EFFECT OF MYCOLOGICALLY FERMENTED AZOLLA USING YEAST (*Saccharomyces cerevisiae*) ON THE GROWTH PERFORMANCE, CARCASS YIELD, FEED UTILIZATION AND ECONOMIC ANALYSIS OF BROILER CHICKEN

AN UNDERGRADUATE THESIS

Presented to the Faculty of
College of Agriculture and Forestry
MISAMIS UNIVERSITY – Ozamiz City
H.T. Feliciano St., Aguada, Ozamiz City, Misamis Occidental

In Fulfillment
of the Requirements for the Degree
Bachelor of Science in Agriculture (BSAg)

ERICK B. ARANAS
JENNICEL L. CAPAPAS
SERGEI S. RATO

May 2026

CERTIFICATE OF PANEL APPROVAL

This research paper, entitled **"EFFECT OF MYCOLOGICALY FERMENTED AZOLLA USING YEAST (*Saccharomyces cerevisiae*)"**, prepared and submitted by ERICK A. ARANAS, SERGEI S. RATO, JENNICEL P. CAPAPAS, in fulfillment of the requirements for the degree of **Bachelor of Science in Agriculture,** has been examined and is recommended for acceptance and approval.

GETHER P. ENARIO, Ph.D.
Instructor-Adviser
06/01/2026
Date

Approved by the Committee of Oral Examination with a grade of ***Passed.***

OLIVER S. TALIP, Ph.D.
Chairman
06/01/2026
Date

YUNALYN VILLANTES, Ph.D.
Member
6/1/26
Date

FOR. BOBBY ALAMAN, MPM-BCM
Member
06/01/2026
Date

Accepted and approved in fulfillment for the degree Bachelor of Science in Agriculture.

OLIVER S. TALIP, Ph.D.
Dean, College of Agriculture and Forestry
06/01/26
Date

Dedication

This research is fully dedicated to our parents, who have always supported us financially, emotionally, spiritually, and morally. They have inspired us and given us courage when we felt like giving up. To our classmates, mentors, friends, family, and siblings who offered guidance and motivation to complete this study.

Finally, we dedicate this book to the All-Powerful God, to whom we are grateful for our protection, abilities, strength, and guidance, as well as for providing us with a healthy life. We offer you all of these.

Erick
Sergie
Jennicel

ACKNOWLEDGEMENT

The researchers wish to express their profound gratitude to all those who provided the support, guidance, and encouragement necessary to complete this undergraduate thesis. First and foremost, they acknowledge the Almighty God for granting them the strength, wisdom, and perseverance required throughout this study. They extend their heartfelt appreciation to their thesis adviser, whose unwavering mentorship and constructive feedback were vital in shaping the research, as well as to the panel members and statistician for their critical evaluations and expert input.

Sincere appreciation is also extended to the faculty and staff of the College of Agriculture and Forestry at Misamis University for their technical assistance and for providing access to essential resources. The researchers are equally grateful to their families for their enduring patience and moral support, which served as a constant source of strength. They also thank their friends and classmates for their camaraderie and hands-on help during the demanding phases of fieldwork and data collection.

Their dedication to the agricultural field remains a driving force in the pursuit of knowledge that leads to practical and meaningful applications. This academic milestone is a testament to the collective support and dedication of these individuals and institutions, without whom this accomplishment would not have been possible.

Erick
Sergei
Jennicel

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ABSTRACT

This study assessed the effects of Saccharomyces cerevisiae fermentation and Azolla inclusion (0–15%) on broiler growth performance, feed intake, carcass traits, and economic performance. Farmers currently have little knowledge about the practical application and fermentation of Azolla as a feed ingredient in broiler production, despite the growing interest in alternative feed resources to lower production costs. A fully randomized design with a 4 × 2 factorial layout was employed. The findings indicated that while higher inclusion levels tended to result in somewhat lower final weight, weight gain, and profitability, Azolla inclusion had no discernible impact on growth performance, feed consumption, carcass characteristics, or economic factors. This suggests that adding Azolla to broiler feed won't negatively affect the birds' overall performance. Saccharomyces cerevisiae supplementation, on the other hand, only marginally and non-significantly enhanced feed consumption, carcass characteristics, and economic returns, but it considerably increased final weight and weight gain. This implies that, under the study's settings, yeast has a favorable impact on growth performance but no effect on other measures. Across all assessed variables, the interaction between Azolla incorporation and yeast fermentation was not significant, suggesting that there are neither antagonistic nor synergistic effects when the two treatments are combined. In conclusion, while yeast supplementation may improve growth performance but does not significantly improve feed efficiency, carcass characteristics, or economic profitability, Azolla can be used as a feed ingredient up to 15% without detrimental consequences. The results of this study could provide farmers with more details on the potential application of fermented Azolla as a cost-effective, alternative feed source for broiler production.

Keywords: conversion, percentage, significant, supplementation

INTRODUCTION

Background of the Study

The Philippines poultry industry sector provides food security and livelihoods and makes a substantial economic contribution to the nation (Ortega et al., 2021). This industry, which includes native, layer, and broiler chickens, is one of the fastest-growing in Philippine agriculture. With a share distribution of 22.3% for layered chicken, 34.7% for broiler, and 43% for native/improved chicken, the entire chicken inventory in 2023 amounted to 202.82 million birds.

The Philippines is still largely dependent on imports for feed raw materials. However, the sector is having difficulties with the high cost of feed ingredients (Shirisha & Mohanty, 2017). Corn, soybean meal, and fish meal are among the approximately four million metric tons of animal feed components that the Philippines imported in 2018 (Tan, 2024). Poultry producers and customers are suffering as a result of rising feed costs, which raises the cost of livestock and poultry products (Eardly, 2022; Reeve, 2021).

Due to the current economic crisis, farmers have increasingly utilized alternative feed ingredients to reduce the cost of poultry feed (Ito, 2024). According to previous estimates, feed accounts for approximately 70% of the total production costs in chicken farming (Oladokun & Johnson, 2012). Alternative feeds will undoubtedly lower production costs and increase the profits of chicken breeders. It is possible to employ locally accessible alternative feeds such as copra flour, maize, Azolla, and moringa

Alshelmani et al., 2021). The difficulty with feed formulation based on substitute feed is that their nutritional content is lower than that of conventional feeds.

The aquatic fern Azolla has a high nutritional profile, making it an intriguing addition to chicken feed. It contains large amounts of important amino acids, minerals, vitamins A, B12, and β-carotene, as well as protein (20.4% to 35%) (Kathirvelan et al., 2015; Swain et al., 2022) claimed that Azolla can improve the feed conversion ratio when added to chicken diets. Its low lignin content, which increases digestion, makes it a good feed substitute (Kathirvelan et al., 2015). Azolla has numerous pharmacological properties in addition to its nutritional value, including antioxidant, hepatoprotective, and immunostimulatory activities. However, the nutrient composition of Azolla is much lower than that of traditional feed ingredients. Thus, the need to increase its nutrient composition is important.

A potential way to increase the nutritional value of poultry feed is by mycological fermentation, which uses fungus to ferment feed (Imelda et al., 2008). Using enzymes produced by fungi like yeast (*Saccharomyces cerevisiae)*, this mechanism breaks down complex carbohydrates and organic substances in the feed that would otherwise be difficult to digest. Sun et al. (2023) state that lignin and non-starch polysaccharides (NSP) such as cellulose, pectin, gums, glucans, mucilages, inulin, and chitin are examples of complex carbohydrates. They also make up a significant portion of the dietary fiber component in plant-based feed ingredients like Azolla aquatic fern.

Yeast-based feed additives offer a number of benefits for chicken health and productivity. Saccharomyces cerevisiae, often known as baker's yeast, contains β-glucans and mannan-oligosaccharides that positively affect the immune system, blood parameters, and chicken growth performance Bilal et al. (2020) claim that these additions improved feed intake, body weight gain, and feed conversion ratio while also improving gut morphology. By promoting beneficial bacteria and inhibiting pathogen colonization through competitive exclusion, yeast products alter the gut microbiota (Perricone et al., 2022; Elghandour et al., 2020). Additionally, they improve antioxidant status, increase blood immunoglobulin levels to support immunological function, and improve nutritional digestibility (Bilal et al.).

These dietary fibers are the least digestible constituents of poultry feed, as birds lack endogenous NSPs and lignocellulose-degrading enzymes (e.g., cellulases, xylanases, gluconases, amylase, and protease) (Liu et al., 2022; Karthika Devi et al., 2020). NSP and lignin influence the physiology of the gut and its function, affecting the endogenous secretion of water, lipids, electrolytes, and proteins. It has anti-nutritive effects on nutrient digestion and absorption in poultry (Antoniou et al., 1981; Choct & Annison, 1990; Bedford et al., 1991). However, through fermentation, the metabolites produced and the enzymes secreted enhance nutrient utilization in the feed (Sun et al., 2023). This results in nutritional improvement and enhances the production performance of broiler chickens (Ahmad et al., 2023; Chuang et al., 2020; Ibrahim et al., 2023).

However, there is a lack of locally available feed ingredients for broiler chicken diets that undergo fermentation with yeast (*S. Cerevisiae*). There is a chance to investigate its effect on the growth performance of broiler chickens, as most current research focuses on traditional livestock or laboratory settings. In order to boost the nutritional value of Azolla and improve the production performance of broiler chickens, the study will employ yeast (*S. Cerevisiae*) for mycological fermentation. In order to determine whether mycological fermentation using azolla may improve the growth performance and meat quality of broiler chickens and support the sustainability and productivity of regional poultry industries, this study compares several levels of fermentation using yeast (*S. cerevisiae).*

<u>Significance of the Study</u>

Local farmers who raise chickens are struggling due to rising feed costs. They can address this problem by using locally accessible substitute feed items. However, compared to commercial diets, the nutritional value of those alternative feeds is significantly lower.

Therefore, mycological fermentation using yeast (*S. Cerevisiae*) to enhance the nutritional value of locally sourced feed components on the development performance of broiler chickens will be extremely beneficial to farmers who raise poultry, particularly broiler chickens. Improving the quality of poultry feed is its primary objective, which can help the chickens mentioned above to grow more effectively. Economically speaking, this approach would reduce the need for expensive commercial feeds, lowering production costs and boosting backyard producers' profits. Additionally, this study promotes the preservation and use of regional poultry biodiversity. From a scientific standpoint, it closes a gap in the literature by providing fresh insights into sustainable feed production methods and the use of yeast (*S. Cerevisiae*) in animal nutrition. Furthermore, the results may impact policy choices, and promoting the results may also have an impact on policy choices, encouraging all local farmers as well. This study on the effects of adding different amounts of Azolla fermented with yeast to the diet of broiler chickens is significant for a number of reasons. First, the protein-rich aquatic fern species Azolla pinata can be used as a sustainable poultry feed ingredient. It can improve nutrients that are very important to the development of broiler chickens to meet the desired quality. The Azolla pinnata fern has already been introduced as an alternative that is fed with high nutrient content and minerals, and it can be easily cultured or propagated.

Objectives of the Study

The purpose of the study was to assess the effectiveness of mycological fermentation using yeast *(S. cerevisiae)* in improving the nutritional quality of Azolla and to determine its effects on the growth performance of broiler chickens (*Gallus domesticus*).

Specifically, the study aimed to:

1. determine the growth performance of Broiler chicken fed with dry Azolla (*Azolla pinnata)* with and without fermentation of yeast *(S. cerevisiae*);
2. determine the feed utilization of broiler chicken fed with fermented Azolla with and without yeast;
3. determine the carcass traits of broiler chicken fed with fermented Azolla with and without yeast;
4. determine the economic analysis of broiler chicken fed with fermented Azolla with and without yeast; and
5. determine the interaction between different levels of fermented and unfermented Azolla and yeast supplementation to broiler chickens.

Hypothesis

This study proves the following hypothesis: Null Hypotheses (Ho):

1. There is no significant difference in the growth performance of broiler chickens fed with dry Azolla (*Azolla pinnata)* with and without fermentation of yeast *(S. Cerevisiae*) in terms of initial weight, final weight, and weight gain.

2. There is no significant difference in feed utilization between broiler chickens fed fermented Azolla with and without yeast.
3. There is no significant difference in the carcass traits of broiler chickens fed with fermented Azolla with and without yeast.
4. There is no significant difference in the economic analysis of broiler chickens fed with fermented Azolla with and without yeast.
5. There is no significant difference in the interaction between different levels of fermented and unfermented Azolla with yeast feed in the broiler chicken.

Scopes and Limitations of the Study

The primary goal of this study was to evaluate the feeding management techniques used by broiler chicken raisers in several municipalities in Misamis Occidental. This study set out to determine whether farmers were using commercial or alternative feeds. After the survey was conducted, the main study, which was an experiment, began. It used a 2 × 4 factorial experiment with three (3) replications arranged in a Randomized Complete Block Design (RCBD).

