# Comparative Of The Growth & Survival Rates Of Genetically Improved Farmed Tilapia (Gift) Using Formulated Sweet Potato Granules & Commercial Feeds

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**Abstract:** Background: The issue caused by the amino acids from the costly fish feed in the growth of Genetically Improved Farmed Tilapia is the incredible cost of fish feeds. The study's aim is to look for an alternative & cheap fish feed. The research identified Genetically Improved Farmed Tilapia (GIFT) growth & survival rates in the HAPA using formulated sweet potato granules & commercial feeds for 60 days as basis for the development of a Technology Guide. The experiment method has been used in the research. **Results:** The findings showed that the three formulated feeds have lower protein (20.33, 19.3, & 19.6) yet with higher fat (24.1, 15.69, & 10.72) than the commercial (24.1%, 3%). The initial & final weight in grams, length in centimeters & width in centimeters were highest on T1 then followed by T2 & T3. It was with the use of T1 which proved to be an effective feed. **Conclusion:** The ingredients utilized in the feed formulations are possible substitution of fish feed & the advancement of its usage is commendable.

**Keywords:** Formulated Feeds; Genetically Improved Farmed Tilapia; Fish Feed

## 1. INTRODUCTION

Tilapia farming is a significant factor in this phenomenon in Southeast Asia & has primarily evolved around one species, Nile tilapia. In the 1970s, tilapia agriculture in Asia started to thrive & was followed by regional improvements in hatchery technology & pond husbandry. The genetic aspects of most fish farming, including tilapia farming, were overlooked until the mid-1980s, unlike in l& animal farming, where selective breeding is centuries old. By that moment, in stagnating tilapia returns, the effects of this absence of attention to genetics were starting to demonstrate. According to Pemsl, D., and et.al. research. (2008) In the last four decades, the aquaculture industry has witnessed drastic development, particularly in developing nations. Increasing the development of aquaculture is a mixture of area expansion & technological change (increased strains, feed & fertilizer input, & improved management). One instance of such technological change is the selective tilapia breeding attempts launched together with (inter)national partners by the WorldFish Center (then ICLARM) in 1988. The result of the selective breeding attempt was a tilapia strain called "GIFT," which was first released in 1993 & the growth levels in on-farm studies were considerably greater. The strain was embraced in the Philippines for the first time, but has since spread to 11 Asian nations. Ex-ante trials showed the potential of the GIFT strain & found that significant effect can be anticipated from strains derived from GIFT & GIFT. The research is an ex-post evaluation of the effect of GIFT on the farm level & how the technology was disseminated & used. The research is based on a survey of 780 tilapia manufacturers in three areas in Luzon, the Philippines, undertaken in 2006/2007. The study analyzes GIFT strain acceptance rates & compares GIFT vs. non-GIFT strain results & the effect on tilapia returns of various variables. The main results are that the acceptance of pure GIFT strains is very small (6 percent) based on farmers ' reporting, while nearly half of farmers reported using GIFT strains obtained. In at least 27 percent of cases, there is uncertainty about the genetic origin of the strains, & questions about the purity of the breed remain even for the GIFT & GIFT-derived strains In at least 27 percent of cases, there is uncertainty about the genetic origin of the strains, & questions about the purity of the breed remain even for the GIFT & GIFT-derived strains. The GIFT & GIFT-derived strains did not perform any better compared to other strains based on the scores of farmers & the recorded manufacturing data. This is probable to be the consequence of bad leadership over the last 15 years of enhanced strains rather than a shortcoming of the initial GIFT technology. Nutritionists around the globe are constantly looking for sources of dietary protein in which fish will maximize development & boost output in the shortest moment & at the highest price possible. Peelings & leftover materials are one of the cheapest nutrient sources that can decrease the elevated price of fish feed. Many studies were carried out using multiple protein sources such as chicken entrails & formulated kangkong feeds as quoted by Tabanao (2005). As Ansah, et.al quoted in 2014, Tilapias (Family: Cichlidae) is appropriate for multiple aquaculture systems owing to its ease of propagation, handling tolerance, rapid development in both natural & produced feed, tolerance of a broad spectrum of environmental circumstances, & elevated palatability, marketability & nutrient content. Because of their rapid development & brief generation time, tolerance to a broad spectrum of environmental circumstances, resistance to stress & disease, ability to reproduce in captivity, & acceptance of artificial feeds immediately after yolk-sac absorption, they are particularly well suited for culture in developing nations. From 1970 to 2010, global tilapia production in aquaculture risen from 28,000 tons to over 3 million tons. Globally, tilapias were the dominant group of animals caught in inland fisheries between 2000 & 2005 (the tilapias were exceeded by cyprinids in 2005. In terms of aquaculture manufacturing,

