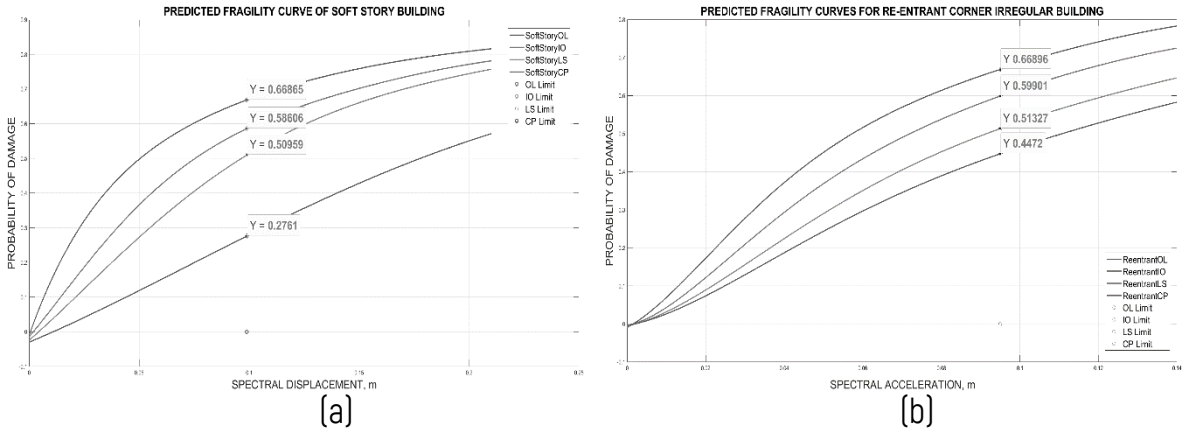


Figure 4. Predicted fragility curves of the irregular buildings reflecting the probability of damage at a 7.1 magnitude earthquake: (a) soft-story building and (b) re-entrant building.

DISCUSSION

The physical conditions of the components of the two select buildings were examined through a rapid visual screening. The study identified the Hotel A as the soft-story building, having a soft story at the ground floor level, while the Hotel B was the re-entrant corner irregular building. The evaluation found a rounding adjacency for re-entrant corner buildings and severe irregularity for soft-story buildings. Further, the assessment resulted in a level score of less than 2.0, requiring structural investigation (FEMA P-154). With this, building loads based on the structural codes were accounted for, providing a reasonable quantity of superimposed dead loads and live loads dependent on the materials reflected on the plans and the as-constructed structures (Costa & Beck, 2024).

Each subject building was then modeled using SeismoBuild software to account for the reinforcing bars, and the nonlinear static analysis was conducted. Subsequently, the pushover curves were obtained. The soft-story building attained a maximum base shears of 2518.961kN, 3545.2kN, 4294.137kN, and 6454.675kN for OL, IO, LS, and CP damage levels, with corresponding target displacements of 0.052m, 0.079m, 0.099m, and 0.183m, respectively. All these results were obtained from the governing modal analysis 21 out of all considered analyses. Analysis 21 accounted for the +Y + eccX earthquake loading, considering accidental torsions. Moreover, for the re-entrant building, analysis 19 (-X + eccY) provided maximum base shear of 1041.831kN, 1239.137kN, 1478.886kN, and 1653.481kN for slight, moderate, extensive, and collapse damage levels. The accidental torsion accounting for 15% of the lateral loads projected to the orthogonal axis provided significant rotations to the building during ground motions (Lazaris, 2019). The maximum base shears obtained are the limits the buildings can resist against ground motions (ASCE 41, 2017). Related literature suggested that at each performance objective OL, IO, LS, and CP, the building is expected to have slight, moderate, extensive, and complete damage (Dya & Oreta, 2015; Omidian & Khaji, 2022; Lazaris, 2019). This study's results implied that each base shear and target displacements were the limits to determine the intensity of the building damage.

Each pushover curve provided spectral displacements, the necessary data to generate the fragility curves. A series of fragility curves were obtained, accounting for all the modal analysis results using log-normal distributions. The number of generated fragility curves equates to the number of pushover curves resulting from the nonlinear static analysis. This generation gave necessary data to forecast the best-fit model to correlate the study buildings' spectral displacement and the probability of damage. Since many curves were made, a polynomial fitting was employed to predict the best-fit fragility curves (Choksi et al., 2017).

Moreover, MATLAB software was utilized to realize the results. The calibration resulted in R-squared values of 99.94%, 99.86%, 99.68%, and 99.30%, and values of RMSE of 0.005054, 0.009197, 0.01471, and 0.02146 for OL, IO, LS, and CP, respectively, for soft-story building. In contrast, R-squared values of 98.84%, 98.44%, 98.48%, and 98.59% and RMSE values of 0.03123, 0.03215, 0.03003, and 0.02661 for each respective increasing performance objectives were obtained for the re-entrant corner irregular building. Polynomial curve fitting proved to be the best-fit prediction model for data trends, giving a very high correlation between the input (spectral displacement) and the output (probability of collapse) variables (Choksi et al., 2017).

Code-based fragility curves were achieved and compared to the predicted models. The relationship between the predicted and code-based fragility curve was explained by the root mean squared error of the two data trends. The correlation provided an RMSE value of 0.0427 for the soft-story building at the operational level. At the subsequent damage levels, IO, LS, and CP, the correlation presented RMSE values of 0.0111, 0.2591, and 0.3793, respectively. In comparison, the re-entrant corner irregular building supplied RMSE values of 0.2909, 0.2199, 0.2053, and 0.3557 for each limit state.

Risk assessment for the subject buildings was primarily conducted using nonlinear static analysis and fragility curves. The assessments were divided into two methods: pushover-based and probability of exceedance. The pushover-based evaluation revealed that the soft-story building exhibited failures in terms of structural member shear force demand/capacity ratios. However, the building could resist member chord rotations during ground motions, passing the damage-capacity member checks. In contrast, both structural member checks showed beam failures in the re-entrant building at all damage levels. The progressive collapse in the re-entrant building was attributed to the excessive load capacity of its structural members (Fikri & Ingham, 2022). The fragility curves generated in this study align with findings from existing literature.

