Annex A

EXECUTIVE BRIEF FOR NEW PROGRAM/PROJECT

<table>
<tr><td>Nature of Request</td><td>New</td></tr>
<tr><td>Title</td><td>Backyard Tilapia Farming in Batangas in Response to the COVID-19 Pandemic</td></tr>
<tr><td>Duration</td><td>12 months (July 1, 2021- June 30, 2022)</td></tr>
<tr><td>Project Leader/Agency</td><td>Dr. Miguel Enrique Ma. A. Azcuna/ BatSU</td></tr>
<tr><td>Monitoring Agency</td><td>PCAARRD</td></tr>
<tr><td>Funding Request</td><td><table><tr><th>ITEMS</th><th>Y1</th></tr><tr><td>PS</td><td>373,934.40</td></tr><tr><td>MOOE</td><td>1,126,065.60</td></tr><tr><td>TOTAL</td><td>1,500,000.00</td></tr></table></td></tr>
<tr><td>Counterpart Funds</td><td>PhP 196,000.00</td></tr>
<tr><td>Background</td><td>The onset of the COVID-19 pandemic showed how food supply can become unstable when transportation and delivery logistics are hampered by lockdowns and curfews. Difficulties arose in the production and selling of agricultural products (e.g. vegetables, fruits, meats, etc). Supermarkets had limited or no stock of food supplies. In other cases, deliveries were postponed or cancelled due to lack of transportation or long lines at checkpoints which would cause the goods to rot and perish (Pamplona 2020). People from isolated towns could not commute to supermarkets for many reasons (e.g. no public transportation, entire household under home quarantine). These situations highlight the relevance of food security in the Philippines amidst the COVID-19 pandemic.

Aquaculture of tilapia in ponds is one solution that can augment food supply in rural areas. This project will set up small-scale backyard tilapia fishponds for beneficiaries/participants in Batangas. These household ponds should have an available source of freshwater (e.g. deep well, stream, river, irrigation canal). This project will primarily allow the beneficiaries to develop and implement livelihood activities during the post-lockdown period. Secondly, it will ensure that they will be able to address their basic food requirements, especially in terms of protein requirements.</td></tr>
<tr><td>Description</td><td>The project will be implemented by the Batangas State University in cooperation with the BFAR Region IV-A and LGUs. It is intended to and increase the disposable</td></tr>
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<table>
<tr><td></td><td>income of poor household families in Batangas during the post-lockdown period for Covid-19 affected areas. It will also meet their immediate nutritional needs in terms of protein derived from fish. Financial and technical know-how will be provided to the fishfarmer cooperators and the respective LGUs.</td></tr>
<tr><td>Project Objectives</td><td>General

To increase the household disposable income and provide immediate fish supply to poor households in Batangas

Specific

1. To introduce good aquaculture practices/technologies on tilapia production
2. To enhance capabilities of tilapia farmers on culture and management practices.
3. To establish linkages with stakeholders and partner LGUs.</td></tr>
<tr><td>Beneficiaries</td><td>1. Small-scale farmers
2. Communities with no access to supermarkets
3. Food establishments during times of pandemic (e.g. lockdowns imposed by COVID-19 pandemic).</td></tr>
<tr><td>Expected Outputs</td><td>
<table>
<tr><th>6Ps</th><th>Y1</th></tr>
<tr><td>Publications</td><td>One (1) manuscript on Tilapia aquaculture submitted to target ISSI journal for peer-review evaluation</td></tr>
<tr><td>Product</td><td>Ten (10) tons of fresh tilapia and one hundred (100) kilos of tilanggit. Market value of approximately Php 1,200,000.00.</td></tr>
<tr><td>People and Services</td><td>Fifteen (15) trained fisherfolk cooperators</td></tr>
<tr><td>Places and Partnership</td><td>Partnership with BFAR Region IV-A, NFRDI, and LGUs in Batangas</td></tr>
<tr><td colspan="2">2IS</td></tr>
<tr><td>Social Impact</td><td>Increased awareness and technical skills in Tilapia production</td></tr>
<tr><td>Economic Impact</td><td>Increased livelihood from the market sale of harvested tilapia</td></tr>
</table>
</td></tr>
</table>

From Monitoring Council (PCAARRD)	
Technical Merit (as assessed by the Monitoring Agency)	Recommended for funding. The project is technically sound.
Technologies that will be Generated	
Socio-Economic Benefit/ Environmental Impact/ Tangible Benefits (from Council)	The project will provide additional source of income for the tilapia farmer cooperators. Environment-friendly culture techniques for tilapia farming will be used in the project.
Remarks (e.g. observations on LIB vis a vis approved and previous year's funding)	This proposal is in line with the PCAARRD's Tilapia ISP. Overall, the requested budget for Y1 is reasonable for implementing the activities of the project. The project is recommended for presentation to the 4th Regular DC meeting on March 17, 2021 for funding consideration under PCAARRD-GIA.

DOST Form 2B

DETAILED RESEARCH & DEVELOPMENT PROJECT PROPOSAL

(For the Component Project)
(To be accomplished by the researcher)

(1) PROJECT PROFILE
Program Title:
Project Title: Backyard Tilapia Farming in Batangas in Response to the COVID-19 Pandemic.
Project Leader/Sex: Dr. Miguel Enrique Ma. A. Azcuna (M)
Agency: Batangas State University ARASOF-Nasugbu
Address/Telephone/Fax/Email: 09457733697 miguel.azcuna@g.batstate-u.edu.ph

(2) COOPERATING AGENCY/IES

BFAR Region IV-A, LGUs

(3) SITE(S) OF IMPLEMENTATION (Municipality / District / Province / Region)
Base Station: Nasugbu, Batangas
Other Site(s) of Implementation: Tuy, Lian, Calatagan, Balayan

(4) TYPE OF RESEARCH
_____ Basic
__X__ Applied

(5) R&D PRIORITY AREA & PROGRAM (based on HNRDA 2017-2022)
__X__ Agriculture, Aquatic and Natural Resources
Sector: _____
_____ Health
Sector: _____
_____ Industry, Energy and Emerging Technology
Sector: _____
_____ Disaster Risk Reduction and Climate Change Adaptation
Sector: _____
_____ Basic Research
Sector: _____

(6) RATIONALE (not to exceed one page)

The onset of the COVID-19 pandemic showed how food supply can become unstable when transportation and delivery logistics are hampered by lockdowns and curfews. Difficulties arose in the production and selling of agricultural products (*e.g.* vegetables, fruits, meats, etc). Supermarkets had limited or no stock of food supplies. In other cases, deliveries were postponed or cancelled due to lack of transportation or long lines at checkpoints which caused the goods to rot and perish (Pamplona 2020). People from isolated towns could not commute to supermarkets for many reasons (*e.g.* no public transportation, entire household under home quarantine). These situations highlight the relevance of food security in the Philippines amidst the COVID-19 pandemic.

Aquaculture of tilapia in ponds is one solution that can augment food supply in rural areas. This project will set up small-scale backyard tilapia fishponds for beneficiaries/participants in Batangas. These household ponds should have an available source of freshwater (*e.g.* deep well, stream, river, irrigation canal). This primary general goal of the project is to increase the disposable income of poor household families in

Batangas during the post-lockdown period for Covid-19 affected areas. Secondly, It will ensure that they will be able to meet their basic food requirements by, especially in terms of protein requirements.

(7) REVIEW OF LITERATURE (not to exceed three pages)

Tilapia Production

Tilapia is one of the most important sources of protein in the Philippines. It can be produced easily from the ponds and cages and has been popular among fish farmers (Romana-Eguia et. al. 2020). In 2015, the highest production of farmed tilapia was produced from the freshwater ponds (54%), followed by freshwater cages (30%), freshwater pens (8%) and brackishwater ponds (7%). Total production in 2016 was about 300,720 metric tons and was valued at Php 24 billion, with most of the production coming from farms. It must be noted however, that farmed tilapia production in the Philippines is showing a downward trend. From 2001 to 2011, there was a 240% increase in tilapia production, but this decreased to a meager 7% from 2007 to 2016. The factors that may have contributed to this include: high water temperature, lack of government assistance, poor breed of tilapia, lack of capital, and high cost of production (Guerrero 2018).

One of the reasons why tilapia production is costly is the high cost and limited availability of commercial feed, and this has prompted a need to find cost-competitive feed substitutes (Sarker et al. 2020, White et al. 2018). A study by Villarino 2020 compared the effectiveness of an inexpensive feed mixture versus commercial feed. The mixture consisted of sweet potato peelings, left-over fish bones from mackerel scad (*Decapterus macarellus*), vegetable oil, and amino acids macerated and dried until granular in form. Nutritional analysis of the mixture revealed that the protein, carbohydrate, fiber and moisture content were similar to that of commercial feed. This resulted to tilapia fed with the mixture and those fed with commercial feed to have nearly identical mean weight gains. The only drawback was that fat and sodium content of the mixture was significantly higher than that of commercial feed, which could have negative consequences like fat accumulation in the liver of the fish. In addition, the ash content of the mixture was significantly lower than that of commercial feed. These discrepancies could have negative consequences, such as reduced growth, decreased well-being, and expanded mortality (Villarino 2020).

Backyard Tilapia Farming and "Fish for Every Family Project"

Tilapia culture in a backyard setting can provide a reliable source of protein for small-scale farmers and can respond to the problem of malnutrition among Filipino children. However, one of the barriers for starting tilapia farming was the lack of capital and other inputs, such as high priced feeds and the lack of technical expertise among others (Asian Development Bank 2005).

To address the issues in malnutrition, PLAN Philippines together with PCAMRD implemented the "Fish for Every Family Project" (FFEFP) in 2009 which aims to help families increase their income by farming and selling tilapia fish, while keeping some in reserve to support their children's diet. Pangilinan et al. 2017 conducted an assessment on the impact of the FFEFP implementation in Occidental Mindoro. Based from the result, FFEFP projects provided self-satisfaction among beneficiaries and build stronger relationships among the

members of the family and of the community. The program enhanced their knowledge on how to venture into farming. They also believed that tilapia has helped their children to become healthier. It also helped families financially by providing allowance to children's going to school.

Fishpond Preparation

Several tasks are necessary in order to prepare a fishpond for aquaculture. First, the bottom mud should be removed until the undesirable bottom black soil is removed. The slope of the dike will depend on the type of soil. For sandy-loamy soil, the inner slope should be 3:1, and for loamy soil, the inner slope should be 2:1; for clay soil, the inner slope should be 1:1. The outer slope of the pond should be 1:2 and the width of the dike crest should be 1.5 -2.0 meters. The ideal water depth should be 2-4 feet during dry season and 4-7 feet during wet season (Rana 2019).

Lime is used to regulate the pH of the soil and pondwater. It increases Ca^{2+}, removes acidity, increases decomposition of organic materials, increased productivity of the pond, decreases water turbidity, eradicates parasites, and increases the appetite of the fish. Organic (e.g. cow dung, poultry manure) and inorganic fertilizers (e.g. TSP-triple super phosphate, urea, MoP – murate of potash) are used to promote phytoplankton growth and increase the natural productivity of the pond (Rana 2019).

Integrating Aquaculture, Environment, and Society

Backyard tilapia farming has several positive benefits on the individual, family, and community (Pangilinan et al. 2017). Individuals who participated were reported to have a greater sense of self-worth and satisfaction. Families were reported to have increased income and less malnutrition. Communities has a strengthened bond through coordinated activities like organized grow-out and harvest of tilapia. In some cases, participants even helped each other procure tilapia fingerlings. Another positive consequence is the emergence of second liner growers (*e.g.* new participants that take interest in the project after seeing the output from the first participants). By showing the positive output of such projects, information dissemination of the benefits of backyard tilapia farming can be spread widely, thus paving the way for widespread aquaculture in rural areas.

Sustainable intensification of aquaculture involves producing more while using less resources and minimizing negative environmental impacts. Less resources may be used by improving the nutrition through formulated diets and deploying genetically improved breeds. Environmental costs can be reduced by using formulations that improve feed efficiency and by implementing better water quality management (Little 2017).

Aquaculture operations in the current setting must plan to become an integral part of a community and region. A diversity of unprocessed and value-added products should be created, and these should be accessible to local markets. Jobs should be created and the environment should be enhanced on local and regional scales (Costa-Pierce 2010).