Factor A was the fermentation of dry Azolla aquatic plants with yeast (*S. cerevisiae)* mixing with commercial feed, and Factor B was the feed formulations at any level, which comprises commercial feeds and a combination of dry Azolla aquatic plants without yeast (*S. Cerevisiae*):

Determine the nutritional value of locally sourced feed ingredients through mycological fermentation using yeast (*S. Cerevisiae*). Ascertain the effect of Azolla, both with and without fermentation of yeast *(Saccharomyces cerevisiae*), on broiler chickens growth performance. Ascertain the quality of meat produced from chickens fed these formulated fermented feeds. Assess the economic feasibility of using fermented feeds in comparison.

Azolla plant, fern, and yeast (*S. Cerevisiae*) fermented the produced feeds for three (3) days in order to prepare the feed fermentation. These unfermented and fermented formulations were given to broiler chickens, and their growth performance was tracked for 20 days. The researchers kept track of key performance metrics in terms of(1) determine the growth performance of Broiler chicken fed with dry Azolla (*Azolla pinnata)* with and without fermentation of yeast *(S. Cerevisiae*.)in terms of initial weight, final weight and weight gain, (2) determined the feed utilization of broiler chicken fed with fermented Azolla with and without yeast, (3) determined the carcass traits of broiler chicken fed with fermented Azolla with and without yeast, (4) determined the economics of broiler chicken fed with fermented Azolla with and without yeast, (5) determined the interaction between different level of fermented and unfermented Azolla with yeast fed in the broiler chicken.

Operational Definition of Terms

Azolla (*Azolla pinnata*) is an aquatic fern known for its high protein content and nitrogen-fixing properties. It is considered a potential sustainable feed ingredient for poultry due to its nutritional value and environmental benefits.

Broiler Chickens, commonly known as broiler chickens, are raised with the express purpose of producing meat. They need a balanced diet to support their ideal growth and development due to their rapid growth rate.

Feed is the diet provided to poultry, consisting of grains, protein sources, vitamins, and minerals.

Feed Conversion Ratio (FCR) is a measure of feed efficiency, calculated as the amount of feed consumed per unit of weight gain or eggs produced. Fermentation is a metabolic process that converts carbohydrates into alcohols or organic acids using microorganisms, such as yeast. In this study, fermentation with *S. Cerevisiae* may enhance the nutritional value of Azolla for broiler chickens.

Feed efficiency measures how effectively feed is converted into body weight by broiler chicks. It is a crucial indicator of the economic and environmental sustainability of chicken production and is often calculated as the amount of feed consumed per unit of weight gain.

Growth parameters refer to measurable indicators of growth and development in broiler chickens. This may include body weight gain, feed conversion ratio, feed intake, and other metrics used to assess the effectiveness of dietary interventions on growth performance.

Growth Rate is the speed at which a broiler gains weight, often expressed as grams per day or kilograms per week.

Management Practices use these metrics to monitor the health and performance of their flocks, adjusting feeding strategies, housing conditions, and other management practices to optimize growth.

Mortality refers to the state of being subject to death. It encompasses the inevitability of death for all living organisms. In a broader sense, it also relates to the rate of death within a population, often expressed as the number of deaths per death within a population, often expressed as the number of deaths per unit of population.

Nutrient digestibility is the ability of broiler chickens to break down and absorb nutrients from their feed. Higher nutrient digestibility indicates more efficient nutrient utilization for growth and development.

A probiotic is a living microbe that is beneficial to health when ingested in sufficient quantities. The study's usage of Cerevisiae may function as a probiotic to enhance broiler hens' intestinal health and nutritional absorption.

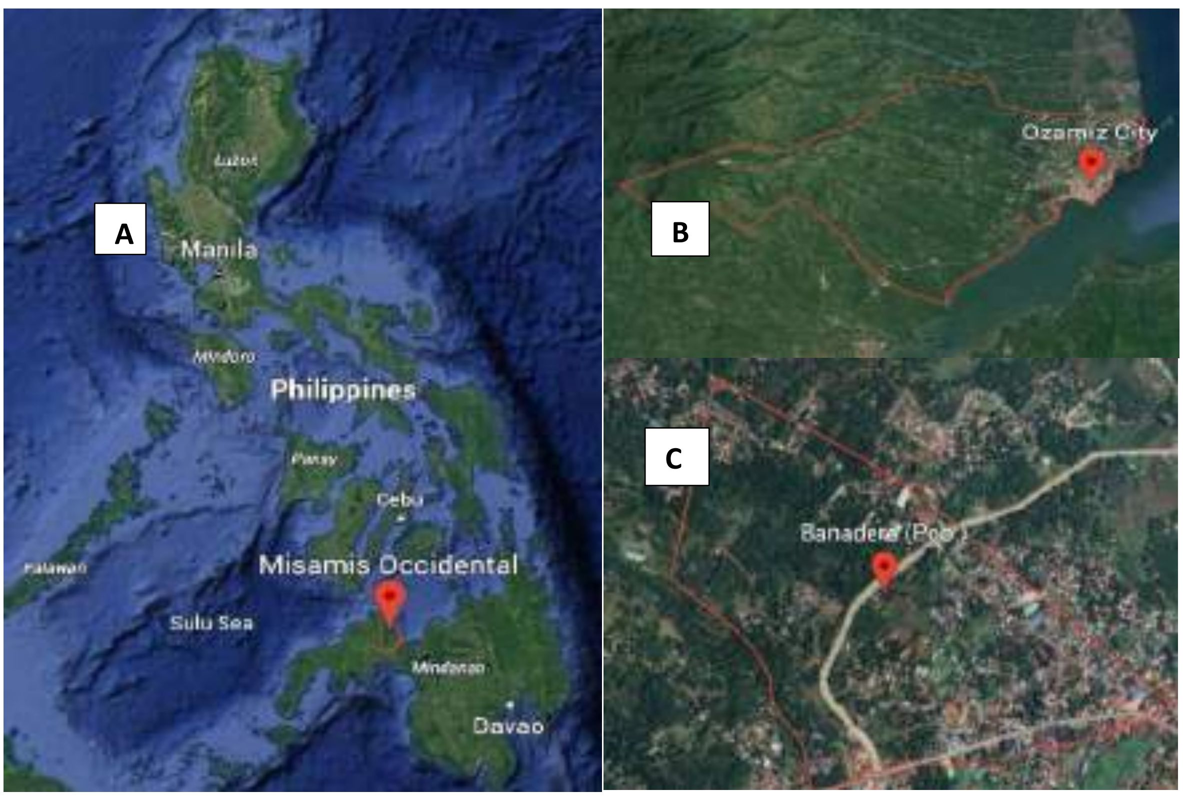
Yeast (*S. Cerevisiae*) is a type of yeast commonly used in fermentation processes. In this study, it is likely used to ferment Azolla, improving its nutritional profile.

MATERIALS AND METHOD

This chapter presents the study's operational framework. It includes the following: the time and place of the study, the experimental design and treatments, the experimental procedure, the data gathered, and the statistical analysis.

Date and Place of the Study

One of the barangays in Ozamiz City, Misamis Occidental, was the site of the experimental investigation from January to April 2025 at the Misamis University Farm Site at Bañadero, Ozamiz City from January to April 2025. (Fig.1)



A. Philippine map highlighting the province of Misamis Occidental
B. Portion of Misamis Occidental map showing Ozamiz city;
C. Aerial view of the experimental site

Materials

The study required one hundred forty-four (144) days old of straight run strain of broiler chicks in same hatching batch, commercial feeds, local feed ingredient (dry Azolla aquatic fern,) vitamins, antibiotics, vaccines, poultry house, brooding cages, yeast for fermenting process, digital weighing scale, record-book and pen, plastic basin, plastic pail, plastic drum, strainer, measuring cup, gloves face masks, net.

Methods

Experimental Design and Treatments

To assure statistical correctness, the study's design was methodically set up in a 4 x 2 factorial experiment using a Randomized Complete Block Design (RCBD) with three (3) exact replications. The fermentation of the commercial feed with yeast (Factor A) and the various formulations of the locally sourced feed ingredients without yeast (Factor B) were the main study factors. Six (6) of the 144 heads of day-old broiler chicks from the same hatching batch were distributed among the experimental replications.

Feed fermentation (Factor A) specifically includes the following treatments: A1 – With fermentation; A2 – Without fermentation of yeast, a biological agent that can very easily be purchased in our local market or grocery stores located throughout our area. The fermentation process is meticulously done after the initial formulation of feeds by the mixing of yeast for a controlled period of 5 days to allow for optimal microbial activity. This structured methodology was implemented to evaluate the potential synergistic effects between fermented commercial feeds and various local ingredient formulations on the overall growth performance of the broilers.

Treatments, Treatments Combination, Treatment Code

For feed formulations (Factor B), Azolla aquatic fern locally sourced feed ingredient was processed and formulated according to different mixes that includes B1 – Commercial Feeds, B2 – 5 percent of unfermented and fermented azolla with yeast and commercial feed, B3- 10 percent of unfermented and fermented azolla with yeast and commercial feed, and B4 – 15 percent of unfermented and fermented azolla with yeast and commercial feed. The feed fermentation either fermented with and or without yeast (Factor A) and also in feed formulation (Factor B) will be fed all throughout within 20 days period of the growing of broiler chickens.

Table 1. Treatments, treatment combinations, and treatment codes of the study on the use of yeast (*S. Cerevisiae*) in mycological fermentation to boost the nutritional content of locally sourced feed ingredients on growth performance.

Feed Fermentation	Azolla level	Treatment Combinations	Treatment Code	Treatment #
A1	B1 – CF 0%	WS-CF Control	A1B1	T1
W/ *S. Cerevisiae*	B2 – 5%	CF-Azolla	A1B2	T2
	B3 – 10%	CF-Azolla	A1B3	T3
	B4 – 15%	CF-Azolla	A1B4	T4
A2	B1 – CF 0%	WoS-Azolla	A2B1	T5
W/out *S. Cerevisiae*	B2 – 5%	CF-Azolla	A2B2	T6
	B3 – 10%	CF-Azolla	A2B3	T7
	B4 – 15%	CF-Azolla	A2B4	T8

A1B1=CF with *S. Cerevisiae* and 0% Azolla, A1B2=5% *S. Cerevisiae* with 5% Azolla, A1B3=*S. Cerevisiae* and 10% Azolla, A1B4=*S. Cerevisiae* and 15% Azolla, A2B1=CF without *S. Cerevisiae* and 0% Azolla, A2B2=without *S. Cerevisiae* and 5% Azolla, A2B3=without *S. Cerevisiae* and 10% Azolla, A2B4=without *S. Cerevisiae* and 15% Azolla.

Experimental Layout

The research employed a 4 x 2 factorial experiment with three (3) replications using a Randomized Complete Block Design (RCBD) using 144 heads of day-old broiler chickens. Eight (8) treatment combinations with six (6) broiler chickens per chickens. Eight (8) treatment combinations with six (6) broiler chickens per treatment make up each block.

Experimental Procedure

Site Selection and Evaluation

The researcher thoroughly evaluated and inspected the specific area where the study was to be conducted. After the formal confirmation of the area, they followed immediately to inspect where the brooding pen and chicken house were to be located to ensure optimal placement. They also closely followed the constructions of the azolla pond where the Azolla plant was to be cultured or propagated with the proper level of soil surface and depth. Then, they started making an Azolla aquatic pond with an area of 5 meters by 10 meters perceptively, then installed a functional trapdoor and put at least 6 inches of tap water and at least one sack of crumbled ruminant manure as essential organic fertilizer, and then put the Azolla plants immediately into the medium. The water of the Azolla Pond was systematically replaced once a month to control the levels of ammonia in the water that could otherwise damage the sensitive azolla plants. They also created a detailed calendar activity for record purposes and to ensure the timely management of all research tasks.

Azolla Production

The Azolla plants propagated in 7 days, so the researcher scheduled collecting them weekly. After the collection, the next procedure was to sundry the collected Azolla plants for at least one day or until they were very dry and put them in a clean plastic drum for fermenting purposes. The estimated amount to be collected as dry azolla plant was 20 to 25 kilos for feed mixing purposes.

Azolla Fermentation

Before the fermentation process, the dry azolla was thoroughly sterilized for at least two hours to eliminate fungi and bacteria. In addition, the researcher conducted a nutrient sample analysis of the dry azolla. In the fermentation process, the researcher provided or secured yeast (*S. cerevisiae)* as a probiotic agent, which was readily available in the local market nationwide. Upon fermentation, the ratio of mixing the ingredients was 500 g: 100 g of yeast (*S. Cerevisiae*), meaning 500 grams of dry Azolla and 100 g of yeast. The mixture was fermented for at least 3 days in a clean plastic drum with a cover. Harvesting was done on the fourth day, and it was ready to use for the said study.

Distribution of Fed

When the ingredients were ready, the researchers prepared the feed computation ratio according to the variable factors to be assessed. The growth differential of broiler chickens fed Azolla fermented with yeast (S. cerevisiae) was evaluated in Factor A. In Factor B, the recommended mixing of various feed levels was prepared as follows: B1: commercial feeds; B2: 5 percent (5%) of fermented and non-fermented Azolla with yeast and commercial feed; B3: 10 percent (10%) of fermented and non-fermented Azolla with yeast and commercial feed; and B4: 15 percent (15%) of fermented and non-fermented Azolla with yeast and commercial feed.