tilapias accounted for roughly 5% of complete worldwide fish farming, second to carps, which accounted for over 70%.GIFT's implementation & dissemination has produced important rural income & jobs, contributing to human nutrition, particularly among the poor, as tilapia is a comparatively cheap fish. Tilapia farming offers an appealing livelihood for hatchery operators & fish farmers & GIFT has made an important contribution to job creation, including for poor small-scale farmers (Khaw, et. al., 2009). The study has attempted to discover the nearly ideal species that will develop quickly in a feeding, development, & survival setting. The study lastly selected the GIFT or the Genetically Improved Farmed Tilapia after thorough studies. The ultimate goal of this study is to encourage sustainable development while providing the Filipino people with financial possibilities. "Give a fish to a man..... he's going to eat a day. Teach him how to farm fish.... He'll feed himself (but may need subsidies for life).Teach him how to use tilapia as his main crop fish..... He'll have a tool that will sustain his future development if used wisely."(Adapted from Anonymous & Jérôme Lazard, 1997).

## 2. METHODS

### 2.1 Research Materials

The materials used in the study were the species of Genetically Improved Farmed Tilapia, formulated sweet potato granules, & commercial feeds. There were four HAPAs; & each HAPA was placed with 10 pieces of Genetically Improved Farmed Tilapia post fingerlings at 30 grams each & is randomly mixed with male & female GIFT. The Genetically Improved Farmed Tilapia placed in $T_0$ were the control group fed with commercial feeds while those of $T_1$ or the 1.5kg sweet potato peelings (Boniatos) + 750 g leftover fish bones of the mackerel scad (Decapterus macarellus) +375 ml of Vegetable oil + 3 tabs amino acid feed, $T_2$= 1 kg sweet potato peelings (Boniatos) + 750 g leftover fish bones of the mackerel scad (Decapterus macarellus) +375 ml of Vegetable oil+2 tabs amino acid feed, & T3= 0.5 kg sweet potato peelings (Boniatos) + 250 g leftover fish bones of the mackerel scad (Decapterus macarellus) +125 ml of Vegetable oil + 1 tab amino acid feed. The instrument, apparatus, & equipment used in the study were the HAPA, aerators, meat grinder, ladles, mixing bowl, drying trays, weighing scale, scoop net, & basins. The study complied with all regulations as mandated by the CTU – University Research Ethics Committee.

### 2.2 Gathering & Formulation of Feeds

Diet formulation is the method of combining the available raw materials to satisfy the established nutrient requirements of Genetically Improved Farmed Tilapia. In this study, the sweet potato peelings were selected as one of the raw materials, which is believed to have the ability to supply nutrients & at the lower cost. In this procedure, the sweet potato peelings (Boniatos) were the main materials, were first procured & gathered. The peelings were then air dried. Then, all the materials such as the sweet potato peelings (Boniatos) + leftover fish bones of the mackerel scad (Decapterus macarellus) + Vegetable oil + amino acid were mixed thoroughly in a mixing bowl. The mixture was then passed through a meat grinder. Then the extrusion, which looked like granules were dried; after drying, the final product is now ready for use.

### 2.3 Determination of Proximate Composition of Feeds

All tests of formulated & the commercial feeds were broken down in the F.A.S.T. lab for the proximate composition as to moisture, crude protein, fat, ash, energy content, & sodium. Moisture & ash were resolved by the standard strategies for AOAC 1995. Difference determined the total carbohydrates. For sodium determination, the test was processed with nitric acid added with potassium chloride & diluted to know the volume. The test solution was suctioned through AAS set inflame discharge mode for estimation.