CONCLUSION

The study shows that the Hotel A was defined as a soft-story building. At the same time, the Hotel B was determined as a re-entrant corner irregular structure, and further structural investigation is needed, attributed to the evaluation cut-off score. The structural nonlinear static analysis showed that Analysis 21 (+Y +eccX) and Analysis 19 (-X + eccY) provided maximum base shears in all the modal analyses for soft-story and re-entrant buildings, respectively. From the log-normal distribution of the spectral displacements of the building, a polynomial fit governs the prediction of the fragility curves. Polynomial curve fitting proved to be the best-fit prediction model for data trends. Pearson's correlation coefficient and RMSE values provided a very high correlation between the spectral displacement and the probability of collapse in the prediction. Comparing these predicted fragility curves to the code-based generated curves provided the margin of error with RMSE values, giving a very high correlation. Therefore, these prediction models can be used

for buildings with the same irregularities. The risk assessment per nonlinear analysis suggested that the subject buildings, Hotel A and Hotel B, are susceptible to earthquakes with magnitudes five and beyond. The predicted fragility curves can be used to quantify the probability of damage during the earthquake and the chance of operability after the disasters. From the study buildings, a spectral acceleration equivalent to a magnitude 7.1 earthquake was assessed, and it concluded that there is a 27.61% probability that the soft-story building would collapse, with 33.14% operability, while 44.72% chance that the re-entrant building would collapse and 33.104% chance of being serviceable.

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PERFORMANCE EVALUATION AND ACCEPTABILITY OF THE MECHANIZED ONION PESTICIDE SPRAYER

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ABSTRACT

This study aims to evaluate the performance and overall acceptability of the mechanized onion pesticide sprayer across multiple criteria, including functionality, durability, safety, and mobility, as well as to assess its performance efficiency in terms of discharge rate, noise level, fuel consumption, spray range, and field efficiency.The prototype was evaluated through a series of tests, including functionality, durability, safety and mobility , discharge uniformity, coverage area, rate of work, field efficiency, and standard time. Test results revealed that the mechanized sprayer outperformed traditional and solar-powered alternatives in all aspects. It achieved excellent ratings for functionality, durability, safety, and mobility, ensuring effective and safe operation. The sprayer also demonstrated consistent discharge uniformity across nozzles, preventing uneven pesticide application. Additionally, the sprayer covered a significantly larger area compared to other sprayer types, reducing spraying time and improving operational efficiency. Furthermore, the sprayer achieved a faster rate of work and higher field efficiency, indicating efficient resource utilization. Finally, the time and motion study confirmed a faster standard time for operating the mechanized sprayer. Overall, the efficiency test results convincingly demonstrate that the mechanized onion pesticide sprayer is an acceptable solution for farmers, offering consistent application, broad coverage, faster operation, and improved resource utilization compared to traditional methods.

Keywords: *Mechanized onion pesticide sprayer, efficiency evaluation, improved resource utilization*

INTRODUCTION

Agricultural crop production had undergone significant changes throughout years. In 2021, the worldwide production of primary crop commodities amounted to 9.5 billion tonnes, marking a 54 percent increase since 2000 (Food and Agriculture Organization, 2022). The underlying reason behind comes from technology innovation that helps the crop to yield better, such as agricultural methods such as spraying chemicals and biochemicals to the crop. Farmers incur financial losses when herbicides and pesticides are applied inefficiently. Despite spending considerable amounts on these chemicals, a significant volume fails to reach weeds and pests when using conventional sprayers (Lambrecht et al., 2019).

In the Philippines, the onion farming is one of the agricultural livelihoods (Capiral et al., 2023). Traditional practices in controlling pests and insects, like spraying chemicals and organic fertilizers were done through conventional backpack and knapsack sprayers (Tecson, 2016). People use hand-operated backpack sprayers to apply different substances, like pesticides and bio-fertilizers, during the plant health control phase in other crops. Meanwhile, conventional spraying possesses several factors that affect the effectiveness of the sprayed chemicals on the crop and physical constraints on human use (Lopes et al., 2011).

In the study of Lambrecht et al. (2019) shows that farmers frequently experienced financial losses as they struggle to apply herbicides and pesticides effectively. They found that many of these chemicals don't reach the weeds and pests when farmers use regular sprayers. De Carvalho et al. (2013) also found that using knapsack sprayers can cause physical strain, especially when carrying heavy loads. This strain can lead to discomfort and posture problems because of the repetitive motion of pumping the sprayer lever with the left arm.

In Occidental Mindoro usually sprayed liquids and biochemicals on their crops through lever-operated knapsack sprayer or back sprayer. Developing a much-efficient technology that takes less effort and time and reduce human constraints during spraying biochemicals remains restrained in local community, thus local research study about agricultural technology and systems specifically on spraying methods, were also limited. Study has shown that using manual 3 sprayers for farming comes with problems like wasting pesticides and unevenly spraying fields (Lopez et al., 2012). This meant that farmers might lose a lot of the pesticides they applied, and some parts of their fields might not have gotten enough protection. While bigger machines offers help but weren't practical for small farms with tricky terrain (Gafoor et al., 2022). With the health and posture issues on the used of knapsack sprayers as well as the waste and uneven distribution of pesticides application, this study aims to address the problems associated with the use of knapsack sprayer. To evaluate the performance and overall acceptability of the mechanized onion pesticide sprayer across multiple criteria, including functionality, durability, safety, and mobility, as well as to assess its performance efficiency in terms of discharge rate, noise level, fuel consumption, spray range, and field efficiency.

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

MATERIALS AND METHODS

Research Design

This study utilized a development-experimental design to evaluate the overall acceptability and performance efficiency of the mechanized onion pesticide sprayer. The evaluation focused on various criteria, including functionality, durability, safety, mobility, and performance metrics such as discharge rate, noise level, fuel consumption, and spray range.