Tilapia Culture and Food Security

Aquaculture can play a role in attaining food security in Asian developing countries like the Philippines. Backyard tilapia farming can be promoted in places where demography is low and there is vast space (Pamplona 2020). Pond culture along with cash crops and on-farm activities may contribute between 5-10% of total income in rural areas (Ahmed and Lorica 2002). It was also reported by Gupta et al. 1999 that on-farm household consumption is directly related to pond culture and production of low-price fish (*e.g.* tilapia and carp). Increased on-farm fish availability can reduce the dependence of households on purchased fish for consumption. Indeed, fish supply produced from a backyard farm can cover most of the food/protein needs of a household. It can also provide jobs and 'own enterprise' employment, including work for women and children, thus generating additional income through the harvesting and sale of tilapia.

In rural areas, tilapia culture is likely to be more advantageous than other agricultural activities (e.g. cash crops and livestock production) due to the following (El Sayed 2006):

1. It can be easily integrated into other agriculture.
2. Use of low-cost inputs and technologies by using locally available on-farm sources.
3. Limited investment needs.
4. Low levels of risk.
5. Low labor requirements.

To be fully maximize the benefits of tilapia culture, certain aspects need to be optimized. The performance of farmed tilapia in the Philippines has been declining due to newly introduced strains, most likely from the loss of genetic variation through founder effect and introgression with Mozambique tilapia (*Oreochromis mossambicus*) (Mair et al. 2002). Collaborations between government fisheries agencies, public, and private institutions developed genetically enhanced tilapia stocks to support the need for quality, fast-growing seedstock (Romana-Eguia et al. 2019, SEAFDEC 2017). Another problem is the early sexual maturation and unwanted reproduction of tilapia in pond cultures. Genetics-based technology can resolve this problem. The use of sex-reversed or Genetically Male Tilapia (GMT) can increase yields by 30-40% and profitability by over 100%. The synthetic hormone 17-α-methyltestosterone is normally used for sex-reversal in tilapia, but natural phytoandrogens such as Benguet Pine (*Pinus kesiya*) pollen extract are just as effective (Nieves 2017). The only disadvantage is the high cost of obtaining suitable amounts of this extract. Table 1 summarizes the various genetically improved Nile tilapia (*Oreochromis niloticus*) strains developed in the Philippines.

Table 1. Summary of Genetically Improved Strains of Nile tilapia (*Oreochromis niloticus*) developed in the Philippines
(Romana-Eguia et al. 2019, SEAFDEC 2017)

Strain	**Genetic Program / Method**
GIFT Tilapia	Genetically improved farm tilapia (GIFT) program: Combined family and within family selection for improved growth
Genomar Supreme Tilapia	Genomar Project: Combined selection for improved growth,

(GIFT-derived)	marker assisted selection
GET Excel and iExCEL or improved GET Excel stocks	GET-Excel Program: Outcrossing two fast-growing strains (FAST and GIFT) for improved growth
Genetically Male Tilapia (GMT) or YY supermale tilapia	GMT Program: Selective breeding and sex reversal methods
Brackishwater Enhanced Selected Tilapia (BEST) and i-BEST / improved BEST	BEST Program: Hybridization and outcrossing; Size-specific selection for salinity tolerance
Cold tolerant tilapia	Cold tolerant tilapia: Hybridization
FAST Tilapia	Freshwater Aquaculture Center Selected Tilapia Program: Rotational mating and hybridization
SaltUno tilapia	SaltUno Project: Hybridization to produce salt tolerant tilapia

(8) OBJECTIVES

General:

To increase the household disposable income and provide immediate fish supply to poor households in Batangas

Specific:

1. To introduce good aquaculture practices/technologies on tilapia production
2. To enhance capabilities of tilapia farmers on culture and management practices
3. To establish linkages with stakeholders and partner LGUs

(9) METHODOLOGY (See guide at the back for details)

Fifteen (15) project sites from 15 beneficiaries in Batangas will be identified for backyard tilapia culture. Genetically-reversed male tilapia fry/fingerlings will be obtained from BFAR Region 4-A or from other commercial sources.

The identified sites should have a sustainable source of water during the 3-4 months culture period of tilapia. Sites should already have an excavated area for the fishpond. The fishfarmer-cooperators should be willing to undergo training on tilapia culture and processing prior to project implementation. At least 15 fisherfolk households will be selected as tilapia farmer cooperators, and selection will primarily consider the following conditions: (a) that the household's income is largely dependent on tilapia production; (b) that the volume of fish produced is not of commercial scale; (c) that the fisherfolk's family may be considered vulnerable – to be determined following the Household Assessment Tool to assess several components, including the household characteristics, socio-economic status, and housing conditions (Shelter Cluster Philippines, www.sheltercluster.org).

The beneficiaries will be trained on how to compute for the costs associated with backyard tilapia culture (e.g. cost of fingerlings, feeds) in order to compute for the net income of profit after market sale of the harvested tilapia (see Tables 2-4). In addition, a practical guide for tilanggit production will be taught to the fishfarmer-cooperators. The overall training will include fishpond construction and management, fishpond fertilization using organic and inorganic fertilizers, feeds and feeding, harvesting of stocks, post-harvest

handling, record keeping, and simple cost and return analysis.

Table 2. Assumptions for Benefit Cost Assessment Analysis
(based on DOST-PCAARRD Backyard Tilapia Farming Project with Laguna State Polytechnic University)

Parameter	**Value**
Total Pond Area:	20-100 m^2
Culture Period	4 - 5 months
Number of Croppings per Year	2
Stocking Density (Semi-Intensive)	4 – 5 pieces per m^2
Survival Rate	85%
Harvest Weight per Piece	250 g
Number of Pieces per Kilo	4
Market Price per Kilo of Harvested Fish *based on BFAR average market price for tilapia in 2020	Php 120.00/kg

Table 3. Variable Cost Consumption
(based on DOST-PCAARRD Backyard Tilapia Farming Project with Laguna State Polytechnic University)

Item	**Cost**
Fingerlings (Php 0.75 per piece, Size 17)	Php 300.00 – 375.00
Feeds (Php 2,000 per 100 m^2 per crop X 2 croppings)	Php 4,000.00
Pond Repair (Php 1,000 per 100 m^2 per crop X 2 croppings)	Php 2,000.00
Aquaculture Supplies (Php 1,000 per 100 m^2 per crop X 2 croppings)	Php 2,000.00
Total	Php 8,300.00 – 8,375.00

Table 4. Benefit Cost Assessment Analysis for Pond with Area = 100 m^2

Parameter	**Value**
Stocking Density	5 pieces
Total Fingerlings Stocked per Crop	500 pieces
Pieces per Harvest @ 85% Survival per Cropping	425 pieces
Amount of Kilos Harvested per Cropping @ 4 pieces-kg size	106 kg
Total Operating Cost	Php 8,375.00
Revenue = 106 kg X Php 120.00 X 2 Croppings	Php 25,440.00
Net Profit [a]	Php 17,065.00
Break-even Price [b]	Php 39.50 per kg

Return on Investment [c]	203.7%
Payback Period [d]	0.33 years
Benefit Cost Ratio [e]	2.04

Legend:

[a] - Net Profit = Revenue – Total Operating Cost

[b] - Break-even Price = Total Operating Cost / Amount of Kilos Harvested in 2 Croppings

[c] - Return on Investment = Net Profit / Total Operating Cost

[d] - Payback Period = Total Operating Cost / Net Profit

[e] - Benefit Cost Ratio = Net Profit / Total Operating Cost

(10) TARGET ACCOMPLISHMENTS AND EXPECTED OUTPUTS

6Ps	Y1
Publications	One (1) manuscript on Tilapia aquaculture submitted to target ISSI journal for peer-review evaluation
Product	Ten (10) tons of fresh tilapia and one hundred (100) kilos of tilanggit. Market value of approximately Php 1,200,000.00.
People and Services	Fifteen (15) trained fisherfolk cooperators
Places and Partnership	Partnership with BFAR Region IV-A, NFRDI, and LGUs in Batangas
2IS	
Social Impact	Increased awareness and technical skills in Tilapia production
Economic Impact	Increased livelihood from the market sale of harvested tilapia

(11) TARGET BENEFICIARIES

1. Small-scale farmers
2. Communities with no access to supermarkets
3. Food establishments during times of pandemic (e.g. lockdowns imposed by COVID-19 pandemic).

(12) GENDER AND DEVELOPMENT (GAD) SCORE (based on the Harmonized Gender and Development Guidelines)

5.25

(13) LIMITATIONS OF THE PROJECT

The fishfarmer-cooperators should have an excavated fishpond filled with freshwater upon the start of the project. In addition, the ponds should be 100 to 500 square meters in size.

(14) LITERATURE CITED

1. Ahmed M, Lorica MH (2002) Improving developing country food security through aquaculture development – lessons from Asia. Food Policy 27:125–141.

2. Asian Development Bank (2005) AN Evaluation of Small Scale Freshwater Rural Aquaculture Development for Poverty Reduction.
3. Costa-Pierce B (2010) Sustainable Ecological Aquaculture Systems: The Need for a New Social Contract For Aquaculture Development. Marine Technology Society Journal.
4. El Sayed A-F (2006) Tilapia Culture 1st ed. CABI Publishing, Cambridge USA.
5. Guerrero RD (2018) Farmed Tilapia Production in the Philippines Is Declining: What Has Happened and What Can Be Done. Philippine Journal of Science 148(2): 11-15.
6. Little DC, Young JA, Zhang W, Newton RW, Al Mamun A & Murray FJ (2018) Sustainable intensification of aquaculture value chains between Asia and Europe: A framework for understanding impacts and challenges, Aquaculture 493: 338-354
7. Mair GC (2002) Tilapia genetics and breeding in Asia. In: Guerrero, R.D. III and Guerrero-del Castillo, M.R. (eds) Tilapia Farming in the 21st Century. Proceedings of the International Forum on Tilapia Farming in the 21st Century (Tilapia Forum 2002). Philippines Fisheries Association, Los Baños, Laguna, Philippines, 100-123.
8. Nieves PM (2017) On-farm trials of phytoandrogen for sex inversion of tilapia. Kuroshio Science, 11-1: 8-13.
9. Pamplona RS (2020) An overview of Philippine agriculture during the transition phase to the new normal. Jayapangus Press Books, 330-352.
10. Pangilinan LA, Parducho RA, Umali ME (2017) Impact Assessment of the Fish for Every Family Projects in Occidental Mindoro, Philippines. Asia Pacific Journal of Multidisciplinary Research 5(4): 157-164.
11. Rana KMS, Hossain MM, Bablee AL, Halim MA, Islam MK, Rahmatullah SM (2019) Contemporary aquaculture and management practices in abhaynagar upazila, jessore, Bangladesh. Journal of Entomology and Zoology Studies 7(4): 1259-1267
12. Romana-Eguia MRR, Eguia RV, Pakingking RV (2020) Tilapia Culture The Basics. Aquaculture Extension Manual No. 66 Aquaculture Department-Southeast Asian Fisheries Development Center, Iloilo, Philippines.
13. Romana-Eguia MRR, Lagman MCA, Basiao ZU, Ikeda M (2019) Genetic research initiatives for sustainable aquaculture production in the Philippines. Journal of Integrated Field Science 16: 4-7.
14. Sarker PK, Kapuscinski AR, McKuin B, Fitzgerald DS, Nash HM, Greenwood C (2020) Microalgae-blend tilapia feed eliminates fishmeal and fish oil, improves growth, and is cost viable. Nature Scientific Reports 10: 19328-19342.
15. SEAFDEC (2017) Southeast Asian State of Fisheries and Aquaculture 2017. Southeast Asian Fisheries Development Center, Bangkok, Thailand. 167p.
16. Villarino RT (2020) Formulated feeds for Genetically Improved Farmed Tilapia (GIFT). Fisheries and Aquaculture Journal 11(277): 1-6.