### 2.4 The Control & Experimental Groups

There were four treatment groups involved in the study, the $T_0$ the control group, $T_1$ or the 1.5kg sweet potato peelings (Boniatos) + 750 g leftover fish bones of the mackerel scad (Decapterus macarellus) +375 ml of Vegetable oil + 3 tabs amino acid feed, $T_2$= 1 kg sweet potato peelings (Boniatos) + 750 g leftover fish bones of the mackerel scad (Decapterus macarellus) +375 ml of Vegetable oil+2 tabs amino acid feed, & $T_3$= 0.5 kg sweet potato peelings (Boniatos) + 250 g leftover fish bones of the mackerel scad (Decapterus macarellus) +125 ml of Vegetable oil + 1 tab amino acid feed. The $T_0$ , the control group, was placed with Genetically Improved Farmed Tilapia using commercial feeds &, $T_1$ or the 1.5kg sweet potato peelings (Boniatos) + 750 g leftover fish bones of the mackerel scad (Decapterus macarellus) +375 ml of Vegetable oil + 3 tabs amino acid feed, T2= 1 kg sweet potato peelings (Boniatos) + 750 g leftover fish bones of the mackerel scad (Decapterus macarellus) +375 ml of Vegetable oil+2 tabs amino acid feed, & $T_3$= 0.5 kg sweet potato peelings (Boniatos) + 250 g leftover fish bones of the mackerel scad (Decapterus macarellus) +125 ml of Vegetable oil + 1 tab amino acid feed, the experimental groups, were placed with the same species using formulated sweet potato granules. Each aquarium was placed with 10 pieces of GIFT at 30 grams each, & had eight samplings. The feeding was done twice daily. The daily feeding rate was three percent of the total body weight. One-half of the total feeds for the day were given in the morning between 6 & 8 o'clock & the other half in the afternoon 4 & 6 o'clock. The weights & survival rates of the Genetically Improved Farmed Tilapia were taken & recorded every sampling.

### 2.5 Water Quality

The water quality was monitored on a daily basis to decide the impact of formulated feeds on it. The parameter for water quality such as temperature, oxygen, & salinity was checked multiple times daily (twice both toward the beginning of the day & afternoon) using an advanced DO meter. The pH was determined two times every week. The ammonia & nitrate were resolved weekly using the API test pack. The criteria for desired water quality depended on the study of Go, et al., (2018). The ideal extents are as follows: DO (3-5 ppm); temperature (22-35 0 C); pH (6.5-8.5); saltiness (<45 ppt); ammonia (<0.025), nitrate (0.1 – 4.5); & nitrite (< 0.02).

### 2.6 Research Gathering Techniques

As a comparative study, the investigator had leaned on the effects of formulated sweet potato granules & commercial feeds on the growth & survival rates of Genetically Improved Farmed Tilapia. Sampling of the species was done every weekend & the data were gathered through the daily observations of the researcher. Through observations, the researcher recorded the data & tabulated for analysis &

interpretations. The data gathered were arranged & put into tables for illustration of the analysis & interpretations.

### 2.7 Biostatistical Treatment

Biostatistical treatment used in the study which the researcher wanted to answer & diagnose carefully the specific problems were: (a) Arithmetic Mean was used to determine the weight, length, & width of the Genetically Improved Farmed Tilapia. (b) To determine the significant difference among growth factors, ANOVA was utilized. (c) To express the total variation that can be attributed to the growth factors, Sum of Squares was used. (d) Tukey Test was employed to determine which treatments were significant.

## 3. RESULTS

### 3.1 Proximate Composition of Formulated Feeds is shown in Table 1.

**Table 1**. Composition of formulated feed.

| Parameters | T0 | T1 | T2 | T3 |
|---|---|---|---|---|
| Crude Protein (%) | $_{a}$24.1 | $_{b}$20.33 | $_{b}$19.3 | $_{b}$19.6 |
| Carbohydrates (%) | 40.2 | 43.07 | 45.44 | 41.16 |
| Crude Fat (%) | $_{a}$3 | $_{b}$24.1 | $_{c}$15.69 | $_{d}$10.72 |
| Fiber (%) | 8.7 | 7.81 | 3.55 | 5.61 |
| Ash (%) | 11.5 | 3.5 | 2.18 | 2.44 |
| Moisture (%) | 9.9 | 10.31 | 10.24 | 8.5 |
| Sodium,ppm | $_{a}$0.11 | $_{b}$362.9 | $_{c}$250.1 | $_{d}$430.2 |

The same superscripts don't significantly differ ($p < 0.05$).