Care and Management Practices

Procurement of Broiler Chicken

One hundred forty-four (144) day-old broiler chicks were purchased from La Purita Breeding Farm in Ipil, Zamboanga Sibugay. Every chick was hatched on the same day to guarantee consistency and dependability during data collecting. In order to avoid problems during the research period, the chicks were also checked to make sure they were clear of any illnesses or infections.

Preparation of Brooding Area

When the chicks arrived, we carefully prepared the brooding cage to create a comfortable and stress-free environment. We repaired any damaged equipment or structures. Before the chicks came, we cleaned and disinfected the brooding area to remove any germs. We covered the floor with clean, dry bedding material, like rice hulls or newspapers, to give them a cozy place to rest and stay warm. We also turned on the incandescent bulbs one hour before their arrival, making sure the area was warm and comfortable. Clean water, enhanced with brown sugar, was prepared and offered to the chicks immediately upon their arrival to provide energy and help them recover from the stress of transportation. Feeding and watering equipment were prepared. One hour after their arrival, a commercial starter feed was introduced. Adequate ventilation was maintained to prevent respiratory issues while avoiding drafts that cause chilling.

During the rainy season or at nighttime, used sacks were installed around the brooding cage and lowered to prevent cold air from seeping in. These sacks were raised during the daytime to allow for proper ventilation. Heating systems were checked and calibrated, and lighting hours were gradually reduced (1 hour/week). The broiler chicks stayed in the brooding area until they were ten (10) days old.

Rearing Management

At ten (10) days old, the broiler chickens were moved to rearing cages to begin the intensive experimental phase of the study. There were twenty-four (24) rearing cages corresponding to a total of twenty-four (24) treatments, structured as eight (8) treatments multiplied by three (3) replications. Six (6) broiler chickens were carefully distributed in each rearing cage, with each cage measuring 4ft x 2.5ft (10 square feet total), providing 1 square foot per chicken plus additional dedicated space for necessary feeders and waterers. The cage dimensions were specifically selected to ensure adequate ventilation and prevent overcrowding, which could lead to physiological stress and increased disease susceptibility. The rearing cages were cleaned every day to keep a healthy environment and stop diseases from starting. The collected chicken manure was responsibly managed and added as nutrient-rich organic fertilizer for the banana plants found in the area as well as other fruit trees located nearby. The chickens were reared in these controlled conditions for twenty (20) days, corresponding to the total duration of the experimental period.

Light Management

Proper lighting management was absolutely essential for the overall health, physiological well-being, and rapid growth of the birds. During the critical brooding phase, three (3) 50-watt incandescent bulbs were used to provide sufficient warmth and illumination for one hundred sixty (160) day-old chicks. For the subsequent rearing phase, one 25-watt bulb per cage was consistently provided to maintain visibility. Initially, the chicks had continuous lighting during the brooding phase to keep them warm, active, and comfortable, ensuring they had constant access to essential feed and water, which effectively promoted early growth and development. After the first week, the lighting schedule was carefully adjusted from 24 hours of illumination down to 16 hours of light, and then further reduced to 8 hours of dedicated nighttime lighting. This gradual, strategic change mimicked natural environmental conditions and supported healthy, normal growth patterns for the broilers. Throughout the entirety of the experimental phase, the 8-hour nighttime lighting schedule was strictly maintained until the very end of the study consistent results.

Disease Prevention, Treatment and Control

To minimize the risk of disease outbreaks, comprehensive preventive measures were strictly implemented. This included the enforcement of strict biosecurity protocols such as limiting unauthorized access to the brooding and rearing areas, routinely disinfecting all equipment and footwear, and maintaining a consistently clean and hygienic environment. The chicks were vaccinated against common poultry diseases according to the professionally recommended vaccination schedule. Regular health checks were performed to closely monitor the chicks for any early clinical signs of illness. If any chicks showed visible signs of infection, they were immediately isolated and treated promptly based on the specific pathogens involved to effectively prevent the further spread of disease. Additionally, diligent and proper record-keeping was maintained to accurately track health status, specific treatments administered, and any recorded mortalities. This included strengthening biosecurity practices by limiting access to the brooding and rearing areas, regularly disinfecting equipment and footwear, and keeping the surroundings clean and sanitary.

The chicks were vaccinated against common diseases as per the recommended vaccination schedule. Regular health checks were conducted to monitor the chicks for any signs of diseases. Any infected chicks were isolated and treated promptly according to the type of pathogens to prevent the spread of infections. Proper record-keeping was maintained to track health status, treatments administered, and any mortalities. By implementing effective disease prevention, treatment, and control measures, the risk of disease outbreaks was successfully reduced, healthy growth was promoted, and Feeding Management practices were optimized to ensure that the broilers received balanced nutrition tailored to their developmental stages, thereby maximizing their overall productive performance throughout the entire research trial.

Table 2. Vaccination Program Schedule.

SR NO.	Age	Vaccine	Route of Administration
1	First day	Mareks's (at hatchery)	S/C at neck
2	5-7th day	RDV F1	I/O or I/N
3	14th day	IBD Vaccine	I/O or I/N
4	21st day	RDV La Sota	Drinking water
5	28th day	IBD Vaccine (Booster)	Drinking water

Source: (www.puoltryindia.co.in)

Feeding Management

AD LIBITUM feeding was implemented to promote optimal growth in the birds. During the brooding phase, the birds were provided with a commercial starter ration. As they transitioned to the rearing phase, there was a gradual shift from the starter feed to a variety of formulated and fermented feeds based on the experimental treatments, helping to prevent digestive issues. Feeders were cleaned regularly to avoid contamination, and daily monitoring of feed intake was conducted to ensure accurate data collection and feed intake was monitored and taken daily to ensure data collection.

Water Management

Clean, fresh water was provided freely to ensure the chicks stayed hydrated. Water dispensers were cleaned and sanitized thrice (3X) a day to prevent the spread of diseases. every other day, electrolytes, vitamins, and antibiotics were added to the water from the brooding phase until the end of the rearing phase. Water consumption was monitored and adjusted as needed. Shade and ventilation were provided to reduce water loss. Water stress was avoided by maintaining a consistent supply. This practice was intended to reduce stress, prevent diseases, and promote hydration and optimal growth. For vitamins VitMin Pro was administered together with the water management interval with 3 days followed with normal clean water.

Data Gathered

This study aimed were to evaluate various aspects of broiler chicken farming, specifically, the use of fermented and Azolla. It focused on feeding management practices, growth performance, feed utilization, carcass weight, and economic analysis.

A. Effect of mycological fermented Azolla using Yeast (*S. Cerevisiae*) on the growth performance of Broiler chicken (*Gallus domesticus).* Parameters such as initial body weight, final body weight, and weight gain were monitored to assess the following:

    1. Initial Body Weight. This was determined by weighing the birds at the beginning of the experiment.

    2. Final Body Weight. This was determined by weighing the birds at the end of the experiment.

    3. Weight Gain. This was calculated by subtracting the initial body weight from the final body weight.

$$\text{Weight Gain} = \text{Final Body Weight} - \text{Initial Body Weight}$$

B. Effect of mycological fermented Azolla using Yeast (*S. Cerevisiae*) on the feed utilization of Broiler chicken (*Gallus domisticus).* This includes the evaluation of the feed consumption, feed conversion ratio (FCR), and feed conversion efficiency (FCE).

    1. Feed Consumption (g). This was determined by measuring the total amount of feed consumed per bird throughout the study period. Feed intake was recorded daily and summed over the entire experiment to assess the birds' feed consumption per treatment.

    2. Feed Conversion Ratio (FCR). This was computed by dividing the total feed intake by the total weight gain. A lower FCR indicates better feed efficiency, meaning the birds required less feed to gain a unit of weight.

$$\text{Feed Conversion Ratio (FCR)} = \frac{\text{Feed Consumption (g)}}{\text{Weight Gain (g)}}$$

3. Feed Conversion Efficiency. This was determined as the reciprocal of the Feed Conversion Ratio (FCR). It represents the efficiency with which the birds convert feed into body weight. A higher FCE indicates better feed utilization.

$$\text{Feed Conversion Efficiency (FCE)} = \frac{\text{Weight Gain (g)}}{\text{Feed Consumption (g)}}$$

C. Effect of mycological fermented Azolla using Yeast (*S. Cerevisiae*) on the carcass traits of Broiler chicken (*Gallus domisticus).* The carcass traits of broiler chickens were assessed in terms of carcass weight, carcass percentage, and dressing percentage. These measurements were used to evaluate the effects of different feed treatments on meat yield and overall carcass quality.

1. Carcass Weight (g). This was measured by weighing the dressed carcass of broiler chickens after slaughter. In line with standard local market practices, only the feathers were removed, while the head, feet, and internal organs were left intact.
2. Carcass Percentage- This was calculated as the proportion of carcass weight relative to live weight using the following formula:
3. $$\text{Carcass Percentage} = \frac{\text{Carcass Weight}}{\text{Live Weight}} \times 100$$
4. Dressing Percentage (%). This refer to the proportion of carcass weight in relation to the live body weight of the chickens. It was computed using the following formula:

$$\text{Dressing Percentage} = \frac{\text{Carcass Weight}}{\text{Live Weight}} \times 100\%$$

D. Effect of mycological fermented Azolla using Yeast (*S. Cerevisiae*) on the carcass traits of Broiler chicken (*Gallus domisticus).* The economic analysis was done to determine how cost-effective and profitable the different feeding strategies were for broiler production. It considered key factors such as feed cost, total production cost, gross sales, net income, and return on investment (ROI).

1. Feed Cost (₱). This refers to the amount spent on the throughout the experiment, calculated by adding all feed-related expenses from start to finish.
2. Total Production Cost (₱). This was computed by summing all expenses incurred in production. Including housing, feed chicks, health care, labor, and other operational costs.
3. Revenue (₱). This was calculated based on the total income earned from selling the chicken at a standard market price of ₱250 per kilogram.
4. Net Income (₱). This was computed by subtracting the total production cost from the gross sales, using the following formula:

$$\text{Net Income} = \text{Gross Sales} - \text{Total Production Cost}$$

5. Return on Investment (ROI, %). This measures the profitability of the production system by comparing net income to total production cost. It was calculated using the following formula:

$$\text{Return on Investment (ROI)} = \frac{\text{Net Income}}{\text{Cost of Production}} \times 100$$

Statistical Analysis

Descriptive statistics, such as mean and standard deviation, were used to summarize the growth performance, feed utilization, carcass traits, and economic indicators of broiler chickens fed Azolla fermented with and without yeast. A two-way analysis of variance (ANOVA) under a factorial randomized complete block design (RCBD) was used to determine the main effects of yeast fermentation and Azolla meal inclusion levels, as well as their interaction, on initial body weight, final body weight, weight gain, feed consumption, feed conversion ratio (FCR), feed conversion efficiency (FCE), carcass weight, carcass percentage, dressing percentage, and economic parameters (feed cost, total production cost, revenue, net income, and return on investment [ROI]). Where significant differences were observed, Tukey's honestly significant difference (HSD) test was applied for post hoc comparisons.

RESULT AND DISCUSSION

Growth and Performance of broiler chicken

The results of the study showed that varying levels of Azolla inclusion (0–15%) had no significant effect ($p > 0.05$) on the initial weight (IW), final weight (FW), and weight gain (WG) of broiler chickens, as reflected in the F-test values of 0.406, 0.897, and 0.682, respectively. Although not statistically significant, birds fed 0% Azolla (A1) recorded the highest FW (1666.78 g) and WG (1335.75 g), while increasing Azolla levels showed a slight numerical decline in growth performance.

Table 3. Effect of mycological fermented Azolla using Yeast (*Saccharomyces cerevisiae*) on the growth performance of Broiler chicken (*Gallus domisticus*)

TREATMENTS	IW(g)	FW (g)	WG (g)
Azolla Levels			
A_1 – 0 % Azolla	294.89±11.83295	1630.63±61.66863	1335.75±61.91438
A_2 – 5 % Azolla	302.05±20.36441	1548.36±81.34707	1246.30±75.28110
A_3 - 10 % Azolla	286.91±28.49998	1521.44±97.15940	1234.53±75.60604
A_4 – 15 % Azolla	273.44±19.33254	1491.22±66.59824	1217.78±54.57175
F-TEST	$.406^{ns}$	$.897^{ns}$	$.682^{ns}$
Yeast Fermentation			
B_1 – W/ Yeast	292.86±24.85876	1550.08±75.82428	1264.29±95.51466
B_2 – With out Yeast	285.79±19.79982	1545.75±105.60248	1252.89±60.25545
F-TEST	$.129^{ns}$	$.047^{*}$	$.033^{*}$
AxB	$.263^{ns}$	$.459^{ns}$	$.284^{ns}$

a, b, c, d. Means within a column with different superscripts differ significantly. F-test = probability value of treatment effects ($p < 0.05$; * $p<0.01$; * $p <0.001$; NS: Not significant). values are presented as mean ± standard deviation. IW = Initial Weight; FW = Final Weight; A1 = 0% Azolla; A2 = 5% Azolla; A3 = 10% Azolla; A4 = 15% Azolla; B_1 = with *Saccharomyces cerevisiae*; B2 = without *Saccharomyces cerevisiae*; A x B = interaction effect between Azolla levels and *Saccharomyces cerevisiae* supplementation.