Project Development

The project was developed via several processes, from pre-planning to final commissioning, to test the Mechanized Onion Pesticide Sprayer. The pre-planning was comprised of data-gathering activities. The researchers studied and collected necessary information and data that could help to uplift the concept of a Mechanized Onion Pesticide Sprayer. The components and functions were also considered so that the construction of the prototype was economically hypothesized and recognized. The researchers also reviewed related studies used by the preceding researchers to help developed ideas, strategies, techniques, and procedures for developing and constructing the machine. After the pre-planning stage, researchers pursued the study and continued with the fabrication based on the initial design and structure. The researchers used the appropriate materials to develop the Mechanized Onion Pesticide Sprayer. The final design was drawn using the SketchUp application. The design stage included materials and tools for constructing the Mechanized Onion Pesticide Sprayer. The engineering design was done with detailed mechanical connections and structures to represent all the parts of the project. The researchers also recognized the components of the machine and the structure of the project. The liquid flow diagram and block diagram were prepared that guide the researchers toward the completion of the project.

Furthermore, the purchasing and procuring stage involved acquiring and gathering materials, and equipment. The researchers analyze each component to serve well functions according to its intended purpose. After the procurement, researchers started the construction of the prototype according to the developed design. Initially, the project's frame were fabricated, followed by the fabrication of product assembly, including the mechanical components. The mechanized onion pesticide sprayer were tested to determine whether each component complied with the desired design and objectives.

Acceptability Evaluation

To evaluate overall acceptability, a panel of experts in agricultural engineering and technology assessed the sprayer using a structured evaluation form. Each expert rated the prototype on a 5-point Likert scale, where 1 indicated "Poor" and 5 indicated "Excellent." The mean scores for functionality, durability, safety, and mobility were calculated, along with an overall mean score to determine the sprayer's acceptability.

Performance Evaluation

The researchers also included the parameters to measure the performance efficiency (functionality, durability, safety, and mobility) of the mechanized onion pesticide sprayer. After the testing stage, the final commissioning and modification were performed based on the results of the evaluation. This constituted the final modification of the prototype and product testing for performance efficiency.

For performance efficiency, several measurements were taken. The discharge rate of the nozzle was measured using a graduated cylinder to collect liquid dispensed over specific time intervals (5, 10, and 15 seconds). The volumes dispensed during these intervals were recorded, and the average discharge rate was calculated. Noise levels were measured with a decibel meter at specified distances from the prototype during three separate trials, and the average noise level was determined to assess compliance with noise regulations. Fuel consumption was measured by recording the time required to consume a fixed volume of fuel (3000 mL) across several trials, with the average fuel consumption rate calculated for efficiency evaluation.

Spray range and field performance were assessed by measuring the length, width, and area covered by the nozzle's spray over multiple trials. The average spray range was computed to determine coverage effectiveness. Additionally, field capacity and efficiency were evaluated by recording the time taken to spray areas of varying sizes (900 sq. ft, 1800 sq. ft, and 2700 sq. ft). The actual and theoretical field capacities were calculated, and field efficiency was assessed to gauge performance under practical conditions.

RESULTS

The prototype was tested for overall acceptability measured in terms of functionality, durability safety and mobility.the experts evaluated the acceptability of the mechanized onion pesticide sprayer across various criteria. The functionality of the sprayer received a mean score of (mean = 4.49), interpreted as "very good." similarly, its durability was rated (mean = 4.26), also interpreted as "very good." safety and mobility both scored (mean = 4.48), with both being interpreted as "very good." the overall mean score for acceptability is (mean = 4.42), which is interpreted as "very good" (Table 1).

Table 1. Mean score of acceptability of the prototype.

ACCEPTABILITY	MEAN	INTERPRETATION
Functionality	4.49	Very Good
Durability	4.26	Very Good
Safety	4.48	Very Good
Mobility	4.48	Very Good
Overall Mean	4.42	Very Good

Legend:1.00-1.49=Poor, 1.50-2.49=Fair, 2.50-3.49=Good, 3.50-4.49=Very Good, 4.50-5.00=Excellent

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

Performance Efficiency of Prototype

In terms of performance efficiency, trial testing such as the discharge rate of nozzle, noise level of the prototype and fuel consumption were carefully evaluated. The researchers also calculated the actual field capacity, efficiency, theoretical field capacity, application rate, and the actual field efficiency.

The discharge rate was obtained by using a graduated cylinder and getting the time or by measuring the volume of liquid required to refill the power sprayer after spraying and getting the total time to consume the liquid. The discharge rate of the prototype was measured at different time intervals. At 5 seconds, the prototype achieved discharge rates of 2314.0 mL, 2310.0 mL, and 2312.5 mL across three trials, resulting in an average discharge rate of (462.43 mL/s). At 10 seconds, the discharge rates recorded were 4659.5 mL, 4664.0 mL, and 4675.5 mL, with an average discharge rate of (466.63 mL/s). For the 15-second interval, the discharge rates were 6972.0 mL, 6966.5 mL, and 6970.5 mL, leading to an average discharge rate of (464.64 mL/s). The overall average discharge rate for the prototype across all time intervals was (464.57 mL/s) (Table 2).

Table 2. Discharge Rate of the prototype.

TIME (sec)	DISCHARGE RATE (ML)			AVERAGE DISCHARGE RATE
	I	II	III	(mL/s)
5	2314.0	2310.0	2312.5	462.43
10	4659.5	4664.0	4675.5	466.63
15	6972.0	6966.5	6970.5	464.64
Average				464.57

The result shows the noise levels of the prototype for three trials. The average noise level was (85 dB) for the first trial, (79 dB) for the second trial, and (76 dB) for the third trial (Table 3).

Table 3. Noise level of the prototype.

TRIALS	TRIAL (dB)			AVERAGE
(m)	I	II	III	(dB/m)
1	84	86	84	85
2	79	78	79	79
3	76	77	76	76

The fuel consumption for 3000 mL over various trials was measured as follows: Trial I had an average of (0.0404 mL/min), Trial II had (0.0404 mL/min), and Trial III had (0.0404 mL/min). The average fuel consumption across all trials was (0.0404 mL/min) (Table 4).

Table 4. Fuel consumption of the prototype.

FUEL CONSUMPTION (mL)	TRIALS (mins)			AVERAGE (mL/min)
	I	II	III	
3000	123	120	121	0.0404

The average spray range measurements were as follows: length was (1.39 m), width was (3.01 m), and area was (4.18 m^2) (Table 5).