(15) PERSONNEL REQUIREMENT

Position	Percent Time Devoted to the Project	Responsibilities
Project Leader	30%	Oversee tilapia production and

		processing
Project Staff	30%	Provide expert advice
Project Support Staff	40%	Administrative and financial tasks
Laborer	100%	Pond maintenance and repair, feeding, and book keeping

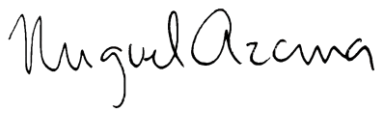
(16) BUDGET BY SITE OF IMPLEMENTATION

Site of Implementation	PS	MOOE	EO	Total
Year 1				
BatSU	**373,934.40**	**1,126,065.60**	**-**	**1,500,000.00**
TOTAL	**373,934.40**	**870,000.00**	**-**	**1,500,000.00**

(17) OTHER ONGOING PROJECTS BEING HANDLED BY THE PROJECT LEADER: 4 (number)

Title of the Project	Funding Agency	Involvement in the Project
Upscaling sea cucumber aquafarming sustainability	Batangas State University	Project Leader
Biodiversity assessment of MPAs in Papaya, Nasugbu	Batangas State University	Project Leader
MBioAssessment of Verde Island Passage	DOST-PCAARRD	Project Staff
Backyard Tilapia farming	DOST-PCAARRD	Project Staff

I hereby certify the truth of the foregoing. Any willful omission/false statement shall be a basis of disapproval and cancellation of the project.

(18)	SUBMITTED BY (Project Leader)	ENDORSED BY (Head of the Agency)
Signature		
Printed Name	**Miguel Enrique Ma. Azcuna**	
Designation/Title	**Assistant Professor**	
Date	**1/28/2021**	

Resume of Miguel Enrique Ma. Azcuna
Home address: 140 CRM Ave. BF Homes Almanza Las Pinas 1750 PHILIPPINES
Mobile: +63-9457733697
Email: Miguel.azcuna@g.batstate-u.edu.ph

Education background

- Ph.D in Marine Science, Major in Marine Biotechnology, Marine Science Institute, University of the Philippines Diliman, Quezon City (2007 – 2019).
- Bachelor of Science in Biology, Major in Marine Biology, Silliman University, Dumaguete City (2002-2005).
- Bachelor of Science in Management Information Systems, Major in Computer Science, Ateneo de Manila University, Quezon City (1996 – 2001).

Current Employment

Head of VIP CORALS Nasugbu and Assistant Professor 2
College of Arts and Sciences, Batangas State University ARASOF – Nasugbu
April 2019 to present

- Creating and implementing project proposals for internal and external funding.
- Teaching courses for the Fisheries and Aquatic Science program.

Work Experience at Marine Science Institute, University of the Philippines Diliman

University Researcher II for EIDR-project
January 2015 to December 2017

- Isolated and purified bioactive compounds from *Callyspongia samarensis* in Bolinao, Pangasinan for screening in anticancer assays.
- Developed an ecological assay to test sponge extracts on *Porites cylindrica* corals.

Science Research Specialist II for Drug Discovery and Health Products – Marine Component
July 2014 to November 2015

- Isolated pure compounds from sponge-associated microorganisms for screening in antimicrobial assays.
- Handled procurement of scientific equipment for the project.
- Organized and participated field collections for Philippine blue sponge *Xestospongia* sp.

University Research Associate II for PharmaSeas Drug Discovery Program
April 2008 to April 2012

- Isolated pure compounds from sponge-associated microorganisms for screening in antimicrobial assays.
- Organized and participated in field collections to isolate microorganisms from marine sponges in the Philippines.

Publications

Azcuna M, Salvador-Reyes L, Tun, J, Lluisma A, Uy ID, Cunanan L, Siringan MA, Concepcion GP. Characterization of the β-protetobacterium *Achromobacter xylosoxidans*

strain ISP2-142-O-2-A using microbiological, chemical and genomics approaches. Philippine Journal of Science 2019, 148(S1): 199-209.

Azcuna MA, Tun JO, Yap HT, Concepcion GP. *Callyspongia samarensis* (Porifera) extracts exhibit anticancer activity and induce bleaching in *Porites cylindrica* (Scleractinia). Chemistry and Ecology 2018, 34(5).

Concepcion GP, Anas ARJ, Azcuna MA. Anticancer compounds from Philippine marine organisms act on major pathways in cancer. Philippine Science Letters 2014, 7(1): 207-228.

DOST Form A

DEPARTMENT OF SCIENCE AND TECHNOLOGY
Project Line-Item Budget
CY ____

Program Title :
Project Title : Backyard Tilapia Farming to Promote Food Security in Batangas in Response to the COVID-19 Pandemic
Implementing Agency : Batangas State University ARASOF-Nasugbu
Total Duration : 12 months
Current Duration : 12 months
Cooperating Agency : BFAR Region IV-A, NFRDI
Program Leader :
Project Leader : Dr. Miguel Enrique Ma. Azcuna
Monitoring Agency : DOST-PCAARRD

	Implementing Agency Counterpart Funding	DOST
I. Personal Services	₱	₱
Direct Cost		
Salaries		
(1) Laborer @ Php 14,440.80/month X 12 months		173,289.60
Honoraria		
(1) Project Leader @ 8,800/month X 12 months		105,600.00
(1) Project Staff (L3) @ Php 7,500/month X 12 months		90,000.00
Indirect Cost		
(Implementing Agency)		
Honoraria		
(2) Project Support Staff (L2) @ Php 1,500/quarter X 4 quarters		12,000.00
Sub-total for PS	₱ -	₱ **380,889.60**
II. Maintenance and Other Operating Expenses		
Direct Cost		
Traveling Expenses		
Local		100,000.00
Foreign		
Communication Expenses (shall be itemized based on GAM)		
Telephone Expenses		10,000.00
Repairs and Maintenance of Facilities (shall be itemized based on GAM)		
Pond repair and maintenance		50,000.00
Hatchery repair and maintenance		50,000.00
Transportation and Delivery Expenses		50,000.00
Supplies and Materials Expenses (shall be itemized based on GAM)		
Office Supplies and Materials		15,000.00
Aquaculture Supplies (hapa nets, feeds)		350,000.00
Other Supplies and Expenses (fingerlings)		150,000.00
Training and Scholarship Expenses (Please indicate)		
Workshop Expenses		100,000.00
Printing and Binding Expenses		10,000.00
Representation Expenses (e.g. food for meetings, etc.)		24,110.40
Professional Services		
Contract Services		140,000.00
Indirect Cost		
BatStateU		
Utilities		50,000.00
Supplies and materials		20,000.00
Sub-Total for MOOE	₱	₱ **1,119,110.40**

DOST Form B

PROJECT WORKPLAN

(1) Program Title:
(2) Project Title: Backyard Tilapia Farming in Batangas in Response to the COVID-19 Pandemic
(3) Total Duration (in months): 12 months **(4) Planned Start Date:** July 2021 **(5) Planned End Date:** June 2022

(6) OBJECTIVES	(7) TARGET ACTIVITIES	(8) TARGET ACCOMPLISHMENTS (quantify, if possible)	Y1			
			Q1	Q2	Q3	Q4
To introduce good aquaculture practices/ technologies on tilapia production	Identify 15 fishfarmer-household cooperators	15 cooperators with fishponds ready for stocking	■			
	Deliver tilapia fingerlings to cooperators	Tilapia fingerlings successfully delivered to the fishponds of the cooperators	■		■	
	Provision of technical assistance to cooperators	15 established backyard farm for fish production Produced the following: Two (2) tons of fresh tilapia and fifty (50) kilos of tilanggit	■	■	■	■
	Monitor growth of tilapia, feeding rate, and mortality	12 monitoring sessions with the cooperators per cropping (about 3 months) Data on feeding rate, size, and mortality	■	■	■	■
	Harvest tilapia	Data on size and mortality at the time of harvest Data on expenses and revenues Incurred during 3 months culture		■		■
To enhance the capabilities of tilapia farmers on culture and management practice.	Provision of trainings	2 capability and skills trainings conducted	■		■	
	Dissemination of the results/output of the project to LGUs	One-day aquaculture seminar to present the output of the project and make plans for future projects				■

(9) EXPECTED OUTPUTS (6Ps)	(10) DETAILS (quantify, if possible)	Y1			
		Q1	Q2	Q3	Q4
Publications	One (1) manuscript on Tilapia aquaculture submitted to target ISSI journal for peer-review evaluation				■
Products	Ten (10) tons of fresh tilapia and one hundred (100) Kilos of tilanggit. Market value of approximately Php 1,200,000.00.		■		■
People Services	Fifteen (15) trained fisherfolk cooperators	■	■	■	■
Places and Partnerships	Partnership with BFAR Region IV-A and LGUs in Batangas	■	■	■	■
2Is					
Social Impact	Increased awareness and technical skills in tilapia production	■	■	■	■

Economic Impact	Increased livelihood from the market sale of harvested tilapia				

DOST Form No. 2B - 2

Budget Breakdown By Source of Fund (use separate sheet for each source and for total)

Project Title: Backyard Tilapia Farming to Promote Food Security in Batangas in Response to the COVID-19 Pandemic

Source of Fund: DOST-PCAARRD	Implementing Agency: BatStateU		Research & Development Station: BatStateU		
		Year 1			
ITEM	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
I. Personal Services					
A. Direct Cost					
1. Salaries					
1 Laborer @14,440.80 x 12mos.	43,322.40	43,322.40	43,322.40	43,322.40	173,289.60
2. Honoraria					
1 Project Leader @ 8,800 x 12mos.	26,400.00	26,400.00	26,400.00	26,400.00	105,600.00
1 Project Staff @ 7,500 x 12 mos	22,500.00	22,500.00	22,500.00	22,500.00	90,000.00
B. Indirect Cost					
1. Honoraria					
BatStateU					-
2 Project Support Staff L2 @1,500/qtr.x8qtrs.	3,000.00	3,000.00	3,000.00	3,000.00	12,000.00
Sub-Total	95,222.40	95,222.40	95,222.40	95,222.40	380,889.60
II. Maintenance and Operating Expenses					
A. Direct Cost					
1. Travel (local)	25,000.00	25,000.00	25,000.00	25,000.00	100,000.00
2. Supplies & Materials					
Office	3,750.00	3,750.00	3,750.00	3,750.00	15,000.00
Aquaculture supplies (hapa nets, feeds)	87,500.00	87,500.00	87,500.00	87,500.00	350,000.00
Other supplies and expenses (fingerlings)	37,500.00	37,500.00	37,500.00	37,500.00	150,000.00
3. Communications (call cards, postage, deliveries)	2,500.00	2,500.00	2,500.00	2,500.00	10,000.00
4. Transportation and delivery expenses	12,500.00	12,500.00	12,500.00	12,500.00	50,000.00
5. Printing and binding expenses	2,500.00	2,500.00	2,500.00	2,500.00	10,000.00
6. Training and workshop expenses					
Workshop expenses (Aquaculture, Feeding, Tilanggit)	25,000.00	25,000.00	25,000.00	25,000.00	100,000.00
7. Representation Expenses (meetings)	6,027.60	6,027.60	6,027.60	6,027.60	24,110.40
8. Repairs and maintenance of facilities					
Pond repair and maintenance	12,500.00	12,500.00	12,500.00	12,500.00	50,000.00
Hatchery repair and maintenance	12,500.00	12,500.00	12,500.00	12,500.00	50,000.00
9. Professional Services					
Contract services	35,000.00	35,000.00	35,000.00	35,000.00	140,000.00
B. Indirect Cost					
BatStateU					-
1. Utility Expenses	12,500.00	12,500.00	12,500.00	12,500.00	50,000.00
2. Supplies and Materials	5,000.00	5,000.00	5,000.00	5,000.00	20,000.00
Sub-Total	279,777.60	279,777.60	279,777.60	279,777.60	1,119,110.40
III. Equipment Outlay					
Sub-Total	0.00				-
Total	**375,000.00**	**375,000.00**	**375,000.00**	**375,000.00**	**1,500,000.00**

Republic of the Philippines
BATANGAS STATE UNIVERSITY
Batangas City
Tel. Nos.: (043) 980-0385 loc. 1546 & 1822
E-mail Address: batstateupresident@gmail.com Website Address: http://www.batstate-u.edu.ph

Office of the University President

February 17, 2021

DR. REYNALDO V. EBORA
Executive Director
Philippine Council for Agriculture, Aquatic and Natural Resources
Research and Development (PCAARRD)

Dear Dr. Ebora :

Warm greetings!