This result that higher inclusion levels of Azolla may not necessarily enhance growth under the conditions of the present study. These findings partially agree with previous studies suggesting that Azolla can be incorporated into broiler diets without negatively affecting growth performance. For example, Adil et al. (2022) reported that including Azolla at levels up to 15% did not impair growth and even enhanced nutrient digestibility in broiler chickens. However, these results differ from studies reporting improved weight gain at higher Azolla inclusion levels. For instance, Ibrahim et al. (2023) observed significantly higher body weight and weight gain at 12% Azolla inclusion, while Najim et al. (2022) reported that 5% Azolla improved both growth performance and gut health in broilers. These differences may be due to variations in processing methods, nutrient composition, as well as environmental and management conditions.

In terms of yeast fermentation, significant effects were observed on FW ($p = 0.047$) and WG ($p = 0.033$), while IW remained non-significant ($p = 0.129$). Birds supplemented with *S. Cerevisiae* (B1) exhibited higher FW (1550.08 g) and WG (1264.29 g) compared to those without yeast (B2). This indicates that yeast supplementation positively influenced growth performance of broiler chicken.

This result is consistent with earlier reports demonstrating the beneficial effects of *S. Cerevisiae* on broiler growth. Saka (n.d.) reported that yeast supplementation improved growth performance and overall productivity in broilers, likely due to improved nutrient digestion and better gut health. The improvement observed in the present study may be explained by the probiotic action of yeast, which enhances feed utilization and intestinal microbial balance.

The interaction between Azolla levels and yeast fermentation (AxB) was not significant ($p > 0.05$) for all measured parameters, indicating that the combined effects of Azolla inclusion and yeast supplementation did not produce synergistic or antagonistic effects on growth performance. This suggests that while yeast independently improved growth, its interaction with varying levels of Azolla did not significantly modify response.

Feed Utilization of Broiler Chicken

Across Azolla levels, birds fed 0% Azolla (A1) recorded a feed consumption of 2449.61 g, which slightly decreased at 5% (2395.05 g) and 10% (2345.36 g), but increased at 15% inclusion (2517.08 g). However, these variations were not statistically significant (F = 0.472). Similarly, the feed conversion ratio (FCR) ranged from 1.84 to 2.07, with the lowest value observed in A1 and the highest in A4, while feed conversion efficiency (FCE) ranged from 48.56% to 54.64%. The absence of significant differences suggests that moderate inclusion of Azolla (up to 15%) did not markedly alter feed utilization efficiency.

Table 4. Effect of mycological fermented Azolla using Yeast (*Saccharomyces cerevisiae*) on the feed utilization of Broiler chicken (*Gallus domisticus).*

TREATMENTS	FC/B	FCR(g)	FCE (g)
Azolla Levels			
A_1 – 0 % Azolla	2449.61±139.09432	1.84±.11639	54.64±3.40063
A_2 – 5 % Azolla	2395.05±356.49107	1.92±.25841	52.84±6.95362
A_3 - 10 % Azolla	2345.36±79.24760	1.91±.13050	52.68±3.63510
A_4 – 15 % Azolla	2517.08±164.21927	2.07±.16793	48.56±3.96989
F-TEST	$.472^{ns}$	$.406^{ns}$	$.297^{ns}$
Yeast Fermentation			
B_1 – W/ *Saccharomyces*	2459.75±172.88248	1.97±51.1150	51.11±3.60513
B_2 – W/out *Saccharomyces*	2393.80±241.47484	1.90±53.2458	53.25±5.97983
F-TEST	$.579^{ns}$	$.214^{ns}$	$.209^{ns}$
AxB	$.564^{ns}$	$.726^{ns}$	$.630^{ns}$

a, b, c, d. Means within a column with different superscripts differ significantly. F-test = probability value of treatment effects ($p < 0.05$; * $p<0.01$; * $p <0.001$; NS: Not significant). values are presented as mean ± standard deviation. FC/B = Feed Conversion per Bird; FCR= Feed Conversion Ratio; FCE=Feed Conversion Efficiency; A1 = 0% Azolla; A2 = 5% Azolla; A3 = 10% Azolla; A4 = 15% Azolla; B_1 = with *Saccharomyces cerevisiae*; B2 = without *Saccharomyces cerevisiae*; AxB = interaction effect between Azolla levels and *Saccharomyces cerevisiae* supplementation.

This finding is consistent with the results of Danayit (2024), who reported that inclusion of Azolla in broiler diets did not significantly affect feed efficiency at lower levels. Conversely, higher inclusion levels may introduce fiber-related constraints, which could explain the numerical increase in FCR at 15%, aligning with the observations of who noted reduced efficiency at elevated Azolla inclusion.

In terms of yeast fermentation, birds fed diets with *S. cerevisiae* (B1) showed slightly lower feed consumption (2393.80 g) and improved FCR (1.90) compared to those without yeast (B2; 2459.75 g and 1.97, respectively). FCE was also numerically higher in the yeast-supplemented group (53.25%) than in the non-supplemented group (51.11%). However, these differences were not statistically significant ($p > 0.05$). The numerical improvement observed may be attributed to the probiotic effects of yeast, which enhance gut health and nutrient absorption. This trend agrees with the findings of Perricone et al. (2022), who reported improved feed efficiency in broilers supplemented with *S. Cerevasiae*. In contrast, the lack of statistical significance in the present study is in line with the results of Saïd et al., (2022), who found that yeast supplementation did not significantly affect feed utilization under certain dietary conditions.

The interaction between Azolla levels and yeast fermentation (A × B) also showed no significant effect on FC, FCR, and FCE ($p > 0.05$), indicating that the combined treatments did not produce synergistic or antagonistic effects on feed utilization. This suggests that the response to Azolla inclusion is largely independent of yeast supplementation under the conditions of this study.

Carcass Traits of Broiler Chicken

The effects of Azolla inclusion and yeast (*S. cerevisiae*) fermentation on carcass weight and dressing percentage of broiler chickens are presented in Table 5. Statistical analysis revealed no significant differences ($p > 0.05$) among treatments for both parameter indicating that neither Azolla levels nor yeast supplementation, as well as their interaction, had a measurable effect on carcass characteristics.

Table 5. Effect of mycological fermented Azolla using Yeast (*Saccharomyces cerevisiae*) on the Carcass Traits of Broiler chicken (*Gallus domisticus)*.

TREATMENTS	Carcass Weight(g)	Dressing Percentage(%)
Azolla Levels		
A_1 – 0 % Azolla	1330.64±61.66863	81.58±.71317
A_2 – 5 % Azolla	1248.33±81.33157	80.58±1.02901
A_3 - 10 % Azolla	1221.45±97.15940	80.21±1.29602
A_4 – 15 % Azolla	1191.39±66.29835	79.86±.89647
F-TEST	$.897^{np}$	$.969^{np}$
Yeast Fermentation		
B_1 – W/ *Saccharomyces*	1250.15±105.46080	80.57±1.35794
B_2 – W/out *Saccharomyces*	1245.75±75.82428	80.55±.94730
F-TEST	$.047^{*}$	$.062^{np}$
AxB	$.458^{np}$	$.514^{np}$

a, b, c, d. Means within a column with different superscripts differ significantly. F-test = probability value of treatment effects ($p < 0.05$; * $p<0.01$; * $p <0.001$; NS: Not significant). values are presented as mean ± standard deviation. A1 = 0% Azolla; A2 = 5% Azolla; A3 = 10% Azolla; A4 = 15% Azolla; B_1 = with *Saccharomyces cerevisiae*; B2 = without *Saccharomyces cerevisiae*; AxB = interaction effect between Azolla levels and *Saccharomyces cerevisiae* supplementation.

Across Azolla levels, carcass weight showed a decreasing numerical trend from 1330.64 g in the control group (A1, 0% Azolla) to 1191.39 g at 15% inclusion (A4). Dressing percentage followed a similar pattern, ranging from 81.99% in A1 to 79.94% in A4. However, these differences were not statistically significant (F = 0.897 for carcass weight; F = 0.969 for dressing percentage). The observed numerical decline at higher inclusion levels may be associated with increased fiber content in Azolla, which can limit nutrient utilization and muscle deposition. This trend is consistent with the findings of Swain et al. (2022), who reported a reduction in carcass yield at higher levels of Azolla inclusion. In contrast, Punyatong et al. (2023) observed no negative effects on carcass traits when Azolla was included at moderate levels, which supports the present results showing no significant differences.

With respect to yeast fermentation, birds supplemented with *S. Cerevisiae* (B1) recorded a carcass weight of 1250.15 g and dressing percentage of 80.57%, which were nearly identical to those of birds without supplementation (B2; 1245.75 g and 80.55%, respectively). The lack of significant differences ($F = 0.047$ for carcass weight and $F = 0.062$ for dressing percentage) indicates that yeast supplementation did not have a meaningful effect on carcass yield under the conditions of this study.

This result aligns with the findings of Davies et al. (2022), who reported no significant improvement in carcass characteristics with yeast supplementation. However, it contrasts with the results of Grigore et al. (2023), who observed enhanced carcass traits in broilers fed yeast-based additives, possibly due to differences in dosage, diet composition, or management practices.

The interaction between Azolla levels and yeast fermentation (A × B) was also not significant ($p > 0.05$), indicating that the combined application of these treatments did not produce synergistic or antagonistic effects on carcass weight and dressing percentage. This suggests that the influence of Azolla inclusion on carcass traits is independent of yeast supplementation.

Economic Analysis o Broiler Chicken

The economic performance of broiler chickens as affected by Azolla inclusion and yeast fermentation is presented in the table 6. Parameters evaluated included total cost (TC), total production cost (TPC), revenue, net income (NI), and return on investment

(ROI). Statistical analysis indicated no significant differences ($p > 0.05$) among treatments for all economic parameters.

Table 6 . Effect of mycological fermented Azolla using Yeast (*Sacharomyces cerevisiae*) on the Economic Performance of Broiler chicken (*Gallus domisticus).*

TREATMENTS	TC(₱)	TPC (₱)	R (₱)	NI(₱)	ROI (₱)
Azolla Levels					
A_1 – 0 % Azolla	14.70	1206.35	1756.45	550.10	45.63
	±.83540	±32.66453	±81.4026	±75.96754	±6.49154
A_2 – 5 % Azolla	14.37	1193.53	1647.80	454.27	38.46
	±2.14135	±83.72026	±107.35767	±114.99367	±10.88163
A_3 - 10 % Azolla	14.07	1181.87	1612.31	430.45	36.46
	±.47684	±18.61146	±128.25041	±130.94020	±11.27169
A_4 – 15 % Azolla	15.10	1222.19	1572.63	350.45	28.82
	±.98538	±38.56459	±87.51382	±103.07327	±9.01167
F-TEST	$.473^{ns}$	$.472^{ns}$	$.895^{ns}$	$.655^{ns}$	$.577^{ns}$
Yeast Fermentation					
B_1 – W/ Yeast	14.36	1193.24	1650.20	456.96	38.53
	±1.45043	±56.70899	±139.20825	±145.54785	±12.74451
B_2 – W/out Yeast	14.76	1208.73	1644.39	435.66	36.16
	±1.03790	±40.59911	±100.08806	±104.33043	±8.96291
F-TEST	$.580^{ns}$	$.579^{ns}$	$.047^{*}$	$.056^{ns}$	$.077^{ns}$
A x B	$.565^{ns}$	$.564^{ns}$	$.458^{ns}$	$.654^{ns}$	$.711^{ns}$

a, b, c, d. Means within a column with different superscripts differ significantly. F-test = probability value of treatment effects ($p < 0.05$; * $p<0.01$; * $p <0.001$; NS: Not significant). values are presented as mean ± standard deviation TC=Total Consumption; TPC = Total Production Cost; R=Revenue; NI=Net Income; ROI=Returned of Investment; A1 = 0% Azolla; A2 = 5% Azolla; A3 = 10% Azolla; A4 = 15% Azolla; B_1 = with *Saccharomyces cerevisiae*; B2 = without *S. Cerevisiae*; AxB = interaction effect between Azolla levels and *Saccharomyces cerevisiae* supplementation.

Across Azolla levels, total cost and total production cost slightly decreased from A1 (₱575.27 and ₱1206.35, respectively) to A3 (₱550.78 and ₱1181.86), before increasing at A4 (₱591.11 and ₱1222.19). Revenue was highest in the control group (₱1804.15) and decreased in treatments with Azolla inclusion. Consequently, net income and ROI followed a declining trend as Azolla level increased, with A1 recording the highest NI (₱609.33) and ROI (50.99%), while A4 had the lowest NI (₱358.52) and ROI (29.43%). However, these variations were not statistically significant (F-values ranging from 0.473 to 0.895). The numerical reduction in profitability at higher inclusion levels may be attributed to slight declines in growth performance and carcass yield, which directly affect market returns. This observation is consistent with Najim et al., (2022), who reported that excessive inclusion of Azolla may reduce economic efficiency due to lower growth performance. In contrast, Shams-eldin et al. (2025) suggested that moderate inclusion levels can reduce feed cost without negatively affecting overall returns, which partially aligns with the present findings at lower inclusion levels (5–10%).