Table 5. Spray range of the nozzle.

SPRAY RANGE	TRIALS (m)			AVERAGE (m^3)
	I	II	III	
Length	1.36	1.42	1.39	1.39
Width	2.95	3.06	3.02	3.01
Area (m^2)	4.00	4.30	4.20	4.18

The trials for spray area and time provided the following results: For a spray area of 900 sq. ft, the time was 37.4 seconds; for 1800 sq. ft, the time was 74.8 seconds; and for 2700 sq. ft, the time was 112.2 seconds. The actual field capacity is (0.8048 ha/hr), while the theoretical field capacity is (0.8261 ha/hr). The application rate is (362.8772 L/ha), and the field efficiency is (97.42%) (Table 6).

Table 6. Performance efficiency of the prototype.

TRIALS	SPRAY AREA (sq. ft)	TIME (sec)
1	900	37.4
2	1800	74.8
3	2700	112.2
Actual Field Capacity (ha/hr)	0.8048	
Theoretical Field Capacity (ha/hr)	0.8261	
Application Rate (L/ha)	362.8772	
Field Efficiency (%)	97.42	

DISCUSSION

The mechanized onion sprayer received exceptional overall acceptability, reflecting strong approval across various evaluated aspects. This finding is consistent with studies on improved sprayer designs, such as Ahmad et al. (2021), which also reported high user satisfaction with advanced sprayer models. The sprayer's high acceptability in terms of functionality, durability, safety, and mobility underscores its user-friendliness, robust construction, ease of handling, and commitment to user safety. These results suggest that the sprayer is well-suited to meet the needs of farmers, potentially enhancing work efficiency and reducing labor.

The discharge rate of the nozzle spray meets the standards set by PAES 157:2011 and 158:2011, which mandate a minimum discharge rate. This high performance indicates that the

sprayer is efficient and effective, aligning with industry guidelines and contributing to improved agricultural practices (Vala & Yadav, 2023).

The noise levels emitted by the prototype power sprayer, which ranged from 76 dB to 86 dB at various distances. These levels are well below the maximum permissible limit of 92 dB specified in PAES 157:2011 and 158:2011. This compliance indicates that the prototype is suitable for use in agricultural settings without exceeding noise regulations, suggesting its practicality for field use.

The fuel consumption of the mechanized onion pesticide sprayer during the trials. The average fuel consumption rate was 0.0404 milliliters per minute, as measured before and after each test in accordance with PAES 157:2011 and 158:2011. This metric is crucial for understanding the sprayer's operational efficiency and cost-effectiveness, providing valuable insights for farmers and agricultural professionals in managing fuel use and overall operational costs.

The spray range of the nozzle, with an average coverage area of 4.18 square meters. This measurement aligns with PAES 157:2011 guidelines, which emphasize the importance of evaluating the distance of spray droplets. Accurate wind speed measurements at the test site further ensured the reliability of the results, highlighting the sprayer's effectiveness in covering target areas.

Field performance shows that the sprayer completed tasks in under 40 seconds for each 900 sq. ft. area, achieving an actual field capacity of 0.8048 ha/hr and a theoretical field capacity of 0.8261 ha/hr. The application rate was 362.8772 L/ha, with a utilization rate of 97.42%. These results indicate that the sprayer operates efficiently under real-world conditions, though factors such as cost and maneuverability should be considered for a comprehensive evaluation.

Despite the positive outcomes, this study acknowledges some limitations. The testing was conducted under controlled conditions that may not fully represent the variability of real-world agricultural environments. Additionally, the sample size and geographic scope of testing could be expanded to further validate the findings across different settings and crops.

The sprayer's high performance and compliance with industry standards suggest it has significant potential for adoption in agricultural practice. Its efficiency in fuel consumption, noise reduction, and effective spray coverage contribute to its practicality for enhancing farming operations. Future research could explore the long-term durability of the sprayer and its performance in diverse agricultural contexts to ensure its suitability for widespread use.

CONCLUSION

The development of the mechanized onion pesticide sprayer involved thorough planning and construction to ensure it met standards for materials and components. Extensive testing was conducted to evaluate its performance in terms of functionality, durability, safety, and mobility, ultimately confirming its effectiveness and efficiency for its intended purpose. The efficiency tests demonstrated that the sprayer can efficiently cover large areas and effectively apply pesticides. Furthermore, an operational manual was developed to provide users with clear instructions on how to operate the sprayer safely and efficiently and maintenance procedure was also provided to prolong the life of the prototype. Overall, the comprehensive approach has resulted in the creation of a reliable and effective tool for pesticide application in onion fields, promising improved outcomes for farmers. Lastly, the mechanized onion sprayer demonstrates strong performance across key parameters, with notable compliance with

industry standards and practical benefits for farmers. Continued evaluation and refinement will further establish its role in advancing agricultural technology.

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RESEARCH ARTICLE

PERFORMANCE EVALUATION OF PORTABLE ONION STORAGE SYSTEM

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ABSTRACT

This study utilized a longitudinal design to assess the performance of a semi-automatic onion storage system over a 160-day period, from May to October. The aim was to evaluate various aspects of onion preservation, including physiological weight loss, sprouting, bulb rot, marketability, power consumption, and environmental conditions. The prototype, which can store onions for up to 160 days and effectively fulfills its intended purpose as well as the needs of onion farmers regarding storage, was successfully created, built, and extended the shelf life of onions by the researcher. The evaluation's tests proved the prototype's excellent ability to extend onions' shelf lives, demonstrating remarkable technical developments that provide growers of onions the choice between automatic and manual operating modes. Moreover, the integration of automated dehumidifier control and solar energy usage makes the system sustainable and effective while significantly reducing energy consumption. The comparative analysis showed that the created machine was more efficient than the untreated fan. Based on these findings, the system is practical for improving onion storage, thereby transforming current cold storage practices.