This is to respectfully transmit the revised project proposal of Batangas State University, in line with the call for proposal for the agriculture, aquatic and natural resources entitled "Backyard Tilapia Farming to Promote Food Security in Nasugbu, Batangas in Response to the COVID-19 Pandemic".

The University fully commits support to this research and in the same note confirms dedication in extending the needed assistance of the researchers in the completion of this undertaking.

Should you have inquiries on the details of the project proposal, feel free to contact Dr. Miguel Enrique Ma. A. Azcuna, Center Head of the VIP CORALS - Nasugbu, via email at miguel.azcuna@g.batstate-u.edu.ph or 09457733697.

Please find the attached revised DOST forms for your perusal.

Thank you very much and hoping for your kind approval.

Sincerely yours,

Approved:

DR. TIRSO A. RONQUILLO
University President

Office of the University President

17 May 2023

Dr. REYNALDO V. EBORA
Executive Director
DOST-PCAARRD

ATTN: Dr. ADELAIDA T. CALPE
Director
Inland Aquatic Resources Research Division (IARRD)

Dear **Dr. Ebora:**

Greetings from Batangas State University – The NEU!

This is to formally endorse to your good office the revised **Terminal Report** for the **"Backyard Tilapia Farming in Batangas in Response to the COVID-19 Pandemic"** project upon following the recommendations from the Action Sheet in the last "Annual Program and Terminal Review of Inland Aquatic R&D Projects". Attached here with are the DOST Form 16 (Terminal Audited Financial Report), DOST Form 11 (List of Personnel Involved), DOST Form 9 (Schedule of Accounts Payable), and DOST Form 8 (Semi-Annual/Annual Financial Report).

For any concerns, you may contact the Project Leader, Dr. Miguel Enrique Ma. A. Azcuna, through his email at miguel.azcuna@g.batstate-u.edu.ph or mobile number at 0945 773 3697.

Sincerely,

Dr. TIRSO A. RONQUILLO
University President

Research and Development Title: Tilapia

Project Title: Backyard Tilapia Farming in Batangas in Response to the COVID-19 Pandemic

Project Leader: Miguel Enrique Ma. Azcuna, Ph.D.

Project Staff: Jonel Corral, Ph.D.
Albert Paytaren
Kenneth Laguatan, CPA, MBA

Implementing Agency: Batangas State University ARASOF-Nasugbu

Funding Agency: DOST-PCAARRD

Cooperating Agencies: Laguna State Polytechnic University, Municipal Agriculture Office (Nasugbu), Municipal Agriculture Office (Balayan), Municipal Agricultural Office (Tuy)

Years of Completion: 2022

Project Title: Backyard Tilapia Farming in Batangas in Response to the COVID-19 Pandemic

Project Leader: Miguel Enrique Ma. Azcuna, Ph.D.

Implementing Agency: Batangas State University ARASOF-Nasugbu

Cooperating Agencies: Laguna State Polytechnic University, Municipal Agriculture Office (Nasugbu), Municipal Agriculture Office (Balayan), Municipal Agricultural Office (Tuy)

Project Duration: July 1, 2021 to June 30, 2022

Source of Fund: DOST-PCAARRD

Total Budget: Php 1,500,000.00

ACKNOWLEDGEMENTS

We are grateful to our funding agency, DOST-PCAARRD, through IARRD (represented by Dr. Cynthia Almazan and IARRD Director, Dr. Adelaida Calpe), our collaborating agencies, Laguna State Polytechnic University (represented by Gil Justiniano and Alvin Sanga) and the Municipal Agricultural Offices of Nasugbu (represented by Lora Destreza), Balayan (represented by Ramelyn Creag), and Tuy (represented by Edmundo Gomez) for assisting with the monitoring sessions conducted with the project's beneficiaries.

We also acknowledge the support of Batangas State University ARASOF-Nasugbu Extension Office and College of Arts and Sciences for assisting in the planning ang logistics of the Livelihood Training Workshop.

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LIST OF ACRONYMS

ABW	Average Body Weight
BEST	Brackishwater Enhanced Selected Tilapia
BFAR	Bureau of Fisheries and Aquatic Resources
BJMP	Bureau of Jail Management and Penology
DOST-PCAARRD	Department of Science and Technology - Philippine Council for Agriculture, Aquatic and Natural Resources Research
FAST Tilapia	Freshwater Aquaculture Center Selected Tilapia Program
FCR	Feed Conversion Ratio
FFEFP	Fish For Every Family Project
GET Excel	GET-Excel Program: Combined selection for improved growth, marker assisted selection
GIFT Tilapia	Genetically Improved Farmed Tilapia Program
GMT	Genetically Male Tilapia
i-BEST	Improved BEST Program
iExCEL	Improved GET Excel Stocks
LGU	Local Government Unit
LSPU	Laguna State Polytechnic University
MoP	Murate of Potash
NFRDI	National Fisheries Research and Development Institute
PCAMRD	Philippine Council for Aquatic and Marine Research and Development
PNP	Philippines National Police
SaltUno Tilapia	SaltUno Project: Hybridization to produce salt tolerant tilapia
TSP	Triple Super Phosphate

ABSTRACT

Backyard tilapia farming is a means of introducing aquaculture to rural areas to enhance food availability and increase livelihood income. The COVID-19 pandemic showed how delivery logistics for food can be hampered by lockdowns and road checkpoints. In order to meet the nutritional needs and increase the income of the poor household families in Batangas during the post-lockdown period, small-scale backyard tilapia fishponds were established and monitored for 15 beneficiaries in Batangas. The results showed that backyard tilapia farming can be a solution to food security problems in rural areas affected by the COVID-19 pandemic. With proper training on good aquaculture practices, majority of the beneficiaries were able to achieve successful harvests with good FCRs. After two croppings, 4.5 tons of fresh tilapia was produced. A livelihood training program to produce tilanggit and smoked tilapia was also conducted, and this yielded 34 kilos of tilanggit. Future studies should explore methods to optimize the aquaculture and post-harvest aspects of tilapia aquaculture.

Introduction

Backyard tilapia farming is a means of introducing aquaculture to rural areas to enhance food availability and increase livelihood income. The COVID-19 pandemic showed how delivery logistics for food can be hampered by lockdowns and road checkpoints. The goal of this project was to provide immediate fish supply to poor households in Batangas during the post-lockdown period and increase the household disposable income. To achieve this, the project introduced good aquaculture practices on tilapia production and proper record keeping. It also provided training and skills development on propagation and maintenance of tilapia. Lastly, a livelihood training workshop was conducted to enhance the capability of producing processed tilapia products that can be sold in the market.

Review of Related Literature

Tilapia Production

Tilapia is one of the most important sources of protein in the Philippines. It can be produced easily from the ponds and cages and has been popular among fish farmers (Romana-Eguia et. al. 2020). In 2015, the highest production of farmed tilapia was produced from the freshwater ponds (54%), followed by freshwater cages (30%), freshwater pens (8%) and brackishwater ponds (7%). Total production in 2016 was about 300,720 metric tons and was valued at Php 24 billion, with most of the production coming from farms. It must be noted however, that farmed tilapia production in the Philippines is showing a downward trend. From 2001 to 2011, there was a 240% increase in tilapia production, but this decreased to a meager 7% from 2007 to 2016. The factors that may have contributed to this include: high water temperature, lack of government assistance, poor breed of tilapia, lack of capital, and high cost of production (Guerrero 2018).

One of the reasons why tilapia production is costly is the high cost and limited availability of commercial feed, and this has prompted a need to find cost-competitive feed substitutes (Sarker et al. 2020, White et al. 2018). A study by Villarino 2020 compared the effectiveness of an inexpensive feed mixture versus commercial feed. The mixture consisted of sweet potato peelings, left-over fish bones from mackerel scad (*Decapterus macarellus*), vegetable oil, and amino acids macerated and dried until granular in form. Nutritional analysis of the mixture revealed that the protein, carbohydrate, fiber and moisture content were similar to that of commercial feed. This resulted to tilapia fed with the mixture and those fed with commercial feed to have nearly identical mean weight gains. The only drawback was that fat and sodium content of the mixture was significantly higher than that of commercial feed, which could have negative consequences like fat accumulation in the liver of the fish. In addition, the ash content of the mixture was significantly lower than that of commercial feed. These discrepancies could have negative consequences, such as reduced growth, decreased well-being, and expanded mortality (Villarino 2020).

Backyard Tilapia Farming and "Fish for Every Family Project"

Tilapia culture in a backyard setting can provide a reliable source of protein for small-scale farmers and can respond to the problem of malnutrition among Filipino children. However, one of the barriers for starting tilapia farming was the lack of capital and other inputs, such as high-priced feeds and the lack of technical expertise among others (Asian Development Bank 2005).

To address the issues in malnutrition, Plan Philippines together with PCAMRD implemented the "Fish for Every Family Project" (FFEFP) in 2009 which aims to help families increase their income by farming and selling tilapia fish, while keeping some in reserve to support their children's diet. Pangilinan et al. 2017 conducted an assessment on the impact of

the FFEFP implementation in Occidental Mindoro. Based from the result, FFEFP projects provided self-satisfaction among beneficiaries and build stronger relationships among the members of the family and of the community. The program enhanced their knowledge on how to venture into farming. They also believed that tilapia has helped their children to become healthier. It also helped families financially by providing allowance to children's going to school.

Fishpond Preparation

Several tasks are necessary in order to prepare a fishpond for aquaculture. First, the bottom mud should be removed until the undesirable bottom black soil is removed. The slope of the dike will depend on the type of soil. For sandy-loamy soil, the inner slope should be 3:1, and for loamy soil, the inner slope should be 2:1; for clay soil, the inner slope should be 1:1. The outer slope of the pond should be 1:2 and the width of the dike crest should be 1.5 -2.0 meters. The ideal water depth should be 2-4 feet during dry season and 4-7 feet during wet season (Rana 2019).

Lime is used to regulate the pH of the soil and pondwater. It increases Ca^{2+}, removes acidity, increases decomposition of organic materials, increased productivity of the pond, decreases water turbidity, eradicates parasites, and increases the appetite of the fish. Organic (*e.g.,* cow dung, poultry manure) and inorganic fertilizers (*e.g.,* TSP-triple super phosphate, urea, MoP – murate of potash) are used to promote phytoplankton growth and increase the natural productivity of the pond (Rana 2019).

Integrating Aquaculture, Environment, and Society

Backyard tilapia farming has several positive benefits on the individual, family, and community (Pangilinan et al. 2017). Individuals who participated were reported to have a greater sense of self-worth and satisfaction. Families were reported to have increased income and less malnutrition. Communities share a strengthened bond through coordinated activities such as organized grow-out and harvest of tilapia. In some cases, participants even helped each other procure tilapia fingerlings. Another positive consequence is the emergence of second liner growers (*e.g.,* new participants that take interest in the project after seeing the output from the first participants). By showing the positive output of such projects, information dissemination of the benefits of backyard tilapia farming can be spread widely, thus paving the way for widespread aquaculture in rural areas.

Sustainable intensification of aquaculture involves producing more while using less resources and minimizing negative environmental impacts. Less resources may be used by improving the nutrition through formulated diets and deploying genetically improved breeds. Environmental costs can be reduced by using formulations that improve feed efficiency and by implementing better water quality management (Little 2017).

Aquaculture operations in the current setting must plan to become an integral part of a community and region. A diversity of unprocessed and value-added products should be created, and these should be accessible to local markets. Jobs should be created and the environment should be enhanced on local and regional scales (Costa-Pierce 2010).

Tilapia Culture and Food Security

Aquaculture can play a role in attaining food security in developing Asian countries like the Philippines. Backyard tilapia farming can be promoted in places where demography is low and there is vast space (Pamplona 2020). Pond culture along with cash crops and on-farm activities may contribute between 5-10% of total income in rural areas (Ahmed and Lorica 2002). It was also reported by Gupta et al. 1999 that on-farm household consumption is

directly related to pond culture and production of low-price fish (*e.g.,* tilapia and carp). Increased on-farm fish availability can reduce the dependence of households on purchased fish for consumption. Indeed, fish supply produced from a backyard farm can cover most of the food/protein needs of a household. It can also provide jobs and 'own enterprise' employment, including work for women and children, thus generating additional income through the harvesting and sale of tilapia.