In terms of yeast fermentation, birds fed diets with yeast (B1) showed slightly lower total cost (₱562.16) and higher revenue (₱1650.20) compared to those without yeast (B2; ₱577.65 and ₱1644.39, respectively). Net income (₱456.96) and ROI (38.53%) were also numerically higher in the yeast-supplemented group. Despite these favourable trends, differences were not statistically significant ($p > 0.05$). The numerical improvement may be associated with the beneficial effects of *S. Cerevisiae* on nutrient utilization and growth efficiency. This trend agrees with the findings of Lee et al. (2024) , who reported improved economic returns in broilers supplemented with yeast. However, the lack of significant effect in the present study confirms the study of Martins et al. (2022) who observed that yeast supplementation did not always result in significant economic benefits, depending on diet composition and production conditions.

The interaction between Azolla levels and yeast fermentation (A × B) was also not significant for all economic parameters, indicating that the combined effects of these treatments did not produce synergistic or antagonistic influences on profitability.

CONCLUSIONS AND RECOMMENDATIONS

The study demonstrated that incorporating Azolla into broiler diets at levels up to 15% can serve as an alternative feed ingredient without negatively affecting the growth performance, feed utilization, carcass characteristics, or economic performance of broiler chickens. Although higher levels of Azolla showed slight numerical reductions in final weight, weight gain, carcass yield, revenue, net income, and return on investment, these differences were not statistically significant, therefore accept the hypothesis. Supplementation with *S. cerevisiae* significantly improved final body weight and weight gain, indicating a positive effect on broiler growth performance. However, its effects on feed utilization, carcass traits, and economic performance were not statistically significant. Furthermore, no significant interaction was observed between Azolla inclusion and yeast supplementation across all measured parameters, suggesting that their combined use did not provide additional benefits. Overall, the findings suggest that Azolla can be incorporated up to 15% in broiler diets as a cost-effective alternative feed ingredient, while *S. Cerevisiae* supplementation may be beneficial primarily for improving growth performance.

Based on the findings of the study, the following recommendations are hereby presented for practical application and future research:

1. Azolla can be safely used in broiler diets at levels of up to 15% when combined with yeast, since the results showed that it does not cause any significant negative effects on production performance or economic returns under this feeding condition.

2. When yeast is not included in the diet, the use of Azolla should be managed more carefully and ideally limited to around 5–10%, because higher inclusion levels—especially

15%—may lead to reduced body weight, weight gain, carcass yield, and income.

3. Aside from broiler chickens, future researchers recommend may also conduct similar studies using other locally available and indigenous chicken breeds found in the country to determine the effectiveness of Azolla and *S. cerevisiae* supplementation under different genetic and production conditions. This may provide additional information on the adaptability, growth performance, and economic potential of alternative feed ingredients in various native poultry production systems.

4. Moreover, future researchers may expand this study by evaluating higher levels of Azolla inclusion, utilizing various fermentation methods, incorporating different probiotic or microbial additives, and extending the feeding duration to further assess their effects on broiler productivity and economic efficiency. The findings of this study may also contribute to the development of more sustainable and economical feeding strategies that reduce reliance on commercial feeds while still maintaining satisfactory broiler performance.

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APPENDIX A

Data Table

Figure 2. Experimental Layout of the Study Using a Randomized Complete Block Design (RCBD) with three (3) replications.

Replication 1	Replication 2	Replication 3
T5	T3	T7
T8	T6	T5
T7	T1	T1
T1	T4	T2
T4	T5	T3
T6	T2	T6
T3	T8	T8
T2	T7	T4

APPENDIX B

Data Table

Table 7. Effect of Mycological Fermented Azolla using Yeast (*Saccharomyces cerevisiae*) on the Growth Performance of Broiler chicken (*Gallus domisticus).*

Treatment	Different Level of Azolla	Initial Weight	Final Weight	Weight Gain
1	0	307.17	1689.83	1382.67
1	0	281.83	1687.00	1405.17
1	0	280.17	1623.50	1343.33
1	5	308.17	1587.83	1279.67
1	5	280.83	1515.50	1234.67
1	5	299.00	1422.50	1123.50
1	10	236.33	1378.83	1142.50
1	10	291.17	1590.17	1299.00
1	10	293.17	1612.67	1319.50
1	15	268.17	1391.17	1123.00
1	15	281.83	1551.33	1269.50
1	15	301.67	1550.67	1249.00
2	0	303.50	1595.50	1292.00
2	0	304.00	1658.67	1354.67
2	0	292.67	1529.33	1236.67
2	5	277.67	1542.50	1264.83
2	5	317.17	1669.00	1351.83
2	5	329.50	1552.83	1223.33
2	10	324.67	1607.50	1282.83
2	10	285.17	1446.67	1161.50
2	10	291.00	1492.83	1201.83
2	15	243.00	1438.67	1195.67
2	15	277.83	1537.00	1259.17
2	15	268.17	1478.50	1210.33

Different level of Azolla with yeast: 0% FCM (1); 5% FCM (2); 10% FCM (3); 15% FCM (4)
Treatment with Yeast (1). With out Yeast (2)

APPENDIX B

Data Table

Table 8. Effect of Mycological Fermented Azolla using Yeast (*Saccharomyces cerevisiae*) on the Fed Utilazation of Broiler chicken (*Gallus domisticus)*

Treatment	Different Level of Azolla	Feed Consumption	FCR	FCE
1	0	2432.66	1.76	56.84
1	0	2389	1.70	58.82
1	0	2379.83	1.77	56.45
1	5	2066.66	1.61	61.92
1	5	2812.5	2.28	43.90
1	5	1915.83	1.71	58.64
1	10	2365	2.07	48.31
1	10	2451.66	1.89	52.98
1	10	2352	1.78	56.10
1	15	2507.33	2.23	44.79
1	15	2720	2.14	46.67
1	15	2333.16	1.87	53.53
2	0	2572.16	1.99	50.23
2	0	2652.5	1.96	51.07
2	0	2271.5	1.84	54.44
2	5	2731.66	2.16	46.30
2	5	2488.66	1.84	54.32
2	5	2355	1.93	51.95
2	10	2222.16	1.73	57.73
2	10	2293.5	1.97	50.64
2	10	2387.83	1.99	50.33
2	15	2713.33	2.27	44.07
2	15	2406.83	1.91	52.32
2	15	2421.83	2.00	49.98

Different level of Azolla with yeast: 0% FCM (1); 5% FCM (2); 10% FCM (3); 15% FCM (4)
Treatment with Yeast (1). With out Yeast (2)

APPENDIX B

Data Table

Table 9. Effect of Mycological Fermented Azolla using Yeast (*Saccharomyces cerevisiae*) on the Carcass Traits of Broiler chicken (*Gallus domisticus)*

Treatment	Different Level of Azolla	Carcass Weight	Dressing Percentage
1	0	1389.83	82.24657264
1	0	1387	82.21695317
1	0	1323.5	81.52140437
1	5	1287.67	81.09604283
1	5	1215.5	80.20455295
1	5	1122.5	78.91036907
1	10	1078.83	78.24223377
1	10	1290.17	81.13426266
1	10	1312.67	81.3974783
1	15	1092.17	78.50748772
1	15	1251.33	80.66158144
1	15	1250.67	80.65369733
2	0	1295.5	81.19711689
2	0	1358.67	81.91338424
2	0	1229.33	80.38339146
2	5	1242.5	80.55105348
2	5	1369	82.02516477
2	5	1252.83	80.68026189
2	10	1307.5	81.33748056
2	10	1146.67	79.26290323
2	10	1192.83	79.90376242
2	15	1138.67	79.14759036
2	15	1237	80.48145738
2	15	1178.5	79.70916469

Different level of Azolla with yeast: 0% FCM (1); 5% FCM (2); 10% FCM (3); 15% FCM (4)
Treatment with Yeast (1). With out Yeast (2)

APPENDIX B

Data Table

Table 10. Effect of Mycological Fermented Azolla using Yeast (*Saccharomyces cerevisiae*) on the Economic Analysis of Broiler chicken (*Gallus domisticus).*

Treatment	Different Level of Azolla	Total Cost	Total Production	Revenue	Income	ROI
1	0	571.29	1202.37	1834.58	632.21	52.58
1	0	561.03	1192.11	1830.84	638.73	53.58
1	0	558.88	1189.96	1747.02	557.06	46.81
1	5	485.33	1116.41	1699.72	583.31	52.25
1	5	660.49	1291.57	1604.46	312.89	24.23
1	5	449.91	1080.99	1481.70	400.71	37.07
1	10	555.40	1186.48	1424.06	237.58	20.02
1	10	575.75	1206.83	1703.02	496.20	41.12
1	10	552.34	1183.42	1732.72	549.30	46.42
1	15	588.82	1219.90	1441.66	221.76	18.18
1	15	638.76	1269.84	1651.76	381.91	30.08
1	15	547.92	1179.00	1650.88	471.89	40.02
2	0	604.05	1235.13	1710.06	474.93	38.45
2	0	622.91	1253.99	1793.44	539.45	43.02
2	0	533.44	1164.52	1622.72	458.20	39.35
2	5	641.50	1272.58	1640.10	367.52	28.88
2	5	584.44	1215.52	1807.08	591.56	48.67
2	5	553.05	1184.13	1653.74	469.61	39.66
2	10	521.85	1152.93	1725.90	572.97	49.70
2	10	538.61	1169.69	1513.60	343.92	29.40
2	10	560.76	1191.84	1574.54	382.70	32.11
2	15	637.20	1268.28	1503.04	234.77	18.51
2	15	565.22	1196.30	1632.84	436.54	36.49
2	15	568.74	1199.82	1555.62	355.80	29.65

Different level of Azolla with yeast: 0% FCM (1); 5% FCM (2); 10% FCM (3); 15% FCM (4)
Treatment with Yeast (1). With out Yeast (2)

APPENDIX C

ANOVA Tables

Table 11: ANOVA on the Initial of Broiler Chicken Fed with fermented Azolla using Yeast (*Saccharomyces cerevisiae*)

Source	SS	DF	Mean Square	F	P-value
FactorA	299.909	1	299.909	.727	.406
FactorB	2706.186	3	902.062	2.188	.129
FactorA * FactorB	1806.150	3	602.050	1.460	.263
Error	6597.561	16	412.348		
Total	2020459.460	24			

a.R Squared = .422 (Adjusted R Squared = .169)

Table 12: ANOVA on the Final Weight of Broiler Chicken Fed with fermented Azolla usi Yeast (*Saccharomyces cerevisiae*)

Source	SS	DF	Mean Square	F	P-value
FactorA	112.667	1	112.667	.017	.897
FactorB	64547.723	3	21515.908	3.319	.047
FactorA * FactorB	17657.418	3	5885.806	.908	.459
Error	103708.120	16	6481.758		
Total	57691130.095	24			

a. R Squared = .443 (Adjusted R Squared = .199)

Table 13. Tukey HSD Analysis of Final Weight Fed with Azolla without Yeast

		Subset	
FactorB	N	1	2
15% Azolla	6	1491.2233	
10% Azolla	6	1521.4450	1521.4450
5% Azolla	6	1548.3600	1548.3600
0% Azolla	6		1630.6383
Sig.		.618	.128

Means for groups in homogeneous subsets are displayed. Based on observed means. The error term is Mean Square (Error) = 497.496. a. Uses Harmonic Mean Sample Size = 6.000. b. Alpha = .05

APPENDIX C

ANOVA Tables

Table 14: ANOVA on the Weight Gain of Broiler Chicken Fed with fermented Azolla using Yeast (*Saccharomyces cerevisiae).*

Source	SS	DF	Mean Square	F	P-value
FactorA	86.678	1	86.678	.174	.682
FactorB	5566.816	3	1855.605	3.730	.033
FactorA * FactorB	2061.876	3	687.292	1.382	.284
Error	7959.935	16	497.496		
Total	4239813.796	24			

R Squared = .492 (Adjusted R Squared = .270)

Table 14. Tukey HSD Analysis of Weight Gain Fed with Azolla without Yeast

		Subset	
FactorB		1	2
15% Azolla	6	1491.2233	
10% Azolla	6	1521.4450	1521.4450
5% Azolla	6	1548.3600	1548.3600
0% Azolla	6		1630.6383
Sig.		.618	.128

Means for groups in homogeneous subsets are displayed. Based on observed means. The error term is Mean Square(Error) = 497.496. a. Uses Harmonic Mean Sample Size = 6.000. b. Alpha = .05

Table 15: ANOVA on the Feed Consumption of Broiler Chicken Fed with fermented Azolla using Yeast (*Saccharomyces cerevisiae*).