Keywords: *portable onion storage system, onion farmers, onion, prototype, automated*

INTRODUCTION

Onions are a crucial crop valued for their flavor, pungency, and culinary versatility (Lawal et al., 2019). Traditionally grown for both domestic consumption and export, global onion production has seen a significant increase, rising by 51.6% from 33 million tons in 2003 to 64 million tons in 2007 (Food and Agriculture Organization of the United Nations, 2012). In the Philippines, nearly 22 provinces contribute to onion production, with Regions III, I, II, VI, and IV-B being major producers of four onion varieties: Red Creole, Yellow, Granex, and Shallots/Multipliers (Department of Agriculture – Philippine Rural Project, 2021). Production of onion in the second quarter of 2023 was recorded at 84.90 thousand metric tons. This was 3.4 percent higher than the previous year's same quarter output of 82.08 thousand metric tons. Among the regions, MIMAROPA Region was the top producer of onion during the quarter with a production of 46.94 thousand metric tons or 55.3 percent share to the total (Philippine Statistics Authority, 2023).

Despite its value, managing onion supply has become increasingly difficult. Challenges include natural disasters, declining farming enthusiasm, disorganized commodity movement, and post-production delays (Calicia & Cabayanan, 2018). Effective storage is crucial to extend shelf life and minimize quality and quantity losses. Although onion bulbs act as natural food reserves, they are susceptible to damage from soil-borne pathogens, affecting growth and sprouting. Ideal storage conditions require a temperature of 25°C - 30°C and relative humidity of 65% - 70%. Inefficient pre- and post-harvest management, poor storage environments, and unpredictable climatic conditions contribute to storage losses in tropical regions, which can range from 30% to 40% (Tripathi & Lawande, 2019).

To address these challenges, various storage solutions have been explored. Cold storage facilities effectively prolong onion shelf life but are expensive and inaccessible for many farmers. This has driven the development of cost-effective and energy-efficient alternatives. Recent research has investigated ambient and controlled temperature storage systems with natural ventilation. For example, Shankar, Thirupathi, and Venugopal (2017) described a farm ventilated storage system using wooden poles and dried coconut thatch for roofing, providing natural ventilation. Falayi and Yusuf (2014) designed a modified wooden storage structure in Nigeria, optimized for wind direction and ambient conditions. In the Philippines, the Department of Agriculture introduced non-refrigerated storage systems in 2013, including the Hanger Ambient Storage (HAS) and High-Temperature Storage (HTS). The HAS features a two-story structure with a wooden slat floor and steel screen walls for optimal air circulation (Idago et al., 2015). The HTS is a tunnel-type structure designed for high-temperature storage. Both systems can extend onion storage life but are limited to approximately three months.

San Jose in Occidental Mindoro is a major contributor to the province's onion production. However, many local farmers, who are small to medium-scale operators, lack access to expensive cold storage facilities. Consequently, they often sell onions immediately after harvest, limiting their profit potential. The main objective of the study is to evaluate the effectiveness of a semi-automatic storage system for onions by examining its impact on physiological weight loss, sprouting, bulb rot, marketability, power consumption, and

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

environmental conditions over a 160-day period. The study aims to identify key factors influencing onion preservation and propose improvements for optimizing storage conditions to extend shelf life and minimize losses.

MATERIALS AND METHODS

Research Design

This study utilized a longitudinal design to assess the performance of a semi-automatic onion storage system over a 160-day period, from May to October. The aim was to evaluate various aspects of onion preservation, including physiological weight loss, sprouting, bulb rot, marketability, power consumption, and environmental conditions.

Data Collection

Data collection systematically monitored key aspects of onion storage to assess the semi-automatic system's performance. Weekly physiological weight loss was tracked using a digital scale, with losses calculated as a percentage of the initial weight. Sprouting was measured bi-weekly by weighing sprouted bulbs and calculating their percentage relative to total weight. Bulb rot was evaluated every two weeks, with rotting bulbs weighed and expressed as a percentage of the initial weight. Monthly assessments of marketable bulbs determined the weight of onions suitable for sale, and marketability was calculated as a percentage. Power consumption was documented monthly, tracking electricity usage by fans, dehumidifiers, and the system overall. Temperature and humidity were recorded three times daily (3 am, 12 pm, 9 pm) using data loggers to monitor fluctuations and trends. This comprehensive approach ensured accurate evaluation of the storage system's effectiveness in preserving onion quality.

Data Analysis

Data analysis evaluated the performance of the semi-automatic onion storage system and its impact on preservation factors. Descriptive statistics, including means, standard deviations, and percentages, summarized physiological weight loss, sprouting, bulb rot, marketability, power consumption, and environmental conditions. Weekly trends in physiological weight loss were plotted to identify patterns and fluctuations, while sprouting and bulb rot progression were correlated with storage conditions. Monthly marketability data tracked changes in the weight of marketable onions. Power consumption was analyzed for energy efficiency and its relation to environmental factors. Temperature and humidity trends were assessed for their effects on preservation. A comparative analysis against benchmarks and previous research highlighted the system's effectiveness and areas for improvement.

RESULTS

Physiological loss

The physiological loss in weight of onions shows a general increasing trend from May to October, reaching a peak in August before showing some reduction towards the end of the period. The total loss of 38.25 kg, which translates to 18.21% of the total weight, highlights a

significant loss over the 160 days, suggesting potential issues related to storage conditions, handling, or intrinsic physiological factors (Table 1).

Table 1. Physiological loss in weight in 160 days (May-October).

WEEK	PHYSIOLOGICAL LOSS IN WEIGHT (KG)	PERCENTAGE (%)
1	0.00	0.00
2	0.00	0.00
3	0.00	0.00
4	1.45	0.69
6	4.20	2.00
8	4.10	1.95
10	4.40	2.09
12	4.30	2.04
14	5.20	2.47
16	4.10	1.95
18	3.50	1.66
20	4.90	2.33
22	2.10	1.00
Total	38.25	18.21

Sprouted bulbs

The result shows a gradual increase in the weight of sprouted bulbs from May to October, peaking in August at 0.5 kg and lowest in May at 0 kg. No sprouted bulbs were seen in May and June. This suggests stored onions began growing over time. The total weight of sprouted bulbs over five months was 1.9 kg, about 0.94% of the total. This small percentage indicates weight loss due to sprouting during storage, highlighting the need for monitoring to maintain product quality and minimize losses.