In rural areas, tilapia culture is likely to be more advantageous than other agricultural activities (*e.g.,* cash crops and livestock production) due to the following (El Sayed 2006):

1. It can be easily integrated into other agriculture.
2. Use of low-cost inputs and technologies by using locally available on-farm sources.
3. Limited investment needs.
4. Low levels of risk.
5. Low labor requirements.

To fully maximize the benefits of tilapia culture, certain aspects need to be optimized. The performance of farmed tilapia in the Philippines has been declining due to newly introduced strains, most likely from the loss of genetic variation through founder effect and introgression with Mozambique tilapia (*Oreochromis mossambicus*) (Mair et al. 2002). Collaborations between government fisheries agencies, public, and private institutions developed genetically enhanced tilapia stocks to support the need for quality, fast-growing seedstock (Romana-Eguia et al. 2019, SEAFDEC 2017). Another problem is the early sexual maturation and unwanted reproduction of tilapia in pond cultures. Genetics-based technology can resolve this problem. The use of sex-reversed or Genetically Male Tilapia (GMT) can increase yields by 30-40% and profitability by over 100%. The synthetic hormone 17-α-methyltestosterone is normally used for sex-reversal in tilapia, but natural phytoandrogens such as Benguet Pine (*Pinus kesiya*) pollen extract are just as effective (Nieves 2017). The only disadvantage is the high cost of obtaining suitable amounts of this extract. Table 1 summarizes the various genetically improved Nile tilapia (*Oreochromis niloticus*) strains developed in the Philippines.

Table 1. Summary of Genetically Improved Strains of Nile tilapia (*Oreochromis niloticus*) developed in the Philippines (Romana-Eguia et al. 2019, SEAFDEC 2017)

Strain	**Genetic Program / Method**
GIFT Tilapia	Genetically improved farm tilapia (GIFT) program: Combined family and within family selection for improved growth
Genomar Supreme Tilapia (GIFT-derived)	Genomar Project: Combined selection for improved growth, marker assisted selection
GET Excel and iExCEL or improved GET Excel stocks	GET-Excel Program: Outcrossing two fast-growing strains (FAST and GIFT) for improved growth
Genetically Male Tilapia (GMT) or YY supermale tilapia	GMT Program: Selective breeding and sex reversal methods
Brackishwater Enhanced Selected Tilapia (BEST) and i-BEST / improved BEST	BEST Program: Hybridization and outcrossing; Size-specific selection for salinity tolerance
Cold tolerant tilapia	Cold tolerant tilapia: Hybridization
FAST Tilapia	Freshwater Aquaculture Center Selected Tilapia Program: Rotational mating and hybridization
SaltUno tilapia	SaltUno Project: Hybridization to produce salt tolerant tilapia

Scientific Basis/Theoretical Framework

The onset of the COVID-19 pandemic showed how food supply can become unstable when transportation and delivery logistics are hampered by lockdowns and curfews. Difficulties arose in the production and selling of agricultural products (*e.g.,* vegetables, fruits, meats, etc.). Supermarkets had limited or no stock of food supplies. In other cases, deliveries were postponed or cancelled due to lack of transportation or long lines at checkpoints which would cause the goods to rot and perish (Pamplona 2020). People from isolated towns could not commute to supermarkets for many reasons (*e.g.,* no public transportation, entire household under home quarantine). These situations highlight the relevance of food security in the Philippines amidst the COVID-19 pandemic.

Aquaculture of tilapia in ponds is one solution that can augment food supply in rural areas. This project set up small-scale backyard tilapia fishponds for beneficiaries/participants in Batangas. These household ponds had an available source of freshwater (*e.g.,* deep well, stream, river, irrigation canal). The project ensured that they will be able to address their basic food requirements, especially in terms of protein requirements. It also allowed the beneficiaries to develop and implement livelihood activities during the post-lockdown period.

The project was implemented by the Batangas State University in cooperation with the BFAR Region IV-A and LGUs. It intended to meet the immediate needs of the poor household families in Batangas in terms of protein source from fish and increase their disposable income during the post-lockdown period for COVID-19 affected areas. Financial and technical know-how was provided to the beneficiaries and their respective LGUs.

Methodology

Fifteen (15) project sites from 15 beneficiaries in Batangas were identified for backyard tilapia culture. Sex-reversed tilapia (SRT) fry/fingerlings were obtained from commercial fingerling sources in Los Baños, Laguna.

The identified sites had a sustainable source of water during the 3-4 months culture period of tilapia. Sites already had an excavated area for the fishpond. At least 15 fisherfolk households were selected as tilapia farmer cooperators, and selection considered the following conditions: (a) that the household's income is largely dependent on tilapia production; (b) that the volume of fish produced is not of commercial scale; (c) that the fisherfolk's family may be considered vulnerable – to be determined following the Household Assessment Tool to assess several components, including the household characteristics, socio-economic status, and housing conditions (Shelter Cluster Philippines, www.sheltercluster.org).

Fingerlings were delivered to the beneficiaries in two croppings. For each cropping, monitoring sessions were conducted every two weeks to measure water parameters (*e.g.,* temperature, dissolved oxygen, pH) and determine the average body weight (ABW), which was necessary to adjust the feeding scheme. Harvest was done at least 4 months after the initial stocking of fingerlings.

The beneficiaries were trained on how to compute for the costs associated with backyard tilapia culture (*e.g.,* cost of fingerlings, feeds) in order to compute for the net income of profit after market sale of the harvested tilapia (Tables 2-4). In addition, a livelihood workshop for tilanggit and smoked tilapia production was taught to the beneficiaries. The overall training included fishpond construction and management, fishpond fertilization using organic and inorganic fertilizers, feeds and feeding, harvesting of stocks, post-harvest handling, record keeping, and simple cost and return analysis (Figures 1-3).

Figure 1. Technical assistance for pond preparation and pond maintenance was provided by Gil Justiniano and Alvin Sanga from Laguna State Polytechnic University.

Figure 2. A cast net was used to sample fish to measure average body weight during the monitoring sessions.

Figure 3. Beneficiaries were trained on computing for average body weight, adjustment of feeding rate, and proper record-keeping.

Table 2. Assumptions for Benefit Cost Assessment Analysis
(based on DOST-PCAARRD Backyard Tilapia Farming Project
of Laguna State Polytechnic University)

Parameter	**Value**
Total Pond Area:	20-100 m^2
Culture Period	4 - 5 months
Number of Croppings per Year	2
Stocking Density (Semi-Intensive)	4 – 5 pieces per m^2
Survival Rate	85%
Harvest Weight per Piece	250 g
Number of Pieces per Kilo	4
Market Price per Kilo of Harvested Fish *based on BFAR average market price for tilapia in 2020	Php 120.00/kg

Table 3. Variable Cost Consumption
(based on DOST-PCAARRD Backyard Tilapia Farming Project
of Laguna State Polytechnic University)

Item	**Cost**
Fingerlings (Php 0.75 per piece, Size 17)	Php 300.00 – 375.00
Feeds (Php 2,000 per 100 m^2 per crop X 2 croppings)	Php 4,000.00
Pond Repair (Php 1,000 per 100 m^2 per crop X 2 croppings)	Php 2,000.00
Aquaculture Supplies (Php 1,000 per 100 m^2 per crop X 2 croppings)	Php 2,000.00
Total	Php 8,300.00 – 8,375.00

Table 4. Cost-Benefit Assessment Analysis for Pond with Area = 100 m^2

Parameter	**Value**
Stocking Density	5 pieces
Total Fingerlings Stocked per Crop	500 pieces
Pieces per Harvest @ 85% Survival per Cropping	425 pieces
Amount of Kilos Harvested per Cropping @ 4 pieces-kg size	106 kg
Total Operating Cost	Php 8,375.00
Revenue = 106 kg X Php 120.00 X 2 Croppings	Php 25,440.00
Net Profit [a]	Php 17,065.00
Break-even Price [b]	Php 39.50 per kg

Discussion of Results and Findings

First Cropping

Fingerlings and feeds were delivered to 9 beneficiaries (Figure 4), and monitoring sessions were conducted to obtain the average body weight of the fish. The culture period for the data was from November 12, 2021 to March 26, 2022.

Figure 4. First cropping delivery of fingerlings and feeds delivered to beneficiaries in Batangas. *Top row, left to right*: Melecio Bo in Brgy. Tan-ag, Lian; Leon Codizal in Brgy. Dalima, Tuy; Guillermo Alas in Brgy. Santol, Balayan. *Middle row, left to right*: Edmundo Gomez in Brgy. Magahis, Tuy; Lorenzo Guevarra in Brgy. Putat, Nasugbu. Bottom row, left to right: Teodoro Jonson in Brgy. Cogunan, Nasugbu; Juner Villarin in Brgy. Putat, Nasugbu; Geraldine Espinosa in Brgy. Gimalas, Balayan.

Significant mortalities (> 30%) were reported in 4 out of the 8 beneficiaries. Among these 4 beneficiaries, 2 beneficiaries had major mortalities. For Teodoro Jonson (Brgy. Cogunan, Nasugbu) nearly all of the fingerlings were reported dead two weeks after stocking. The fingerlings were initially placed inside a holding tank on November 12, 2021 because the pond was not able to be filled with water from the irrigation source. The pond was filled with water after 2 weeks, and the fingerlings were released. However, draining of the pond on December 23, 2022 to check the remaining live fish yielded only 20 fish. One sack of mash feeds was given to Teodoro Jonson for the entire period. For Guillermo Alas (Brgy. Santol, Tuy), 400 fingerlings were reported dead two weeks after stocking. The fingerlings were placed inside a 2-meter x 2-meter hapa net enclosure inside the fishpond upon stocking. However, they were not transferred out of the enclosure until the first monitoring session on December 2, 2022. At this time, the remaining living fish inside the enclosure were counted and transferred out of the enclosure. At the time of harvest, 150 fish were counted.

For Edmundo Gomez, a monitor lizard entered the pond and consumed several fish. In addition, a heavy downpour in March caused muddy water from the spring to enter his pond which resulted in several mortalities. For Geraldine Espinosa, mortalities were reported 1 week after the fingerlings were delivered and during the month of March. Stress from handling and transport could explain the mortalities in the beginning. High temperature and shallow depth of the secondary pond (Figure 1, right photo) could explain the mortalities in the latter period.

Seven (7) of the nine beneficiaries had good harvests (Figure 5). The Feed Conversion Ratio (FCR) for the beneficiaries ranged from 0.64 to 22.5 (Table 5). Two beneficiaries, namely Melecio Bo and Juner Villarin, had FCR values below 1, which indicated a natural supplementary diet for the fish, in the form of phytoplankton and duckweed (Figure 6). Leon Codizal initially had a FCR < 1, but an incident where water flow to the pond was interrupted resulted in mortalities. This ultimately affected the final FCR. Lorenzo Guevarra and BatStateU ARASOF-Nasugbu hatchery facility had fairly good FCRs at 1.28 and 1.25, respectively. For the beneficiaries that reported large mortalities, the FCRs are > 2. Geraldine Espinosa and Guillermo Alas had large FCRs of 4.06 and 5.5, respectively. Edmundo Gomez had an extremely large FCR of 22.5, and this was attributed to the extremely low survival rate.

Figure 5. Harvest of beneficiaries' first cropping. *Top row, left to right*: Melecio Bo in Brgy. Tan-ag, Lian; Juner Villarin in Brgy. Putat, Nasugbu; BatStateU ARASOF-Nasugbu in Brgy. Bucana, Nasugbu; Geraldine Espinosa in Brgy. Gimalas, Balayan. *Bottom row, left to right*: Leon Codizal in Brgy. Dalima, Tuy; Lorenzo Guevarra in Brgy. Putat, Nasugbu; Guillermo Alas in Brgy. Santol, Balayan.

Figure 6. Duckweed in the pond of Leon Codizal (Brgy Dalima, Tuy) which acts as a natural supplement to the feeds that are given daily. Natural diet supplements such as duckweed and plankton can result in FCR values less than 1.

Second Cropping

Fingerlings and feeds were delivered to 13 beneficiaries (Figure 7), and monitoring sessions were conducted to obtain the average body weight of the fish. The culture period for the data was from April 26, 2022 to August 17, 2022.