Source	SS	DF	Mean Square	F	P-value
FactorA	26091.799	1	26091.799	.542	.472
FactorB	97868.386	3	32622.795	.677	.579
FactorA * FactorB	101641.984	3	33880.661	.703	.564
Error	770672.549	16	48167.034		
Total	142337911.797	24			

a.R Squared = .226 (Adjusted R Squared = -.112)

APPENDIX C

ANOVA Tables

Table 16: ANOVA on the Feed Conversion Ratio of Broiler Chicken Fed with fermented Azolla using Yeast (*Saccharomyces cerevisiae*)

Source	SS	DF	Mean Square	F	P-value
FactorA	.025	1	.025	.729	.406
FactorB	.174	3	.058	1.666	.214
FactorA * FactorB	.046	3	.015	.442	.726
Error	.556	16	.035		
Total	90.508	24			

a. R Squared = .306 (Adjusted R Squared = .002)

Table 17: ANOVA on the FCE of Broiler Chicken Fed with fermented Azolla using Yeast (*Saccharomyces cerevisiae*)

Source	SS	DF	Mean Square	F	P-value
FactorA	27.243	1	27.243	1.160	.297
FactorB	119.096	3	39.699	1.691	.209
FactorA * FactorB	41.586	3	13.862	.590	.630
Error	375.627	16	23.477		
Total	65910.652	24			

a. R Squared = .333 (Adjusted R Squared = .042)

Table 18: ANOVA on the Carcass Weight of Broiler Chicken Fed with fermented Azolla using Yeast (*Saccharomyces cerevisiae*)

Source	SS	DF	Mean Square	F	P-value
FactorA	116.336	1	116.336	.018	.895
FactorB	64434.336	3	21478.112	3.321	.047
FactorA * FactorB	17679.639	3	5893.213	.911	.458
Error	103470.347	16	6466.897		
Total	37562901.355	24			

a. R Squared = .443 (Adjusted R Squared = .199)

APPENDIX C

ANOVA Tables

Table 19. Tukey HSD Analysis of Carcass Weight Fed with Azolla without Yeast

		Subset	
FactorB	N	1	2
15% Azolla	6	1191.3900	
10% Azolla	6	1221.4450	1221.4450
5% Azolla	6	1248.3333	1248.3333
0% Azolla	6		1330.6383
Sig.		.620	.128

Means for groups in homogeneous subsets are displayed. Based on observed means. The error term is Mean Square(Error) = 6466.897. a. Uses Harmonic Mean Sample Size = 6.000. b. Alpha = .05

Table 20: ANOVA on the Dressing Percentage of Broiler Chicken Fed with fermented Azolla using Yeast (*Saccharomyces cerevisiae*).

Source	SS	DF	Mean Square	F	P-value
FactorA	.002	1	.002	.002	.969
FactorB	9.903	3	3.301	2.997	.062
FactorA * FactorB	2.630	3	.877	.796	.514
Error	17.623	16	1.101		
Total	155779.281	24			

a. R Squared = .226 (Adjusted R Squared = -.113)

Table 21: ANOVA on the Total Production Cost of Broiler Chicken Fed with fermented Azolla using Yeast (*Saccharomyces cerevisiae*)

Source	SS	DF	Mean Square	F	P-value
FactorA	.940	1	.940	.541	.473
FactorB	3.523	3	1.174	.676	.580
FactorA * FactorB	3.656	3	1.219	.701	.565
Error	27.812	16	1.738		
Total	5124.069	24			

a. R Squared = .226 (Adjusted R Squared = -.112)

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ANOVA Tables

Table 22: ANOVA on the Total Production Cost of Chicken Fed with fermented Azolla using Yeast (*Saccharomyces cerevisiae*)

Source	SS	DF	Mean Square	F	P-value
FactorA	1439.176	1	1439.176	.542	.472
FactorB	5397.007	3	1799.002	.677	.579
FactorA * FactorB	5605.700	3	1868.567	.703	.564
Error	42503.464	16	2656.466		
Total	34671632.574	24			

a. R Squared = .226 (Adjusted R Squared = -.112)

Table 23: ANOVA on the Revenue of Chicken Fed with fermented Azolla using Yeast (*Saccharomyces cerevisiae*)

Source	SS	DF	Mean Square	F	P-value
FactorA	202.704	1	202.704	.018	.895
FactorB	112270.387	3	37423.462	3.321	.047
FactorA * FactorB	30805.004	3	10268.335	.911	.458
Error	180286.732	16	11267.921		
Total	65449599.320	24			

a. R Squared = .443 (Adjusted R Squared = .199)

Table 24. Tukey HSD Analysis of Revenue Fed with Azolla without Yeast

		Subset	
FactorB	N	1	2
15% Azolla	6	1572.6348	
10% Azolla	6	1612.3074	1612.3074
5% Azolla	6	1647.8000	1647.8000
0% Azolla	6		1756.4426
Sig.		.620	.128

Means for groups in homogeneous subsets are displayed. Based on observed means. The error term is Mean Square(Error) = 11267.921. a. Uses Harmonic Mean Sample Size = 6.000. b. Alpha = .05

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ANOVA Tables

Table 25: ANOVA on the Income of Chicken Fed with fermented Azolla using Yeast (*Saccharomyces cerevisiae*)

Source	SS	DF	Mean Square	F	P-value
FactorA	2721.714	1	2721.714	.208	.655
FactorB	121660.663	3	40553.554	3.098	.056
FactorA * FactorB	21663.174	3	7221.058	.552	.654
Error	209435.335	16	13089.708		
Total	5136175.082	24			

a. R Squared = .411 (Adjusted R Squared = .153)

Table 26: ANOVA on the Return of Investment of Chicken Fed with fermented Azolla using Yeast (*Saccharomyces cerevisiae*)

Source	SS	DF	Mean Square	F	P-value
FactorA	33.773	1	33.773	.325	.577
FactorB	860.037	3	286.679	2.755	.077
FactorA * FactorB	145.147	3	48.382	.465	.711
Error	1665.136	16	104.071		
Total	36173.429	24			

a. R Squared = .384 (Adjusted R Squared = .115)

APPENDIX D

Income Statement

Table 27: Overall Income Statement on Effect of Mycological Fermented Azolla Using Yeast(*Saccharomyces cerevisiae*) On The Growth Performance, Carcass Yield, Feed Utilization And Economic Analysis Of Broiler Cchicken(*Gallus domisticus*").

Operating Expenses		Item	Qty	Price
	Chicks	144	45	6480
	Booster Feed	0.5	2015	1007.5
	Starter Feeds	4	1970	7880
	Finisher Feeds	3	1940	5820
	Dry Yeast	4	200	800
	Bulb	24	23	552
	Vaccines	1	70	70
	Dewormer	4	24	96
	Vitamins	10.00	25	250
	Electricity /water			3852
	Azolla	2.00	100	200
	Plastic Bag	1.00	50	50
	Disinfectants	1.00	25	25
	Electrical Tape	1.00	1	30
	Formulated Feeds	407.69	39.14	15957
				43069.48
Capital Expenses				
	Receptable	24	21	504
	Wire	15	40	600
	Trapal	10	70	700
	Housing	6	1500	9000
	Mail Plug	1	30	30
				10834.00
Depreciation Cost	10 years			216.68
Total Production Cost				43286
Gross Sales	Dressed Chicken (250)/kg)	1.20	144	60480
Net Income				17194

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Income Statement

Table 28: T1-Income Statement on Effect of Mycological Fermented Azolla Using Yeast(*Saccharomyces cerevisiae*) On The Growth Performance, Carcass Yield, Feed Utilization And Economic Analysis Of Broiler Chicken(*Gallus domisticus*").

Operating Expenses		Item	Qty	Price
	Chicks	18	45	810
	Booster Feed	0.06	2015	125.94
	Starter Feeds	0	0	0
	Finisher Feeds	0	0	0
	Dry Yeast	0.5	200	100
	Bulb	3	23	69
	Vaccines	0.12	70	8.75
	Dewormer	0.5	24	12
	Vitamins	1.25	25	31.25
	Electricity /water			482
	Azolla	0.25	100	25
	Plastic Bag	0.12	50	6
	Disinfectants	0.12	25	3
	Electrical Tape	0.12	1	4
	Formulated Feeds	50.96	39.14	
				1676.56
Capital Expenses				
	Receptable	24	21	504
	Wire	15	40	600
	Trapal	10	70	700
	Housing	6	1500	9000
	Mail Plug	1	30	30
				10834.00
Depreciation Cost	10 years			216.68
Total Production Cost				1893.24
Total Production Cost /R				631.08
Gross Sales	Dressed Chicken (250kg)	1.20	18	5400
Net Income	Production Cost			3506.76
				631.08

APPENDIX D

Income Statement

Table 29:T2-Income Statement on Effect of Mycological Fermented Azolla Using Yeast(*Saccharomyces cerevisiae*) On The Growth Performance, Carcass Yield, Feed Utilization And Economic Analysis Of Broiler Chicken(*Gallus domisticus*").

Operating Expenses		Item	Qty	Price
	Chicks	18	45	810
	Booster Feed	0.06	2015	125.94
	Starter Feeds	0	0	0
	Finisher Feeds	0	0	0
	Dry Yeast	0.5	200	100
	Bulb	3	23	69
	Vaccines	0.12	70	8.75
	Dewormer	0.5	24	12
	Vitamins	1.25	25	31.25
	Electricity /water			482
	Azolla	0.25	100	25
	Plastic Bag	0.12	50	6
	Disinfectants	0.12	25	3
	Electrical Tape	0.12	1	4
	Formulated Feeds	50.96	39.14	
				1676.56
Capital Expenses				
	Receptable	24	21	504
	Wire	15	40	600
	Trapal	10	70	700
	Housing	6	1500	9000
	Mail Plug	1	30	30
				10834.00
Depreciation Cost	10 years			216.68
Total Production Cost				1893.24
Total Production Cost /R				631.08
Gross Sales	Dressed Chicken (250kg)	1.20	18	5400
Net Income	Production Cost			3506.76
				631.08

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Income Statement

Table 30:T3-Income Statement on Effect of Mycological Fermented Azolla Using Yeast(*Saccharomyces cerevisiae*) On The Growth Performance, Carcass Yield, Feed Utilization And Economic Analysis Of Broiler Chicken(*Gallus domisticus*").

Operating Expenses		Item	Qty	Price
	Chicks	18	45	810
	Booster Feed	0.06	2015	125.94
	Starter Feeds	0	0	0
	Finisher Feeds	0	0	0
	Dry Yeast	0.5	200	100
	Bulb	3	23	69
	Vaccines	0.12	70	8.75
	Dewormer	0.5	24	12
	Vitamins	1.25	25	31.25
	Electricity /water			482
	Azolla	0.25	100	25
	Plastic Bag	0.12	50	6
	Disinfectants	0.12	25	3
	Electrical Tape	0.12	1	4
	Formulated Feeds	50.96	39.14	
				1676.56
Capital Expenses				
	Receptable	24	21	504
	Wire	15	40	600
	Trapal	10	70	700
	Housing	6	1500	9000
	Mail Plug	1	30	30
				10834.00
Depreciation Cost	10 years			216.68
Total Production Cost				1893.24
Total Production Cost /R				631.08
Gross Sales	Dressed Chicken (250kg)	1.20	18	5400
Net Income	Production Cost			3506.76
				631.08

APPENDIX D

Income Statement

Table 31:T4-Income Statement on Effect of Mycological Fermented Azolla Using Yeast(*Saccharomyces cerevisiae*) On The Growth Performance, Carcass Yield, Feed Utilization And Economic Analysis Of Broiler Chicken(*Gallus domisticus*").

Operating Expenses		Item	Qty	Price
	Chicks	18	45	810
	Booster Feed	0.06	2015	125.94
	Starter Feeds	0	0	0
	Finisher Feeds	0	0	0
	Dry Yeast	0.5	200	100
	Bulb	3	23	69
	Vaccines	0.12	70	8.75
	Dewormer	0.5	24	12
	Vitamins	1.25	25	31.25
	Electricity /water			482
	Azolla	0.25	100	25
	Plastic Bag	0.12	50	6
	Disinfectants	0.12	25	3
	Electrical Tape	0.12	1	4
	Formulated Feeds	50.96	39.14	
				1676.56
Capital Expenses				
	Receptable	24	21	504
	Wire	15	40	600
	Trapal	10	70	700
	Housing	6	1500	9000
	Mail Plug	1	30	30
				10834.00
Depreciation Cost	10 years			216.68
Total Production Cost				1893.24
Total Production Cost /R				631.08
Gross Sales	Dressed Chicken (250kg)	1.20	18	5400
Net Income	Production Cost			3506.76
				631.08

APPENDIX D

Income Statement

Table 32:T5-Income Statement on Effect of Mycological Fermented Azolla Using Yeast(*Saccharomyces cerevisiae*) On The Growth Performance, Carcass Yield, Feed Utilization And Economic Analysis Of Broiler Chicken(*Gallus domisticus*”).