Table 2. Percentage of sprouted bulbs in 160 days (May-October).

WEEK	SPROUTED BULB (KG)	PERCENTAGE (%)
1	0.0	0.00
2	0.0	0.00
3	0.0	0.00
4	0.0	0.00
6	0.0	0.00
8	0.0	0.00
10	0.5	0.23
12	0.4	0.19
14	0.0	0.00
16	0.3	0.14
18	0.3	0.19
20	0.1	0.05
22	0.3	0.14
Total	1.9	0.94

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

Bulb rot and Marktable Bulb

The results show the onion decay during storage. The highest rot, 2.90 kg, was in September. The total rotten bulb for five (5) months was 22.35 kg, accounting to 10.64% of the initial weight. It was observed that no rotten bulb was observed in May, suggesting favorable conditions. A sudden increased was observed in July with 2.40 kg (1.14% of initial weight). The highest weight of rotten bulb was collected during September and may be attributed to the decrease in humidity during the rainy season. Furthermore, in May, 210 kg was initially placed in the developed onion storage. After six months of storage, only 147.50 kg of onion were considered as marketable accounting to 70.24% of the initial weight. The decreased was likely due to natural weight loss influenced by factors like temperature and humidity. The study suggests operational or environmental factors impacted onion quality, with increasing weight loss and rotting over time (Table 3).

Table 3. Percentage of bulb rot and marketable bulbs in 160 days (May-October).

Week	BULB ROT		MARKETABLE BULBS	
	Weight (kg)	Percentage (%)	Weight (kg)	Percentage (%)
1	0.00	0.00	210.00	100.00
2	0.60	0.28	209.40	99.71
3	0.90	0.42	208.50	99.29
4	1.05	0.50	206.00	98.10
6	2.30	1.09	199.40	94.95
8	2.00	0.95	193.00	91.90
10	2.40	1.14	185.50	88.33
12	2.00	0.95	178.70	85.10
14	1.30	0.61	172.00	81.90
16	2.20	1.14	165.20	78.67
18	2.20	1.05	159.00	75.71
20	2.90	1.38	152.10	72.43
22	2.50	1.19	147.50	70.24
Total	22.35	10.64	147.50	70.24

Power consumption

Results show power consumption from May to October, the including fan and dehumidifier usage, and electricity bills. The kilowatt data indicates energy efficiency, crucial for comparing to traditional cold storage. The total power consumption is 671 kW.; the fluctuations in fan and dehumidifier usage and bills show monthly variations, influenced by weather and operational needs (Table 4).

Table 4. Power consumption during the 6-month storage period.

MONTH	FAN CONSUMPTION (KW)	DEHUMIDIFIER (KW)	ELECTRICITY BILL (KW)
May	50	60	110
June	60	80	140
July	68	65	133
August	53	67	120
September	60	70	130
October	18	20	38
Total	309	362	671

Temperature and humidity level

Result shows the temperature and humidity changes over 160 days, the key for onion storage. These factors are crucial for regulating the system effectively, guiding adjustments based on weather. The monitoring was done every 3 am, 12 pm, and 9 pm to capture the daily trends for diverse data analysis. The weather, particularly in wet seasons, affects power consumption. The humidity decreases with rising temperature and vice versa. The high humidity (peaking at 87%) can mislead due to equipment issues. Unstable conditions affect system power use, potentially compromising efficiency. Considering environmental factors in system design ensures optimal performance, preserving onions effectively (Figure 1).

(a) (b)

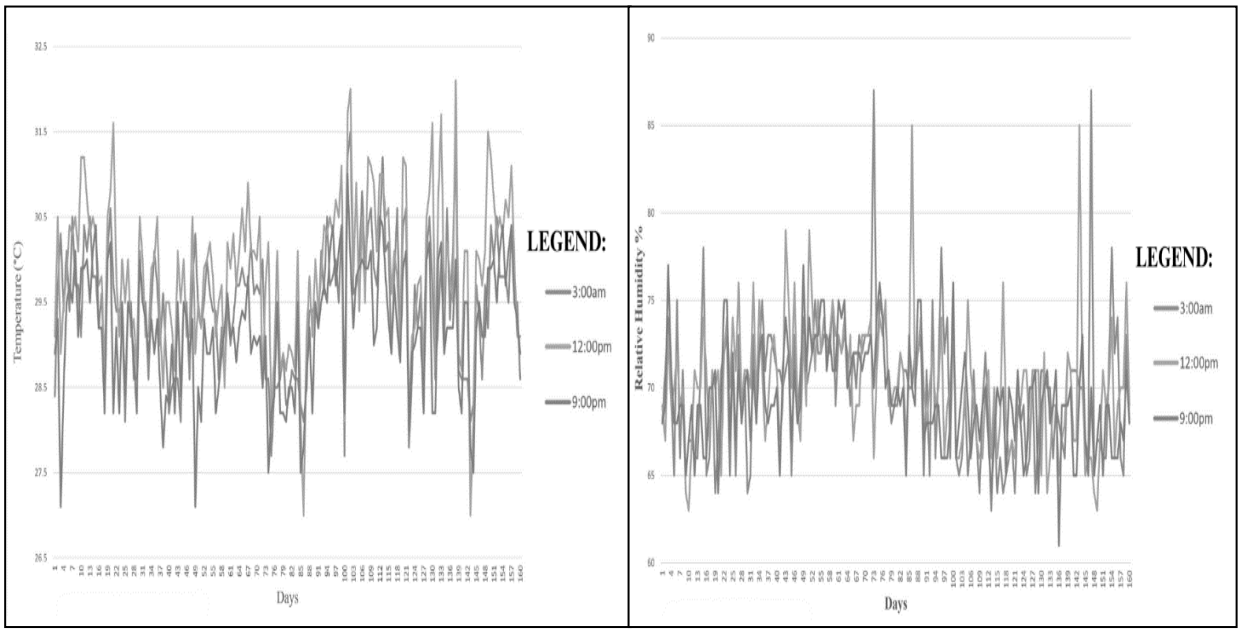

Figure 1. Monitoring of (a) temperature and (b) humidity in the developed onion storage