Figure 7. Second cropping delivery of fingerlings and feeds to beneficiaries in Batangas. *Top row, left to right*: Lorenzo Guevarra and Christian Guevarra in Brgy. Putat, Nasugbu; Guillermo Alas in Brgy. Santol, Balayan; Noel Alas in Brgy. Santol, Balayan; Julian (caretaker of Geraldine Espinosa) in Brgy. Gimalas, Balayan, Leandro Cabadin in Brgy. Putat, Nasugbu.

Bottom row, left to right: Leon Codizal in Brgy. Dalima, Tuy; Fred Arellano in Brgy. Malapad na Bato, Nasugbu; Juner Villarin in Brgy. Putat, Nasugbu; Florenda Yamson in Brgy. Sanpiro, Balayan; Honorato Benedicto in Brgy. Sanpiro, Balayan.

Significant mortalities (> 30%) were reported in only 1 beneficiary. For Lorenzo Guevarra (Brgy. Putat, Nasugbu) nearly all of the fingerlings were reported dead two weeks after stocking. The fingerlings were initially placed inside a holding tank on July 18, 2022 because the pond was not yet ready for stocking. Monitoring on August 2, 2022 revealed that 80% of the fingerlings died. For the pond of Christian Guevarra (Brgy. Putat, Nasugbu), there was a 30% mortality because of overabundant water vegetation (*e.g.*, kangkong) that reduced the amount of dissolved oxygen in the water.

The FCR for the beneficiaries ranged from 0.63 to 2.34 (Table 5). Ten beneficiaries had FCR values below 1, which could be attributed to low mortality rates and natural supplementary diets in the form of phytoplankton and duckweed. Although the pond of Christian Guevarra had 30% mortality, the FCR was 0.63 because the fish that survived grew to an average body weight of 180 grams. The pond of Lorenzo Guevarra had a FCR of 2.16 because of the 80% mortality. For BatStateU ARASOF-Nasugbu, the FCR of 2.34 could be attributed to the fish not eating the feeds provided.

Table 5. Summary of Harvest Data and Pond Performance of Project Beneficiaries

NAME OF COOPERATOR	Total Stock (pcs)		HARVESTED ABW (g)		HARVESTED BIOMASS (Kgs)		% SURVIVAL		FEED CONSUMED (Kgs)		FCR	
Pond Area (sq. m.)	1st Crop	2nd Crop	1st Crop	2nd Crop	1st Crop	2nd Crop	1st Crop	2nd Crop	1st Crop	2nd Crop	1st Crop	2nd Crop
BatStateU ARASOF-(Nasugbu 100 sq. m.)	900	900	121 ± 34.47	43 ± 22.53	80	32	73	82	100	75	1.25	2.34
Melecio Bo (Tan-ag, Lian 1400 sq. m.)	9800	7000	148 ± 48.17	200 ± 47.96*	1,300	1,400*	99	100	1,125	955	0.86	0.68
Juner Villarin (Putat, Nasugbu 100 sq.m.)	1000	1000	220 ± 49.90	80 ± 28.28*	185	80*	84	100	120	70	0.64	0.87
Lorenzo Guevarra (Putat, Nasugbu 120 sq.m.)	1000	800	264 ± 58.56	30 ± 9.35*	225	6	85	20	290	13	1.28	2.16
Leon Codizal (Dalima, Tuy 700 sq.m.)	4000	4500	120 ± 27.39	80 ± 28.28*	395	360*	82	95	615	315	1.55	0.87
Edmundo Gomez (Magahis, Tuy 80 sq.m.)	500	-	100 ± 20.00	-	2	-	4	-	45	-	22.5	-
Teodoro Jonson (Cogonan, Nasugbu 300 sq.m.)	1500	-	0	-	0	-	0	-	20	-	n/a	-
Geraldine Espinosa (Gimalas, Balayan 20 sq.m)	400	500	100 ± 19.03	50 ± 9.35*	16	25*	40	100	65	22.5	4.06	0.90
Guillermo Alas (Santol, Balayan 175 sq.m.)	1000	1000	113 ± 21.09	100 ± 18.37*	17	100*	15	100	95	85	5.5	0.85
Christian Guevarra (Putat, Nasugbu 350 sq. m.)	-	2000	-	180 ± 20.00*	-	252*	-	70	160	-	-	0.63
Noel Alas (Santol, Balayan 175 sq. m.)	-	1000	-	60 ± 14.14*	-	60*	-	100	-	60	-	1.00

Florenda Yamson (Sanpiro, Balayan 20 sq. m.)	-	500	-	30 ± 9.35*	-	15*	-	100	-	13	-	0.86
Honorato Benedicto (Sanpiro, Balayan 20 sq. m.)	-	500	-	40 ± 10.00*	-	20*	-	100	-	13	-	0.65
Leandro Cabadin (Putat, Nasugbu, 20 sq m.)	-	500	-	30 ± 14.14*	-	15*	-	100	-	13	-	0.86
Fred Arellano (Malapad na Bato, Nasugbu, 30 sq m.)	-	500	-	30 ± 10.00*	-	15*	-	100	-	13	-	0.86
TOTAL	20,100	20,700	1,186	893*	2,220	2,342			2,635	1,648		
Mean			131.77 ± 75.43	73.31 ± 56.63*	224.11 ± 423.62	183.07 ± 380.80	53.55 ± 38.99%	89.76 ± 22.89%	263.50 ± 349.49	137.29 ± 270.98	4.71 ± 7.39	0.83 ± 0.54

Legend:
* Fish were not yet harvested. Average body weight was recorded last August 17, 2022 and used to estimate the Harvest Biomass.
- Fingerlings were not stocked for the beneficiary during the respective cropping.
n/a No FCR was computed.

Economic Assessment of Beneficiaries after Project Intervention

The beneficiaries earned profit from the sale of harvested tilapia. The harvested biomass and net profit for the first and second cropping are summarized in Table 6. Since the beneficiaries received fingerlings and feeds from the project, the profit obtained from the sale of tilapia was the net profit. The ponds of the beneficiaries also did not require any extensive repair and aquaculture supplies (*e.g.,* crates, etc.) were readily available.

NAME OF COOPERATOR	**HARVESTED BIOMASS (kg.)**		**NET PROFIT (in Php)**	
	1st crop	**2nd crop**	**1st crop**	**2nd crop**
BatStateU ARASOF-Nasugbu	80	32	9,600	3,840
Melecio Bo (Tan-ag, Lian)	1,300	1,400*	156,000	168,000*
Juner Villarin (Putat, Nasugbu)	185	80*	22,200	9,600*
Lorenzo Guevarra (Putat, Nasugbu)	225	6	27,000	720
Leon Codizal (Dalima, Tuy)	395	360*	47,400	43,200*
Edmundo Gomez (Magahis, Tuy)	2	-	140	-
Teodoro Jonson (Cogonan, Nasugbu)	0	-	0	-
Geraldine Espinosa (Gimalas, Balayan)	16	25*	1,920	3,000*
Guillermo Alas (Santol, Balayan)	17	100*	2,040	12,000*
Christian Guevarra (Putat, Nasugbu)	-	252*	-	30,240*
Noel Alas (Santol, Balayan)	-	60*	-	7,200*

Florenda Yamson (Sanpiro, Balayan)	15*	-	1,800*	-
Honorato Benedicto (Sanpiro, Balayan)	20*	-	2,400*	-
Leandro Cabadin (Putat, Nasugbu)	15*	-	1,800*	-
Fred Arellano (Malapad na Bato, Nasugbu)	15*	-	1,800*	-

Legend:
* Fish were not yet harvested. Average body weight was recorded last August 17, 2022 and used to estimate the Harvest Biomass.
- Fingerlings were not stocked for the beneficiary during the respective cropping.

Livelihood Training Workshop for Tilanggit and Smoked Tilapia

The workshop was conducted at the BatStateU ARASOF-Nasugbu gymnasium on August 19, 2022 (Figure 8). Alvin Sanga of Laguna State Polytechnic University was invited as the resource speaker of the workshop. The participants were composed of beneficiaries from the project, BatStateU Fisheries and Criminology students, and representatives from the Municipal Agricultural Office of Nasugbu, Bureau of Jail Management and Penology (BJMP), and Philippine National Police (PNP).

The participants were trained on how to properly descale and clean fresh tilapia. For tilanggit production, they were taught how to butterfly-cut the fish and soak in 1:4 brine solution. The participants brought home their brined tilanggit for drying at home. For smoked tilapia, they were taught how to properly boil the fish prior to smoking and prepare the smokehouse with the necessary material for smoking (*e.g.,* coconut husks/bunot, sugar cane pulp/bagas, guava leaves). The participants were able to taste the smoked tilapia during the workshop.

Figure 8. Highlights of the Livelihood Training Workshop. *Top row, left to right*: Awarding of Certificate of Appreciation to Alvin Sanga of LSPU; Beneficiaries and participants processing tilapia into tilanggit. *Bottom row, left to right*: Alvin Sanga demonstrating how to boil tilapia prior to smoking; Preparation of the smokehouse; Tilapia are organized on metal racks for smoking.

Outputs

6 Ps	Expected Output	Actual Output
Publications	One (1) ISSI peer-reviewed publication on Backyard Tilapia Farming	One (1) manuscript submitted to The Philippine Journal of Fisheries
Product	Four (4) tons of fresh tilapia and one hundred (100) kilos of tilanggit	4.562 tons of fresh tilapia and 34 kilos of tilanggit
People and Services	Fifteen (15) trained beneficiaries	Fifteen (15) trained beneficiaries
Places and Partnership	Partnership with BFAR Region IV-A, NFRDI, and LGUs in Batangas	Partnerships with Municipal Agriculture Offices of Nasugbu, Tuy, and Balayan
Patents	No patents expected from the project	
Policies	No policies expected from the project	

Outcomes

The project had a positive effect on the beneficiaries in the sense that it gave them added confidence to pursue tilapia culture as a means of livelihood. The implementing agency, BatStateU ARASOF-Nasugbu, decided to continue the backyard tilapia farming project and the associated livelihood training program through its Office of Extension Services. In addition, a research proposal to automate tilapia feeding and measure water parameters was submitted for internal funding by Melvin Roxas from the College of Engineering of BatStateU ARASOF-Nasugbu. The University is committed to improve its fishponds, facilities, and laboratories for the BS FAS program. Plans are underway to create a Fishery Hub (*e.g.,* concrete fishponds, fisheries laboratories) in its property in Brgy. Bucana, Nasugbu. Lastly, a livelihood center for post-harvest processing is already under construction inside the campus. This will be instrumental for the production of tilanggit and smoked tilapia.

Potential Impacts

2 Is	Expected Output	Actual Output
Social Impact	Increase awareness and technical skills in tilapia production	Beneficiaries were trained on proper aquaculture practices, monitoring, and record-keeping
Economic Impact	Additional income of tilapia farmers as a result of development of fishponds and trainings on tilapia farming	Beneficiaries with successful harvests were able sell the harvested tilapia for additional income

Summary and Conclusion

The results of the project showed that backyard tilapia farming can be a solution to food security problems in rural areas affected by the COVID-19 pandemic. With proper training on good aquaculture practices, majority of the beneficiaries were able to achieve successful harvests with good FCRs. The fish produced under the project improved the lives of the beneficiaries either by augmenting their diet with protein-rich food or by adding to their household income. Overall, the tilapia produced by the project contributed to the supply chain of tilapia in Batangas province. The livelihood training program enhanced the capabilities of the beneficiaries in post-harvest processing to make tilapia products that can be sold in the market.

Recommendation for Future R&D Work Based on Research Result

Future R&D work will be focused on the aquaculture and post-harvest aspects of tilapia aquaculture. For aquaculture, a hatchery set-up in BatStateU ARASOF-Nasugbu that can produce male sex-reversed fingerlings will make stocking of fingerlings to beneficiaries easier. Methods to optimize day-to-day activities in tilapia culture (*e.g.,* automated feeding, measurement of water parameters) will reduce overhead (*e.g.,* hiring of laborer). For post-harvest processing, the BS Food Technology program will further optimize the tilanggit-making process by adding additional flavors to the brine solution. They can also investigate methods of packaging that will preserve and extend the shelf life of tilanggit and smoked tilapia.

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Appendices

Publication:

A Short Communication Manuscript was submitted to The Philippine Journal of Fisheries and was already approved for publication.