Operating Expenses		Item	Qty	Price
	Chicks	18	45	810
	Booster Feed	0.06	2015	125.94
	Starter Feeds	0	0	0
	Finisher Feeds	0	0	0
	Dry Yeast	0.5	200	100
	Bulb	3	23	69
	Vaccines	0.12	70	8.75
	Dewormer	0.5	24	12
	Vitamins	1.25	25	31.25
	Electricity /water			482
	Azolla	0.25	100	25
	Plastic Bag	0.12	50	6
	Disinfectants	0.12	25	3
	Electrical Tape	0.12	1	4
	Formulated Feeds	50.96	39.14	
				1676.56
Capital Expenses				
	Receptable	24	21	504
	Wire	15	40	600
	Trapal	10	70	700
	Housing	6	1500	9000
	Mail Plug	1	30	30
				10834.00
Depreciation Cost	10 years			216.68
Total Production Cost				1893.24
Total Production Cost /R				631.08
Gross Sales	Dressed Chicken (250kg)	1.20	18	5400
Net Income	Production Cost			3506.76
				631.08

APPENDIX D

Income Statement

Table 33:T6-Income Statement on Effect of Mycological Fermented Azolla Using Yeast(*Saccharomyces cerevisiae*) On The Growth Performance, Carcass Yield, Feed Utilization And Economic Analysis Of Broiler Chicken(*Gallus domisticus*").

Operating Expenses		Item	Qty	Price
	Chicks	18	45	810
	Booster Feed	0.06	2015	125.94
	Starter Feeds	0	0	0
	Finisher Feeds	0	0	0
	Dry Yeast	0.5	200	100
	Bulb	3	23	69
	Vaccines	0.12	70	8.75
	Dewormer	0.5	24	12
	Vitamins	1.25	25	31.25
	Electricity /water			482
	Azolla	0.25	100	25
	Plastic Bag	0.12	50	6
	Disinfectants	0.12	25	3
	Electrical Tape	0.12	1	4
	Formulated Feeds	50.96	39.14	
				1676.56
Capital Expenses				
	Receptable	24	21	504
	Wire	15	40	600
	Trapal	10	70	700
	Housing	6	1500	9000
	Mail Plug	1	30	30
				10834.00
Depreciation Cost	10 years			216.68
Total Production Cost				1893.24
Total Production Cost /R				631.08
Gross Sales	Dressed Chicken (250kg)	1.20	18	5400
Net Income	Production Cost			3506.76
				631.08

APPENDIX D

Income Statement

Table 34:T7-Income Statement on Effect of Mycological Fermented Azolla Using Yeast(*Saccharomyces cerevisiae*) On The Growth Performance, Carcass Yield, Feed Utilization And Economic Analysis Of Broiler Chicken(*Gallus domisticus*").

Operating Expenses		Item	Qty	Price
	Chicks	18	45	810
	Booster Feed	0.06	2015	125.94
	Starter Feeds	0	0	0
	Finisher Feeds	0	0	0
	Dry Yeast	0.5	200	100
	Bulb	3	23	69
	Vaccines	0.12	70	8.75
	Dewormer	0.5	24	12
	Vitamins	1.25	25	31.25
	Electricity /water			482
	Azolla	0.25	100	25
	Plastic Bag	0.12	50	6
	Disinfectants	0.12	25	3
	Electrical Tape	0.12	1	4
	Formulated Feeds	50.96	39.14	
				1676.56
Capital Expenses				
	Receptable	24	21	504
	Wire	15	40	600
	Trapal	10	70	700
	Housing	6	1500	9000
	Mail Plug	1	30	30
				10834.00
Depreciation Cost	10 years			216.68
Total Production Cost				1893.24
Total Production Cost /R				631.08
Gross Sales	Dressed Chicken (250kg)	1.20	18	5400
Net Income	Production Cost			3506.76
				631.08

APPENDIX D

Income Statement

Table 35:T8-Income Statement on Effect of Mycological Fermented Azolla Using Yeast(*Saccharomyces cerevisiae*) On The Growth Performance, Carcass Yield, Feed Utilization And Economic Analysis Of Broiler Chicken(*Gallus domisticus*").

Operating Expenses		Item	Qty	Price
	Chicks	18	45	810
	Booster Feed	0.06	2015	125.94
	Starter Feeds	0	0	0
	Finisher Feeds	0	0	0
	Dry Yeast	0.5	200	100
	Bulb	3	23	69
	Vaccines	0.12	70	8.75
	Dewormer	0.5	24	12
	Vitamins	1.25	25	31.25
	Electricity /water			482
	Azolla	0.25	100	25
	Plastic Bag	0.12	50	6
	Disinfectants	0.12	25	3
	Electrical Tape	0.12	1	4
	Formulated Feeds	50.96	39.14	
				1676.56
Capital Expenses				
	Receptable	24	21	504
	Wire	15	40	600
	Trapal	10	70	700
	Housing	6	1500	9000
	Mail Plug	1	30	30
				10834.00
Depreciation Cost	10 years			216.68
Total Production Cost				1893.24
Total Production Cost /R				631.08
Gross Sales	Dressed Chicken (250kg)	1.20	18	5400
Net Income	Production Cost			3506.76
				631.08

APPENDIX E

Crude Protein Analysis

REGIONAL STANDARDS AND TESTING LABORATORIES
DEPARTMENT OF SCIENCE AND TECHNOLOGY – X
J.V. Seriña Street, Carmen, 9000, Cagayan de Oro City
Republic of the Philippines

CHEMICAL TESTING LABORATORY

PAB ACCREDITED TESTING LABORATORY
PNS ISO/IEC 17025:2017
LA-2019-3369

REPORT OF CHEMICAL ANALYSIS

Customer's Name : *SERGEI S. RATO*
Address : *Tangub, Misamis Occidental*
Submitted by : *Mr. Sergei S. Rato*
Address : *Tangub, Misamis Occidental*
Date Submitted : 06 May 2025
Request Number : R10-052025-CHE-0229

Sample Description	Parameter(s)	Method Used	Date of Analysis	Result
Feed, coded as T1, w/ Yeast and CM Sampling Date: *Not indicated* Production Date: *April 24, 2025* Sample code: CHE-0230	Crude Protein	Method 991.20, OMA AOAC, 21st Edition / Automated Kjeldahl Method	26 May 2025	21.81 g/100g

ANALYZED BY:

ENGR. CARIENEL P. CANE
Project Technical Assistant II
Registered Chemical Technician
PRC Reg. No. 0008275

CHECKED/CERTIFIED BY:

ADELINE [illegible]CUADO, RCh
Project Technical Specialist I
PRC Reg. No. 0007822

ISSUED UNDER THE AUTHORITY OF:

RONALD [illegible]GAN, MITO, ECT
Officer-in-Charge, RSTL

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Effectivity Date: 11 November 2024

Figure 3. Laboratory Test Result on Crude Protein Analysis Coded as T1 0% CF with yeast. Conducted by the Department of Science and Technology Regional Standards and Testing Laboratories (DOST-RSTL) Region 10.

APPENDIX E

Crude Protein Analysis

REGIONAL STANDARDS AND TESTING LABORATORIES
DEPARTMENT OF SCIENCE AND TECHNOLOGY - X
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Republic of the Philippines

PAB ACCREDITED TESTING LABORATORY
LA-2019-388B

CHEMICAL TESTING LABORATORY

REPORT OF CHEMICAL ANALYSIS

Customer's Name : *SERGEI S. RATO*
Address : *Tangub, Misamis Occidental*
Submitted by : *Mr. Sergei S. Rato*
Address : *Tangub, Misamis Occidental*
Date Submitted : 06 May 2025
Request Number : R10-052025-CHE-0228

Sample Description	Parameter(s)	Method Used	Date of Analysis	Result
feed, coded as T3, 10% Dried Azolla w/ Yeast Sampling Date: *Not Indicated* Production Date: *April 24, 2025* Sample code: CHE-0229	Crude Protein	Method 991.20, OMA AOAC, 21st Edition / Automated Kjeldahl Method	26 May 2025	22.88 g/100g

ANALYZED BY: ENGR. CARMENEL P. CANE
Project Technical Assistant II
Registered Chemical Technician
PRC Reg. No. 0008276

CHECKED/CERTIFIED BY: ADELINE ... CUADO, RCh
Project Technical Specialist I
PRC Reg. No. 0007822

ISSUED UNDER THE AUTHORITY OF: RONALD ... ANGAN, MITO, ECT
Officer-in-Charge, RSTL

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Figure 4. Laboratory Test Result on Crude Protein Analysis Coded as T2 5% Azolla and CF with yeast. Conducted by the Department of Science and Technology Regional Standards and Testing Laboratories (DOST-RSTL) Region 10.

APPENDIX E

Crude Protein Analysis

REGIONAL STANDARDS AND TESTING LABORATORIES
DEPARTMENT OF SCIENCE AND TECHNOLOGY - X
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Republic of the Philippines

CHEMICAL TESTING LABORATORY

PAB ACCREDITED TESTING LABORATORY
LA-2019-388B

REPORT OF CHEMICAL ANALYSIS

Customer's Name : *SERGEI S. RATO*
Address : *Tangub, Misamis Occidental*
Submitted by : *Mr. Sergei S. Rato*
Address : *Tangub, Misamis Occidental*
Date Submitted : 06 May 2025
Request Number : R10-052025-CHE-0228

Sample Description	Parameter(s)	Method Used	Date of Analysis	Result
feed, coded as T3, 10% Dried Azolla w/ Yeast Sampling Date: *Not Indicated* Production Date: *April 24, 2025* Sample code: CHE-0229	Crude Protein	Method 991.20, OMA AOAC, 21st Edition / Automated Kjeldahl Method	26 May 2025	22.88 g/100g

[illegible]

ANALYZED BY:
ENGR. CARMENEL P. CANE
Project Technical Assistant II
Registered Chemical Technician
PRC Reg. No. 0008276

CHECKED/CERTIFIED BY:
ADELINE P. PACUADO, RCh
Project Technical Specialist I
PRC Reg. No. 0007822

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Officer-In-Charge, RSTL

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Figure 5. Laboratory Test Result on Crude Protein Analysis Coded as T3 10% Azolla and CF with yeast. Conducted by the Department of Science and Technology Regional Standards and Testing Laboratories (DOST-RSTL) Region 10.

APPENDIX E

Crude Protein Analysis

REGIONAL STANDARDS AND TESTING LABORATORIES
DEPARTMENT OF SCIENCE AND TECHNOLOGY – X
J.V. Seriña Street, Carmen, 9000, Cagayan de Oro City
Republic of the Philippines

CHEMICAL TESTING LABORATORY

PAB ACCREDITED TESTING LABORATORY
PNS ISO/IEC 17025:2017
LA-2019-358B

REPORT OF CHEMICAL ANALYSIS

Customer's Name : *SERGEI S. RATO*
Address : *Tangub, Misamis Occidental*
Submitted by : *Mr. Sergei S. Rato*
Address : *Tangub, Misamis Occidental*
Date Submitted : 06 May 2025
Request Number : R10-052025-CHE-0227

Sample Description	Parameter(s)	Method Used	Date of Analysis	Result
feed, coded as T4, 15% Dried Azolla w/ Yeast and CM Sampling Date: *Not indicated* Production Date: *April 24, 2025* Sample code: CHE-0228	Crude Protein	Method 991.20, OMA AOAC, 21st Edition / Automated Kjeldahl Method	26 May 2025	22.75 g/100g

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ENGR. CARIENEL P. CANE
Project Technical Assistant II
Registered Chemical Technician
PRC Reg. No. 0008275

CHECKED/CERTIFIED BY:

ADELINE [illegible]UADO, RCh
Project Technical Specialist I
PRC Reg. No. 0007822

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Figure 6. Laboratory Test Result on Crude Protein Analysis Coded as T4 15% Azolla and CF with yeast. Conducted by the Department of Science and Technology Regional Standards and Testing Laboratories (DOST-RSTL)Region 10.