The crude protein (Table 1) of the formulated feeds indicated that commercial feed contained the highest protein; next is T1 while T2 & T3 had nearly the equivalent amount. Results further uncovered that there were no significant ($p<0.01$) contrasts in the crude protein of the three formulated feeds. Nonetheless, when contrasted with the control feed, their protein substance were significantly ($p<0.01$) lower. With respect to carbohydrates compositions of the control & experimental feed, the most noteworthy worth was observed in T2 & the least worth was in the control feed. Notwithstanding, the carbohydrates content among the four feeds were practically identical as an inconsequential result was got utilizing the trial of Analysis of Variance (ANOVA). The formulated & control feeds have various amount (Table 1) of crude fat. Among the formulated, Treatment 1 contained significantly higher amount (24.1) followed by T2 then, at T3 (10.72). The fat compositions of these feed were significantly higher than the control feed as it had the least fat substance (3.0). The high-fat contents of the formulated feeds compensate for their low protein contrasted with the control feed as the ongoing pattern in fish feeds is to use higher levels of lipids in the eating routine. Although increasing dietary lipids can help lessen the high expenses of eating regimens by incompletely sparing protein in the feed, issues such as excessive fat statement in the liver can decrease the wellbeing & market quality of fish. The fiber content among the experimental groups uncovered that T1 acquired the highest percentage. The least amount was seen in T2. The control feed had the highest fiber substance of 8.7 than the experimental groups. Their fiber compositions did not essentially contrast. As indicated by Go, et.al 2018 that it isn't prescribed for fish to contain fiber substance past 8-12% since these amount would result in the decrease in nature of unusable supplement. In this way, the fiber amount of these feed were in the acceptable range. Concerning the ash amount of the four groups, the control feed obtained significantly higher amount (11.5) compared to the three experimental feeds (T1, T2, T3) which have ash amount extending from 2.18-3.5. These qualities are not exactly the required content in feeds since according to Khaw, et.al (2009) the standard ash content in fish sustains for the most part goes from 7%to 12%. The outcome suggests that formulated feeds contain less minerals analyzed than the control feed. Along these lines, they have to be supplemented with minerals to provide better development execution to angle. On the other h&, the acquired ash of the control feed surpasses as far as possible. In this manner, it may have negative consequences for the fishes, including expanded mortality & reduced growth (Adewolu, 2008). The sodium content of the formulated feeds was estimated in ppm. The obtained sodium of the four groups is reflected in Table 1. The information demonstrates that the sodium content of the four feeds were significantly unique. T3 has significantly higher substance followed by T1 & T2; the control feed got the least amount.

### 3.2 Growth Performance

The growth performance & survival rate of Genetically Improved Farmed Tilapia in a HAPA for 60 days is shown in Table 2. Results revealed that T1 showed better growth execution among the formulated feeds because it had the most amazing weight gain in addition to the control feed & the least value was seen in the examples supported by T3. This may be anticipated to result in a slightly greater quantity of protein in T1, but its fat content was the least compared with the other two medicines (T2 & T3). Nevertheless, in the Weight Gain & Length Increases of the four medicines, ANOVA Examination showed no critical ($p<0.01$) comparison. Despite the reality that control feed saw the highest ordinary weight gain, the value was practically identical to that of control feed.

***Table 2.*** *Growth performance & survival rate of Genetically Improved Farmed Tilapia (GIFT) for 60 days.*

| | $T_0$ | | | $T_1$ | | | $T_2$ | | | $T_3$ | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Initial | Final | Weight Gain | Initial | Final | Weight Gain | Initial | Final | Weight Gain | Initial | Final | Weight Gain |
| Total | 153 g | 710 g | 556.9 g | 153.2 g | 638 g | 484.9 g | 153 g | 604 g | 451 g | 153.2 g | 540 g | 386.9 g |
| Mean | 15.3 | 71 | 55.69 | 15.32 | 63.8 | 48.49 | 15.3 | 60.4 | 45.1 | 15.32 | 54 | 38.69 |