NFRDI The Philippine Journal of Fisheries <tpjf@nfrdi.da.gov.ph> Mar 13, 2023, 8:58 AM
to Miguel, Jonel, me

Dear Authors,

We are pleased to inform you that The Philippine Journal of Fisheries (TPJF) would like to publish your commentary titled "Addressing Food Security in Batangas, Philippines through Backyard Tilapia Farming" as recommended by the peer reviewers and agreed upon by the editor-in-chief. No further comment from the peer reviewers.

Make sure that you have read our publication policy here http://www.nfrdi.da.gov.ph/tpjf/Policy.php

I will update you again once we are done proofreading, editing, and layouting your final paper. We're excited to move forward with your submission. Please feel free to email me with any questions.

Best regards,
Cy

Products:

Harvested Tilapia from Beneficiaries

Income Generated

NAME OF COOPERATOR	HARVESTED BIOMASS (kg.)		NET PROFIT (in Php)	
	1st crop	2nd crop	1st crop	2nd crop
BatStateU ARASOF-Nasugbu	80	32	9,600.00	3,840.00
Melecio Bo (Tan-ag, Lian)	1,300	1,400*	156,000.00	168,000.00*

Juner Villarin (Putat, Nasugbu)	185	80*	22,200.00	9,600.00*
Lorenzo Guevarra (Putat, Nasugbu)	225	6	27,000.00	720.00
Leon Codizal (Dalima, Tuy)	395	360*	47,400.00	43,200.00*
Edmundo Gomez (Magahis, Tuy)	2	-	140.00	-
Teodoro Jonson (Cogonan, Nasugbu)	0	-	0	-
Geraldine Espinosa (Gimalas, Balayan)	16	25*	1,920.00	3,000.00*
Guillermo Alas (Santol, Balayan)	17	100*	2,040.00	12,000.00*
Christian Guevarra (Putat, Nasugbu)	-	252*	-	30,240.00*
Noel Alas (Santol, Balayan)	-	60*	-	7,200.00*
Florenda Yamson (Sanpiro, Balayan)	15*	-	1,800.00*	-
Honorato Benedicto (Sanpiro, Balayan)	20*	-	2,400.00*	-
Leandro Cabadin (Putat, Nasugbu)	15*	-	1,800.00*	-
Fred Arellano (Malapad na Bato, Nasugbu)	15*	-	1,800.00*	-

Legend * - fish were not harvested, profit was estimated based on ABW.

People Services:

Livelihood Training Workshop for Tilanggit and Smoked Tilapia attended by representatives from LGUs, BS Fisheries and Aquatic Sciences students, and other representatives from Nasugbu.

Places and Partnership:

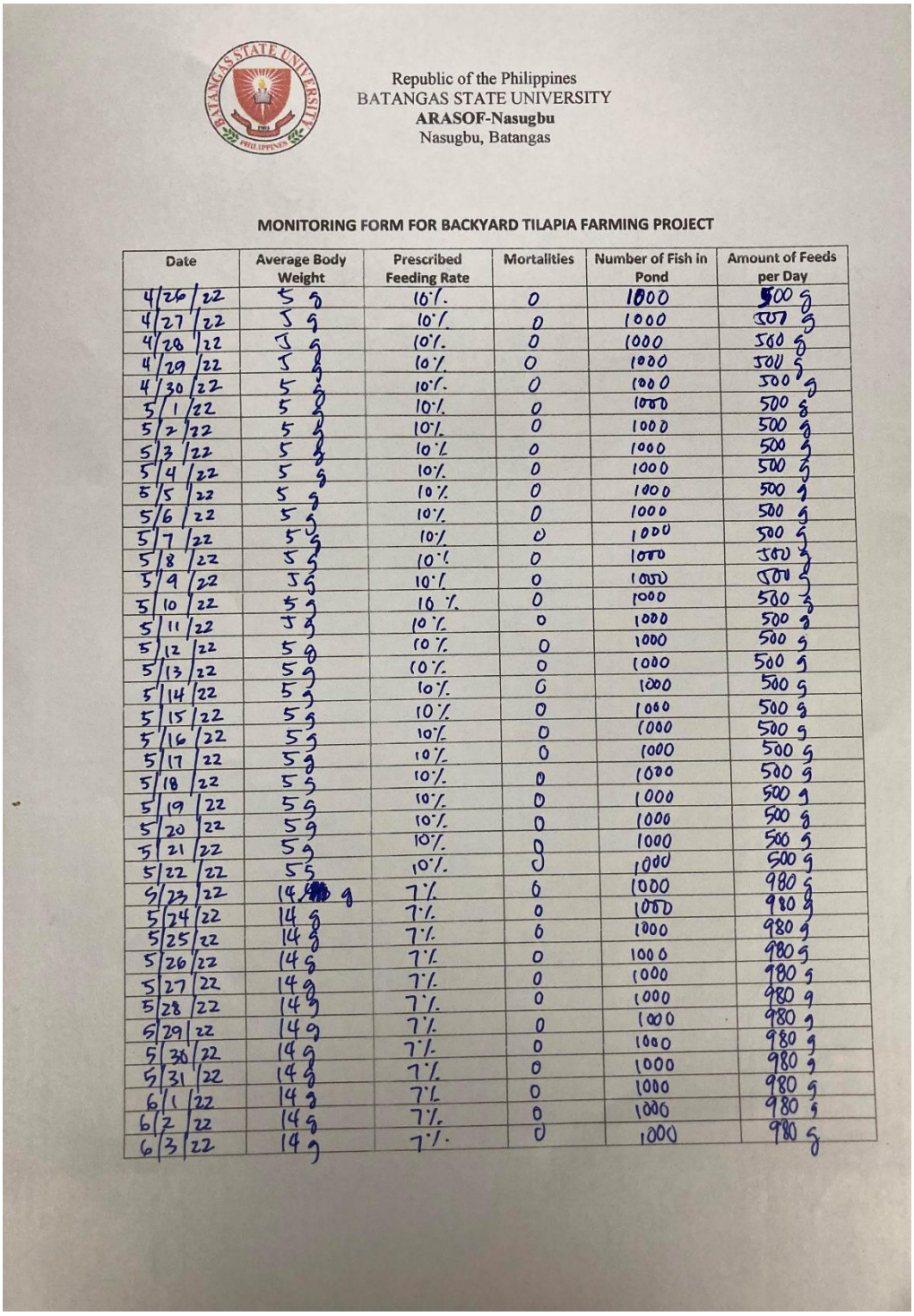
Linkages with Municipal Agricultural Office Representatives of Balayan and Tuy, Batangas.

Statistical Formula:

$$FCR = \frac{\text{Harvested Biomass (kg)}}{\text{Feed Consumed (kg)}}$$

Monthly Monitoring Forms:

Sample Monitoring Forms for Juner Villarin (3 pages)



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ARASOF-Nasugbu
Nasugbu, Batangas

MONITORING FORM FOR BACKYARD TILAPIA FARMING PROJECT

Date	Average Body Weight	Prescribed Feeding Rate	Mortalities	Number of Fish in Pond	Amount of Feeds per Day
4/26/22	5 g	10%	0	1000	500 g
4/27/22	5 g	10%	0	1000	500 g
4/28/22	5 g	10%	0	1000	500 g
4/29/22	5 g	10%	0	1000	500 g
4/30/22	5 g	10%	0	1000	500 g
5/1/22	5 g	10%	0	1000	500 g
5/2/22	5 g	10%	0	1000	500 g
5/3/22	5 g	10%	0	1000	500 g
5/4/22	5 g	10%	0	1000	500 g
5/5/22	5 g	10%	0	1000	500 g
5/6/22	5 g	10%	0	1000	500 g
5/7/22	5 g	10%	0	1000	500 g
5/8/22	5 g	10%	0	1000	500 g
5/9/22	5 g	10%	0	1000	500 g
5/10/22	5 g	10%	0	1000	500 g
5/11/22	5 g	10%	0	1000	500 g
5/12/22	5 g	10%	0	1000	500 g
5/13/22	5 g	10%	0	1000	500 g
5/14/22	5 g	10%	0	1000	500 g
5/15/22	5 g	10%	0	1000	500 g
5/16/22	5 g	10%	0	1000	500 g
5/17/22	5 g	10%	0	1000	500 g
5/18/22	5 g	10%	0	1000	500 g
5/19/22	5 g	10%	0	1000	500 g
5/20/22	5 g	10%	0	1000	500 g
5/21/22	5 g	10%	0	1000	500 g
5/22/22	5 g	10%	0	1000	500 g
5/23/22	14 g	7%	0	1000	980 g
5/24/22	14 g	7%	0	1000	980 g
5/25/22	14 g	7%	0	1000	980 g
5/26/22	14 g	7%	0	1000	980 g
5/27/22	14 g	7%	0	1000	980 g
5/28/22	14 g	7%	0	1000	980 g
5/29/22	14 g	7%	0	1000	980 g
5/30/22	14 g	7%	0	1000	980 g
5/31/22	14 g	7%	0	1000	980 g
6/1/22	14 g	7%	0	1000	980 g
6/2/22	14 g	7%	0	1000	980 g
6/3/22	14 g	7%	0	1000	980 g

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Date	Average Body Weight	Prescribed Feeding Rate	Mortalities	Number of Fish in Pond	Amount of Feeds per Day
6/4/22	14 g	7%	0	1000	980 g
6/5/22	14 g	7%	0	1000	980 g
6/6/22	14 g	7%	0	1000	980 g
6/7/22	14 g	7%	0	1000	980 g
6/8/22	14 g	7%	0	1000	980 g
6/9/22	14 g	7%	0	1000	980 g
6/10/22	14 g	7%	0	1000	980 g
6/11/22	14 g	7%	0	1000	980 g
6/12/22	14 g	7%	0	1000	980 g
6/13/22	14 g	7%	0	1000	980 g
6/14/22	14 g	7%	0	1000	980 g
6/15/22	14 g	7%	0	1000	980 g
6/16/22	14 g	7%	0	1000	980 g
6/17/22	14 g	7%	0	1000	980 g
6/18/22	14 g	7%	0	1000	980 g
6/19/22	14 g	7%	0	1000	980 g
6/20/22	35 g	6%	0	1000	2.1 kg
6/21/22	35 g	6%	0	1000	2.1 kg
6/22/22	35 g	6%	0	1000	2.1 kg
6/23/22	35 g	6%	0	1000	2.1 kg
6/24/22	35 g	6%	0	1000	2.1 kg
6/25/22	35 g	6%	0	1000	2.1 kg
6/26/22	35 g	6%	0	1000	2.1 kg
6/27/22	35 g	6%	0	1000	2.1 kg
6/28/22	35 g	6%	0	1000	2.1 kg
6/29/22	35 g	6%	0	1000	2.1 kg
6/30/22	35 g	6%	0	1000	2.1 kg
7/1/22	35 g	6%	0	1000	2.1 kg
7/2/22	35 g	6%	0	1000	2.1 kg
7/3/22	35 g	6%	0	1000	2.1 kg
7/4/22	35 g	6%	0	1000	2.1 kg
7/5/22	35 g	6%	0	1000	2.1 kg
7/6/22	35 g	6%	0	1000	2.1 kg
7/7/22	35 g	6%	0	1000	2.1 kg
7/8/22	35 g	6%	0	1000	2.1 kg
7/9/22	35 g	6%	0	1000	2.1 kg
7/10/22	35 g	6%	0	1000	2.1 kg
7/11/22	35 g	6%	0	1000	2.1 kg
7/12/22	35 g	6%	0	1000	2.1 kg