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

DISCUSSION

The data presented highlights the physiological weight loss in onions over 160 days, offering insights into the dynamics of dehydration throughout the storage period. This aligns with findings by Lawal et al. (2019), emphasizing the significance of understanding weight reduction patterns for effective agricultural planning. The study also underscores the importance of monitoring sprouting, as indicated by the work of Calicia & Cabayanan (2018), to mitigate losses and maintain product quality. Additionally, observations on onion decay, supported by the research of Kiran et al. (2024) and Falayi & Yusuf (2014), emphasize the necessity of implementing appropriate storage and handling practices to minimize spoilage.
Moreover, the study clarify the relationship between environmental factors and onion storage, echoing the findings of the Food and Agriculture Organization of the United Nations (2012) considering various conditions affect the quality, shelf life, and marketability of onions. These factors are crucial in ensuring that onions remain in good condition during storage, preserving their quality and reducing losses due to spoilage. The fluctuation in temperature and humidity levels, as discussed by Tripathi & Lawande (2019), underscores their critical role in influencing power consumption and ultimately the efficiency of storage systems. By considering such environmental factors, as recommended by Idago et al. (2015), onion storage systems can be optimized for enhanced reliability and effectiveness, thereby improving onion preservation and minimizing losses.

Idago et al. (2015) highlight the significance of physiological weight loss in onion storage. Dehydration affects quality and yield, urging farmers to manage crops effectively. Their study underscores the importance of understanding and quantifying these losses for optimizing production and reducing post-harvest losses.

The presence of sprouted bulbs in stored onions, as observed in the study, aligns with Naqash et al. (2021) findings, indicating a progression in onion physiology during storage. Monitoring sprouting trends is crucial for onion management to prevent quality deterioration and losses. Table 2 shows the percentage of sprouted bulbs in 160 days.

Isma'ila et al. (2017) highlight bulb rot's significant impact on onion storage, leading to economic losses. They likely explore its causes like fungal infections and environmental factors. Understanding these mechanisms is key for farmers to implement preventive measures such as proper storage and fungicide use, ensuring crop protection and market value preservation. Marketable bulbs play a crucial role in the onion industry, representing the subset of bulbs deemed suitable for sale and consumption. Eriballo et al. (2021) explore the significance of marketable bulbs in the onion industry, focusing on factors like size, shape, color, and quality. Understanding these factors helps optimize cultivation and post-harvest practices to meet market standards, benefiting both producers and consumers. Table 4 shows the result of the marketable analysis of stored onion after 160 days.

The study on onion storage power consumption, echoing SEforAll (2018), emphasizes energy efficiency's pivotal role in agriculture. The study underscores the importance of optimizing energy efficiency in storage facilitie. This aligns with global efforts for sustainable energy practices, advocating tailored strategies to minimize power consumption while

maintaining effective storage conditions. Table 5 shows the power consumed during the storage period.

The study by Kelyaum et al. (2019) provides valuable insights into the intricate relationship between temperature and humidity in storage environments, particularly concerning onion preservation. Understanding these dynamics is crucial for maintaining optimal conditions that prolong onion shelf life and minimize spoilage. By examining the findings of Kelyum et al. (2019), the variations in temperature and humidity levels impact the efficacy of storage systems, influencing factors such as power consumption and overall efficiency. Incorporating these insights into the design and operation of onion storage facilities can ensure better control over environmental conditions, leading to improved preservation outcomes and reduced losses.

CONCLUSION

The researchers develop an alternative storage for onion by using semi-automatic functions to extend the shelf life of onions. The three key elements make up this new approach: a reliable power backup system, a powerful dehumidifier with automated input/output features, and an advanced primary control panel for the motor. The system provides improved operating efficiency and offers a workable answer for extending the shelf life of stored onions by smoothly integrating these components.

Researchers meticulously prepared an operation manual for users, which offered comprehensive guidance on operating the prototype. Users can understand and implement the system through this resource, improving its functionality and efficiency.

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Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

IMPLEMENTING GUIDELINES IN WRITING AND CONDUCTING UNDERGRADUATE AND GRADUATE RESEARCH

I. Requirements before Enrolling Undergraduate Research

1. The student must have passed English 10 or its equivalent (Methods of Research/Technical Writing for BAT) where a research proposal is required and completed (Chapters 1-3).
2. The student must have an adviser of his/her choice or designated by the Research Chair. The adviser has technical knowledge of the research topic the student is pursuing.
3. The student must have successfully defended his/her research proposal before a panel on pre-oral defense.
4. The student reports regularly to his/her adviser for direction and guidance in the conduct of his/ her research.
5. A consultation sheet is secured from the Chair's Office where records of the transaction or consultation with the adviser are reflected for purposes of monitoring and supervision.
6. A certificate of Ready for pre-oral/final defense signed by panel member, critic reader, statistician and financial critic must be secured by the students before the pre-oral or final defense.
7. The student must provide panelists copies of the manuscript at least one week before the final defense.

II. Thesis Adviser

1. The student has the option to choose an adviser from the list of advisers provided by the Research Chair. The thesis adviser chosen by the student has technical knowledge regarding the research problem he/she is pursuing. If possible, the adviser and the advisee must have the same field of interest/specialization.
2. The thesis adviser should be a permanent faculty or employee of the Institution, if possible.
3. In cases where students cannot choose an adviser, the Research Chair will designate an adviser based on the adviser/student's specialization/major.
4. In case the student changes his/her adviser for any acceptable reason, a permit to change adviser must be secured from the Research Chair. Both the "changed" adviser and the new adviser must affix their signature on the permit.

III. Selection of the Members of the Panel, Data Analyst, Financial Critic, and Critic Reader

1. The student is free to choose at most three members of the panel who have technical knowledge on the research he/she is pursuing, one statistician, one financial critic, and one critic reader.
2. The student selects from the list of panel members, statistician, financial critic, and critic reader provided by the Research Chair.