## 4. DISCUSSION

### 4.1Proximate Composition of Formulated Feeds

Protein inclusion is the most costly piece of a fish feed; in this way it is vital to satisfy & match each fish species ' appropriate & least protein requirement & amino acids (Banrie, 2013). The protein requirement of a fish relies on a number of variables, including water temperature & water quality, as well as its hereditary structure & nutritional levels (Craig et al, 2017). Providing high quantities of protein in an animal diet is both financially & environmentally ridiculous, since, as stated by Banrie (2013), protein parts are one of the very costly nutritional elements, & taking into account excessive proteins also builds the nitrogen excretion of the fish. The correct amount of carbohydrates should be provided in fish feeds to ensure the highest nutrient usage, growth, digestion & health results of fish (Abro, 2014). Protein, fat & sugars are the fundamental components of meals (Craig & Helfrich, 2002). Protein in fish feed is used for fish development as long as both fat & sugar are adequate; something else will be used as a source of vitality (Craig & Helfrich, 2002). It can subsequently be suggested that high-vitality fat supplements can be used as a replacement for protein in feed formulation (Craig & Helfrich 2002). Consequently, the latest consolidation of high fat in fish consumes fewer calories. When appropriate measures of crude fiber are integrated into the fish feed, different health benefits can be attributed that can be shown in the duration & size growth of the species. Indeed, crude fiber assumes an important job in fish health by efficiently removing poisons & waste products as a result of its ability to bind water along these lines helping the animal to also create firmer stools (Abro, 2014). Moderate fiber inclusions in feeds enhance binding as well as feed section within the feed channel. The development of sodium in the form of salt makes the sustenance increasingly satisfactory & has some benefits for fish diets such as boosting the appetite of the fish & acting as humectants by reducing motion of the water. As mentioned by Towers as quoted by Go, et.al in 2018 promotes consideration of salt in fish to yield important outcomes in the growth & efficiency of fish.

### 4.2 Growth & Survival Rates of the Genetically Improved Farmed Tilapia (GIFT)

Despite the study of Magondu et al. as cited by Go, et.al (2018), the results of the study were that sustaining the fish on detailed eating schemes resulted in a significantly higher mean fish weight gain than that of fish benefiting from unfigured eating schemes on the grounds that the highest weight gain was seen in the fish samples benefiting from commercial feed. Control feed has the lowest Feed Conversion Ratio estimate & the highest Feed Efficiency followed by T1 while T3 has the highest Feed Conservation Ratio estimate. It implies a smaller measure of T3 feed is needed to contrast one kilo of fish with T2 & T1. On the other side, T3 shows bad performance in the growth of fish, but it also needs the most amazing feed measure to provide one kilo of fish in contrast to the other two procedures (T1 & T2). The estimates of Feed Conversion Ratio collected in this research were smaller than the values of Feed Conversation Ratio collected on tilapia fingerlings by Adewolu (2003) maintained weight control plans with distinct protein concentrations. Also, in this research, the values of Feed Conversion Ratio & Feed Efficiency were not within the range of "healthy growth" as they competed with Craig, et. al, (2002), a healthy growth feed should have an estimated Feed Conversion Ratio of 1.5-2.0 or a Feed Efficiency of half. It indicates that the formulated feeds should be enhanced to guarantee the Genetically Improved Farmed Tilapia (GIFT) is ideally developed.

### 4.3 Water Quality

**Table 3.** The Effect of treatments on water quality.

| Parameter | T0 | T1 | T2 | T3 |
|---|---|---|---|---|
| Dissolved O2 | 4.5 | 4.7 | 4.4 | 4.5 |
| (mg/dl) | 28.5 | 28.6 | 28.6 | 28.5 |
| Temperature ($^oC$) | 7.3 | 7.3 | 7.3 | 7.3 |
| ph | - | - | - | - |
| Ammonia | - | - | - | - |
| Nitrate | | | | |

(-) not detected

The superb quality of water maintained throughout the experiment was due to the velocity of momentum generated by winds producing waves that resulted in excellent water trade in all boundaries. As a result, there was no uneaten nutrition loaded on the HAPA & ammonia & nitrate development was avoided.

## 5. CONCLUSION

The formulated feeds have the option of adding the commercial feed equal to the development of the Genetically Improved Farmed Tilapia (GIFT). They are also possible in feed formulation to replace fishmeal in order to decrease feed costs. In this way, sweet potato peelings (Boniatos) & the remaining mackerel scad fish bones (Decapterus macarellus) that do not compete with human consumption should be developed for use in the formulation of feed.

List of Abbreviations
ADB – Asian Development Bank
ANOVA - Analysis of Variance
GIFT – Genetically Improved Farmed Tilapia
FCR – Feed Conversion Ratio
FE- Feed Efficiency

## DECLARATIONS

Ethics Approval & Consent to Participate
The study complied with all regulations as mandated by the CTU – University Research Ethics Committee.
Availability of data & materials
The data that support the findings of this study are available from the corresponding author upon request.
Competing Interests
The author declares that he has no competing interests of this article.
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