APPENDIX E

Crude Protein Analysis

REGIONAL STANDARDS AND TESTING LABORATORIES
DEPARTMENT OF SCIENCE AND TECHNOLOGY – X
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Republic of the Philippines

CHEMICAL TESTING LABORATORY

PAB ACCREDITED
TESTING LABORATORY
PNS ISO/IEC 17025:2017
LA-2019-358B

REPORT OF CHEMICAL ANALYSIS

Customer's Name : *SERGEI S. RATO*
Address : *Tangub, Misamis Occidental*
Submitted by : *Mr. Sergei S. Rato*
Address : *Tangub, Misamis Occidental*
Date Submitted : 06 May 2025
Request Number : R10-052025-CHE-0230

Sample Description	Parameter(s)	Method Used	Date of Analysis	Result
feed, coded as T5, w/out Yeast Sampling Date: *Not indicated* Production Date: *April 24, 2025* Sample code: CHE-0231	Crude Protein	Method 991.20, OMA AOAC, 21st Edition / Automated Kjeldahl Method	26 May 2025	21.73 g/100g

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ENGR. CARIENEL P. CANE
Project Technical Assistant II
Registered Chemical Technician
PRC Reg. No. 0008275

CHECKED/CERTIFIED BY:

ADELINE [illegible]UADO, RCh
Project Technical Specialist I
PRC Reg. No. 0007822

ISSUED UNDER THE AUTHORITY OF:

RONALD A. PANGAN, MITO, ECT
Officer-in-Charge, RSTL

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DOST-X URL: [illegible]

Figure 7. Laboratory Test Result on Crude Protein Analysis Coded as T5 0% CF with out yeast. Conducted by the Department of Science and Technology Regional Standards and Testing Laboratories (DOST-RSTL) Region10

APPENDIX E

Crude Protein Analysis

REGIONAL STANDARDS AND TESTING LABORATORIES
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J.V. Seriña Street, Carmen, 9000, Cagayan de Oro City
Republic of the Philippines
CHEMICAL TESTING LABORATORY

PAB ACCREDITED TESTING LABORATORY

REPORT OF CHEMICAL ANALYSIS

Customer's Name : *SERGEI S. RATO*
Address : *Mausswagon, Calamba, Misamis Occidental*
Submitted by : *Mr. Sergei S. Rato*
Address : *Mausswagon, Calamba, Misamis Occidental*
Date Submitted : 06 May 2025
Request Number : R10-052025-CHE-0223

Sample Description	Parameter(s)	Method Used	Date of Analysis	Result
feed, coded as T6, 5% Dried Azolla w/out Yeast *Production Date: April 24, 2025* Sample code: CHE-0224	Crude Protein	Method 991.20, OMA AOAC, 21st Edition / Automated Kjeldahl Method	14 – 15 May 2025	21.41 g/100g

ANALYZED BY/ CERTIFIED BY: SHENNA GRACE P. ERAN, RCh
Science Research Specialist II
PRC Reg. No. 0012234

CHECKED BY: MARL ANDRIAN PATRICK H. DALINAO,
Registered Chemical Technician
Project Technical Specialist I
PRC Reg. No. 0007246

ISSUED UNDER THE AUTHORITY OF: ENGR. DELWIN M. BALANAY, JR.
Officer-in-Charge, RSTL Section

Date Issued: 16 May 2025
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Figure 8. Laboratory Test Result on Crude Protein Analysis Coded as T6, 5% Azolla and CF with out yeast. Conducted by the Department of Science and Technology Regional Standards and Testing Laboratories (DOST-RSTL) Region 10.

APPENDIX E

Crude Protein Analysis

REGIONAL STANDARDS AND TESTING LABORATORIES
DEPARTMENT OF SCIENCE AND TECHNOLOGY – X
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Republic of the Philippines

CHEMICAL TESTING LABORATORY

PAB ACCREDITED TESTING LABORATORY
PNS ISO/IEC 17025:2017
LA-2019-358B

REPORT OF CHEMICAL ANALYSIS

Customer's Name : *SERGEI S. RATO*
Address : *Tangub, Misamis Occidental*
Submitted by : *Mr. Sergei S. Rato*
Address : *Tangub, Misamis Occidental*
Date Submitted : 06 May 2025
Request Number : R10-052025-CHE-0231

Sample Description	Parameter(s)	Method Used	Date of Analysis	Result
feed, coded as T7, 10% Dried Azolla w/out Yeast&CM Sampling Date: *Not indicated* Production Date: *April 24, 2025* Sample code: CHE-0232	Crude Protein	Method 991.20, OMA AOAC, 21st Edition / Automated Kjeldahl Method	26 May 2025	23.70 g/100g

ANALYZED BY:

ENGR. CARIENEL P. CANE
Project Technical Assistant II
Registered Chemical Technician
PRC Reg. No. 0008275

CHECKED/CERTIFIED BY:

ADELINE [illegible]UADO, RCh
Project Technical Specialist I
PRC Reg. No. 0007822

ISSUED UNDER THE AUTHORITY OF:

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Figure 9. Laboratory Test Result on Crude Protein Analysis Coded as T7, 10% Azolla and CF with out yeast. Conducted by the Department of Science and Technology Regional Standards and Testing Laboratories (DOST-RSTL) Region 10

APPENDIX E

Crude Protein Analysis

REGIONAL STANDARDS AND TESTING LABORATORIES
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Republic of the Philippines

CHEMICAL TESTING LABORATORY

PAB ACCREDITED TESTING LABORATORY
PNS ISO/IEC 17025:2017
LA-2019-386B

REPORT OF CHEMICAL ANALYSIS

Customer's Name : *SERGEI S. RATO*
Address : *Tangub, Misamis Occidental*
Submitted by : *Mr. Sergei S. Rato*
Address : *Tangub, Misamis Occidental*
Date Submitted : 06 May 2025
Request Number : R10-052025-CHE-0232

Sample Description	Parameter(s)	Method Used	Date of Analysis	Result
feed, coded as T8, 15% Dried Azolla w/out Yeast & CM Sampling Date: *Not indicated* Production Date: *April 24, 2025* Sample code: CHE-0233	Crude Protein	Method 991.20, OMA AOAC, 21st Edition / Automated Kjeldahl Method	26 May 2025	23.13 g/100g

ANALYZED BY:

ENGR. CARIENEL P. CANE
Project Technical Assistant II
Registered Chemical Technician
PRC Reg. No. 0008275

CHECKED/CERTIFIED BY:

ADELINE D. [illegible]ADO, RCh
Project Technical Specialist I
PRC Reg. No. 0007822

ISSUED UNDER THE AUTHORITY OF:

RONALD [illegible]AN, MITO, ECT
Officer-in-Charge, RSTL

Certificate No.: 2025-0374C
Date Issued: 26 May 2025
Page 1 of 1

Revision 12

Figure 10. Laboratory Test Result on Crude Protein Analysis Coded as T8, 15% Azolla and CF with out yeast. Conducted by the Department of Science and Technology Regional Standards and Testing Laboratories (DOST-RSTL) Region 10

APPENDIX F

Documentation

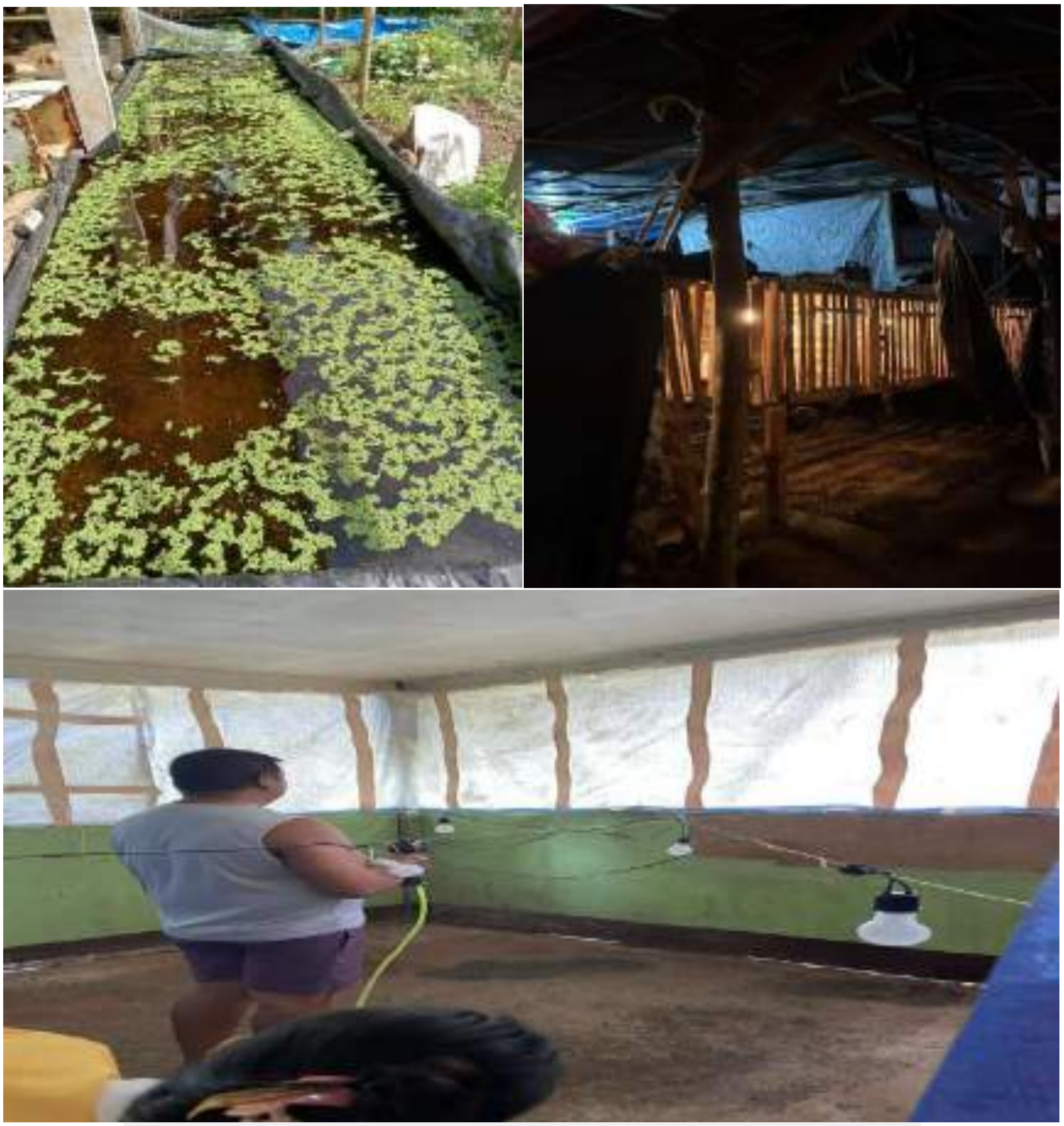

Figure 11. Azolla pond preparation, Brooding cage preparation, Rearing cage. Azolla Production at the Experimental Site in Misamis University, Capucao Farm and Banadero Farm Ozamis City, Misamis Occidental.

APPENDIX F

Documentation

Figure 12. Harvesting, drying Azolla Sterilize dry Azolla . Photos on the Formulated and Fermented Locally Sourced Feed Ingredients Used in the Experiment.

APPENDIX F

Documentation

Figure 13 . Procurement of old chicks Broiler Chicks from La Purita breeding farm in Ipil, Zamboanga, Sibugay.

APPENDIX F

Documentation

Figure 14. During preparation of Mix CF and Azolla for treatment distribution.

APPENDIX F

Documentation

Figure 15. During administered vaccine to the broiler chicken.

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APPENDIX F

Documentation

Figure 16. During transferring of chicks to their perspective treatment cage Light management per cage of chicks.

APPENDIX F

Documentation

Figure 17. Growth During Data Collection on Broiler Chickens Weekly, Weight and Final Weight

APPENDIX F

Documentation

Figure 18. Harvesting of Broiler Chicken, Slaughtering / Selling/ Carcass Collecting Data.

APPENDIX G

Turnitin Result

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Misamis University

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Turnitin Result

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APPENDIX H

Grammarly Result

CURRICULUM VITAE

Name	: Erick B. Aranas
Address	: Purok 1 Manaka. Ozamiz City
	Misamis Occidental
Date of Birth	: March 19, 1989
Place of Birth	: Manaka, Ozamiz City
Age	: 37
Nationality	: Filipino

PERSONAL PARTICULAR

Civil Status	: Married
Religion	: Roman Catholic
Name of Parents	: **Mother:** Emma B. Aranas
	: **Father:** Deceased

EDUCATIONAL ATTAINMENT

Elementary	: Manaka Elementary School
	: Manaka, Ozamiz City (2000-2001)
High School	: Ozamiz City School Of Arts And Trade (OCSAT)
	: (2004-2005)
College:	: Misamis University

CURRICULUM VITAE

Name : Jennicel L. Capapas,

Address : Purok -1 Lam-an Ozamis City

Misamis Occidental

Date of Birth : January 5 2004

Place of Birth : Purok 2- Tituron, Tangub City , Misamis Occidental

Age : 22

Nationality : Filipino

PERSONAL PARTICULAR

Civil Status : Single

Religion : Roman Catholic

Name of Parents : **Mother:** Jovie L. Capapas

: **Father:** Venancio S. Capapas

EDUCATIONAL ATTAINMENT

Elementary : Tituron, Elementary School

: Tituron, Tangub City Misamis Occidental (2014 - 2015)

Junior High School : Bongabong, National High School

: Bongabong Tangub City, Misamis Occidental (2018-2019)

Senior High School : Bongabong, Senior High School

: Bongabong Tangub City , Misamis Occidental (2021-2022)

College: : Misamis University

: Ozamiz City, Misamis Occidental (2022 - 2026)

CURRICULUM VITAE

Name : Sergei S. Rato

Address : Purok-3 Brgy. 3 Tangub City
Misamis Occidental

Date of Birth : April 11, 2004

Place of Birth: Medina Hospital Ozamis City , Misamis Occidental

Age : 22

Nationality : Filipino

PERSONAL PARTICULAR

Civil Status : Single

Religion : Roman Catholic

Name of Parents : **Mother:** Almabella S. Rato
: **Father:** Geminiano P. Rato

EDUCATIONAL ATTAINMENT

Elementary : Tangub City, Central School
: Mantic, Tangub City Misamis Occidental (2014 - 2015)

Junior High School: St. Micheals High School
: Brgy. 2 Tangub City, Misamis Occidental (2018-2019)

Senior High School: St. Micheals, Senior High School
: Brgy. 2 Tangub City , Misamis Occidental (2021-2022)

College: : Misamis University
: Ozamiz City, Misamis Occidental (2022 - 2026)