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

IV. Role of a Thesis Adviser

1. The adviser is a faculty member of the Academic Department who provides guidance and direction, encouragement, and motivation to his/her advisee in the process of thesis writing.
2. He/she recommends the manuscript for oral defense and signs a particular form for this purpose. The adviser sees to it that his/her advisee is prepared for the oral defense.
3. He/she guides and briefs the advisee on the mechanics of oral defense and prepares him/her on what to expect during the proceeding.
4. He/she must be present during the oral defense but should refrain from answering questions for the advisee or negate views of the members of the panel. He/She may clarify or simplify questions for the advisee and take down notes on suggestions and recommendations.
5. He/she makes concrete suggestions and acts promptly and wisely on parts of the manuscript which require correction or revision. He/She sees to it that his/her advisee follows the prescribed format in writing the manuscript.
6. He/she monitors the progress of the research work of his/her advisee. Members of the panel should also help the adviser in ensuring that the advisee does what is expected of him/her.
7. He/she certifies the approval of the final manuscript.

V. Role of the Members of the Panel

1. The panel members assess the research papers and give comments, suggestions, and recommendations for the improvement of the research paper.
2. They may approve/disapprove the research proposal. Disapproved paper means it has not satisfactorily met the basic requirements of a good research paper.
3. They help monitor the student's research work in coordination with his/her adviser.
4. They evaluate and rate the paper using standard criteria as part of the computation of final grade in Methods of Research or Thesis Writing.
5. They certify the approval of the final manuscript.

VI. Role of a RECO Member

1. The RECO member is a staff of R&D Unit/representative from the pool of experts and is duly designated by the R&D Director.
2. The RECO member is a regular member of the panel during the pre-oral and final defense. He/She informs the new trends in research undertakings.
3. He/she helps monitor the student's research work in coordination with his/her adviser.
4. He/she evaluates and rates the paper using standard criteria as part of the computation of final grade in Methods of Research or Thesis Writing.
5. He/she endorses a student's research proposal for possible funding in the R&D Unit.
6. He/she certifies the approval of the final manuscript.

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

VII. Role of a Statistician

1. The statistician guides the student in the use of appropriate statistical tools for his/her research paper.
2. He/she gives advice in data encoding and interpretation of the research results.
3. He/she certifies the correctness of the methodology and statistics used in the research manuscript.

VIII. Role of a Critic Reader

1. The critic reader must proofread the manuscript.
2. He/she certifies the correctness in the writing of the manuscript.

IX. Role of a Research Chair

1. The Research Chair helps in implementing policies on the conduct of thesis research paper.
2. He/she prepares the schedule of the pre-oral and final defense.
3. He/she certifies the approval of oral defense of the students.
4. He/she acts as the Chair of the research panel.
5. He/she performs research monitoring in coordination with the adviser.
6. He/she consolidates the evaluation sheets as a basis of grade or rating of the students.
7. He/she certifies the approval of the final manuscript.

X. Requirements for Oral Defense

1. The student must have a written recommendation from his/her thesis adviser in terms of his/her readiness/preparedness for the oral defense.
2. The student must have a certification from the Statistician/Financial Critic as to the approval of statistical/financial requirements of his/her paper.
3. The student must have a certification from a critic reader as to the appropriate grammar and language use.
4. The student must likewise have an approval from the Methods of Research Instructor and Department Chair prior to his/her oral defense.
5. Required copies of the research papers should be submitted at the Research Office with the adviser's certification at least one week before the scheduled defense.
6. The students who failed to defend his/her thesis on schedule will not be allowed to conduct off-campus practice teaching and will not be included in the list of graduating students.

XI. Decorum in the Conduct of Oral Defense

1. The student must be in proper attire.
2. The members of the panel must be in semi-formal or formal attire during oral presentation.
3. The audience must observe silence throughout the presentation.

Vol. 3, No. 1, June 2024 | pISSN:2980-4523 | eISSN: 3027-9054

XII. Submission Procedures

1. Students who failed to defend his/her thesis on schedule will only be allowed to conduct OJT/RLE activities within OMSC Offices/Department/Unit.
2. The deadline for submission of loose-leaf theses and is at least one workweek before the last day for the submission of grades for graduating students to provide sufficient time for binding. For example, if the deadline for submission of grades is May 7, theses must be approved for binding before April 30.
3. Undergraduate theses must be hardbound using green leatherette with gold lettering.
4. To facilitate future open-access repository, digital copy of theses must be submitted to the College Research Coordinator for safe keeping. With file name: College_Year of Graduation_Last Name of the First Author_Title of Thesis
   Example: CTE_2023_Dela Cruz_Case Study of Occidental Mindoro State College
5. An undergraduate student should submit the following to the College: Four hardbound copy for the department, library, adviser, and student. One digital copy (in PDF with scanned copy of the signed documents) for the department.
6. Addition of Permission Page (Republic Act No. 8293 - Intellectual Property Code of the Philippines). Theses will be classified into one of only four categories:
   - I: has patentable or registrable invention or registration
   - P: author wishes to publish the work personally
   - C: confidential information of a third party is embedded
   - R: a regular work, i.e., it has no patentable invention or creation, the author does not wish for personal publication, there is no confidential information.

XIII. Contents

CHAPTER I: INTRODUCTION
- Background of the Study
- Objectives of the Study
- Significance of the Study

CHAPTER II: REVIEW OF RELATED LITERATURES
- Related Literature
- Theoretical Framework
- Conceptual Framework
- Operational Definition
- Hypothesis/Assumptions

CHAPTER III: RESEARCH METHODOLOGY
- Study Design
- Study Setting – This may be applicable only to some studies.
- Unit of Analysis and Sampling
- Research Instrument

- Data Collection Procedure
- Data Processing and Analysis
- Scope and Limitations
- Ethical Considerations

CHAPTER 4: RESULTS AND DISCUSSION

- Results
- Discussion

CHAPTER V: CONCLUSIONS AND RECOMMENDATIONS

- Conclusion
- Recommendation

REFERENCES
APPENDIX (categorized as A,B,C etc.)
A. Communication/Permit to Conduct the Study
B. Research Instrument Use Permission
C. Research Instruments
D. Pictures/Plates
E. Originality Report
F. Researcher's Profile

Effectivity: starting First Semester, Academic Year 2023-2024

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