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Nasugbu, Batangas

MONITORING FORM FOR BACKYARD TILAPIA FARMING PROJECT

Date	Average Body Weight	Prescribed Feeding Rate	Mortalities	Number of Fish in Pond	Amount of Feeds per Day
7/13/22	35 g	6%	0	1000	2.1 kg
7/14/22	35 g	6%	0	1000	2.1 kg
7/15/22	35 g	6%	0	1000	2.1 kg
7/16/22	35 g	6%	0	1000	2.1 kg
7/17/22	35 g	6%	0	1000	2.1 kg
7/18/22	110 g	3%	0	1000	3.3 kg
7/19/22	110 g	3%	0	1000	3.3 kg
7/20/22	110 g	3%	0	1000	3.3 kg
7/21/22	110 g	3%	0	1000	3.3 kg
7/22/22	110 g	3%	0	1000	3.3 kg
7/23/22	110 g	3%	0	1000	3.3 kg
7/24/22	110 g	3%	0	1000	3.3 kg
7/25/22	110 g	3%	0	1000	3.3 kg
7/26/22	110 g	3%	0	1000	3.3 kg
7/27/22	110 g	3%	0	1000	3.3 kg
7/28/22	110 g	3%	0	1000	3.3 kg
7/29/22	110 g	3%	0	1000	3.3 kg
7/30/22	110 g	3%	0	1000	3.3 kg
7/31/22	110 g	3%	0	1000	3.3 kg
8/1/22	110 g	3%	0	1000	3.3 kg
8/2/22	110 g	3%	0	1000	3.3 kg
8/3/22	110 g	3%	0	1000	3.3 kg
8/4/22	110 g	3%	0	1000	3.3 kg
8/5/22	110 g	3%	0	1000	3.3 kg
8/6/22	110 g	3%	0	1000	3.3 kg
8/7/22	110 g	3%	0	1000	3.3 kg
8/8/22	110 g	3%	0	1000	3.3 kg
8/9/22	110 g	3%	0	1000	3.3 kg
8/10/22	110 g	3%	0	1000	3.3 kg
8/11/22	110 g	3%	0	1000	3.3 kg
8/12/22	110 g	3%	0	1000	3.3 kg
8/13/22	110 g	3%	0	1000	3.3 kg
8/14/22	110 g	3%	0	1000	3.3 kg
8/15/22	160 g	3%	0	1000	4.8 kg
8/16/22	160 g	3%	0	1000	4.8 kg
8/17/22	160 g	3%	0	1000	4.8 kg
8/18/22	160 g	3%	0	1000	4.8 kg
8/19/22	160 g	3%	0	1000	4.8 kg
8/20/22	160 g	3%	0	1000	4.8 kg

TERMINAL AUDITED FINANCIAL REPORT

(To be submitted by accountant and researcher together with DOST Forms 11, 12, and 13)

(1) Title Program: Project: Backyard Tilapia Farming in Batangas in Response to the COVID-19 Pandemic			(2) Project Leader/Gender Dr. MIGUEL ENRIQUEMA. A. AZCUNA		(3) Duration 07/01/2021-06/30/2022
(4) Start Date 07/01/2021	(5) Completion Date 06/30/2022		(6) Implementing Agency/Entity/Research & Development Station BATANGAS STATE UNIVERSITY ARASOF-Nasugbu		
(7) Particulars	(8) Total Approved Budget	Latest Approved Reprogramme	(9) Total Releases	(10) Total Expenditures	(11) Total Unreleased Budget	(12) Unexpended Balance/Savings
I. Personal Services						
A. Direct Cost						
1. Salaries/Wages	173,289.60	-	-	-	-	-
2. Honoraria	195,600.00	195,600.00	195,600.00	195,600.00	-	-
B. Indirect Cost (Separate amounts for coordinating agency and implementing ag		-		-		
2. Honoraria	12,000.00	12,000.00	12,000.00	12,000.00	-	-
Sub-Total	**380,889.60**	**207,600.00**	**207,600.00**	**207,600.00**	**-**	**-**
II. Maintenance and Operating Expenses						
A. Direct Cost		-				
1. Traveling Expense - Local	100,000.00	125,000.00	125,000.00	90,300.00	-	34,700.00
2. Training & Seminar Expenses	100,000.00	70,000.00	70,000.00	-	-	70,000.00
3. Office Supplies Expense	15,000.00	9,000.00	9,000.00	-	-	9,000.00
4. Other Supplies and Materials Expenses (fing	150,000.00	100,000.00	100,000.00	15,000.00	-	85,000.00
5. Communication Expenses	10,000.00	10,000.00	10,000.00	-	-	10,000.00
6. Other General Services	-	188,289.60	188,289.60	159,980.73	-	28,308.87
7. Professional Services	140,000.00	135,000.00	135,000.00	59,086.35	-	75,913.65
8. Pond & Hatchery	100,000.00	106,000.00	106,000.00	21,000.00	-	85,000.00
9. Printing and Binding Expenses	10,000.00	10,000.00	10,000.00	-	-	10,000.00
10. Representation expenses	24,110.40	24,110.40	24,110.40	8,200.00	-	15,910.40
11. Transportation and Delivery Services	50,000.00	35,000.00	35,000.00	-	-	35,000.00
12. Aquaculture Supplies	350,000.00	410,000.00	410,000.00	322,922.00	-	87,078.00
B. Indirect Cost (Separate amounts for coordinating agency and implementing age		-				-
1. Supplies & Materials	20,000.00	20,000.00	20,000.00	-	-	20,000.00
2. Utilities	50,000.00	50,000.00	50,000.00	50,000.00	-	-
Sub-Total	**1,119,110.40**	**1,292,400.00**	**1,292,400.00**	**726,489.08**	**-**	**565,910.92**
TOTAL	**1,500,000.00**	**1,500,000.00**	**1,500,000.00**	**934,089.08**	**-**	**565,910.92**

CERTIFIED CORRECT:

KENNETH S. LAGUATAN, CPA, MBA
Head, Accounting Office

VERIFIED:

N/A
Auditor

PTR/License No.__

NOTED:

Dr. MIGUEL ENRIQUEMA. A. AZCUNA
Project Leader

APPROVED:

Dr. ENRICO M. DALANGIN
Chancellor

Note: Audited Financial Report (AFR) will be submitted at the terminal year of the project; For Government Agencies, financial report duly received by COA will be submitted awaiting AFR

DOST Form 11

LIST OF PERSONNEL INVOLVED

(1) Title **Program:** **Project:** Backyard Tilapia Farming in Nasugbu, Batangas in Response to the COVID-19 Pandemic			(2) Project Leader/Gender: Dr. Miguel Enrique Ma. Azcuna / Male		(3) Implementing Agency: Batangas State University ARASOF-Nasugbu		
(4) Personnel/Gender	(5) Designation		(6) Remuneration		(7) Percent Time		(8) Highest Educational Attainment/ Discipline (Field of Specialization)
	In Office	For This Particular Project (include Terms of Reference/Duties and Responsibilities)	In Office (Salary)	For This Particular Project	(a) This Project	(b) Other Project	
Miguel Enrique Ma. Azcuna / Male	Assistant Professor II	Project Leader	33,514.00	8,800.00	20%	80%	Ph.D Marine Science
Jonel Corral / Male	Assistant Professor II	Project Staff L1	33,514.00	7,500.00	20%	80%	Ph.D Marine Ecology
Brian Vendiola / Male	Laborer I	Laborer I	-	14,440.80	100%	-	
Albert Paytaren / Male	Instructor I / Head, Extension Services	Project Staff L2	27,892.00	500.00	40%	60%	MS in Information Technology
Kenneth Laguatan / Male	Accountant	Project Staff L2	43,681.00	500.00	40%	60%	BS Accounting

CERTIFIED CORRECT:

Dr. MIGUEL ENRIQUE MA. AZCUNA
Project Leader

NOTED:

Dr. ENRICO M. DALANGIN
Chancellor

Problems Encountered

There were delays in the procurement of feeds due to the spread of the COVID-19 Delta variant in August to September 2021, which forced the Procurement office of BatStateU ARASOF-Nasugbu to undergo home quarantine. One procurement officer was infected and had to undergoisolation for 3 weeks. Because of this, fingerlings and feeds were delivered to the beneficiaries in November instead of August to September. As a solution to this, the Procurement office decided to purchase all of the feeds for the duration of the project under one Purchase Order. The deliveryof feeds to BatStateU ARASOF-Nasugbu was scheduled in 6 installments (60 sacks per installment) from November 2021 to February 2022 so as not to overcrowd the designated storagearea of feeds at BatStateU ARASOF-Nasugbu.

There was also a difficulty in processing enough tilapia to produce 100 kilos of tilanggit. The tilapia cultured at BatStateU ARASOF-Nasugbu were expected to yield the 100 kilos of tilanggit. However, only 112 kilos were harvested, and this was insufficient to reach the expectedyield, because we did not expect the dry weight to be significantly lower (17-20% of the raw fish). In the future, tilapia weighing 50-70 grams may be obtained from the beneficiaries upon harvest,since about 5-10% of every harvest usually consists of small-size tilapia. These may be processedinto tilanggit by BS Fisheries and Aquatic Science (BSFAS) students at BatStateU ARASOF- Nasugbu.

DOST Form 9
SCHEDULE OF ACCOUNTS PAYABLE
As of December 31, 2021
(To be submitted by accountant and researcher together with DOST Form 8)

(1) Title Program: Project: Backyard Tilapia Farming in Batangas in Response to the COVID-19 Pandemic			
(2) Project Leader Dr. MIGUEL ENRIQUEMA. A. AZCUNA		(3) Implementing Agency BATANGAS STATE UNIVERSITY ARASOF-Nasugbu	
(4) Payee	(5) Particulars	(6) Amount	(7) Remarks
	None to Report		

CERTIFIED CORRECT:

KENNETH S. LAGUATAN, CPA, MBA
Head, Accounting Office

APPROVED:

Dr. MIGUEL ENRIQUEMA. A. AZCUNA
Program/Project Leader

COMMISSION ON AUDIT
BATANGAS STATE UNIVERSITY
24 AUG 2022

DOST Form 8

SEMI-ANNUAL/ANNUAL FINANCIAL REPORT

(To be submitted by accountant and researcher within one month after due date)

as of June 30, 2022

(1) Title		(2) Project Leader/Gender	(3) Source of Fund
Program:			
Project: Backyard Tilapia Farming in Batangas in Response to the COVID-19 Pandemic		Dr. MIGUEL ENRIQUEMA. A. AZCUNA	REGULAR TRUST FUND
(4) Project Duration (number of months):		(5) Date when fund was received by	(6) Implementing Agency:
Original:	Project Start Date: 07/01/2021	Implementing Agency	Implementation Base Station:
	Project End Date: 06/30/2022	JULY 2021	BATANGAS STATE UNIVERSITY ARASOF-Nasugbu
Revised (if applicable):	Project Start Date:		
	Project End Date:		

(7) Particulars	(8) Total Approved Budget for the Year	(9) Latest Reprogrammed Budget as of F.Y. 2022	(10) Releases 1st Year of Implementation			(11) Disbursements ___Year of Implementation			(12) Accounts Payable To Date	(13) Total Expenditures To Date	(14) Unreleased Budget To Date	(15) Unexpended Budget To Date
			Total Previous Year	Total This Year	Total To Date	Total Previous Year	Total This Year	Total To Date				
I. Personal Services												
A. Direct Cost												
1. Salaries/Wages	173,289.60				-			-		-	-	-
2. Honoraria	195,600.00	195,600.00	195,600.00		195,600.00	103,800.00	91,800.00	195,600.00		195,600.00	-	-
B. Indirect Cost (Separate amounts for coordinating agency and implementing agency)												
2. Honoraria	12,000.00	12,000.00	12,000.00		12,000.00		12,000.00	12,000.00		12,000.00	-	-
Sub-Total	380,889.60	207,600.00	207,600.00	-	207,600.00	103,800.00	103,800.00	207,600.00	-	207,600.00	-	-
II. Maintenance and Operating Expenses												
A. Direct Cost												
1. Traveling Expense - Local	100,000.00	125,000.00	125,000.00		125,000.00	27,000.00	63,300.00	90,300.00		90,300.00	-	34,700.00
2. Training expenses	100,000.00	70,000.00	70,000.00		70,000.00			-		-	-	70,000.00
3. Office Supplies Expense	15,000.00	9,000.00	9,000.00		9,000.00			-		-	-	9,000.00
4. Other Supplies and Materials Expenses (fingerlings)	150,000.00	100,000.00	100,000.00		100,000.00	15,000.00		15,000.00		15,000.00	-	85,000.00
5. Telephone Expenses	10,000.00	10,000.00	10,000.00		10,000.00			-		-	-	10,000.00
6. Other General Services	-	188,289.60	188,289.60			76,347.53	83,633.20	159,980.73		159,980.73	-	28,308.87
7. Other Professional Services	140,000.00	135,000.00	135,000.00		135,000.00		59,086.35	59,086.35		59,086.35	-	75,913.65
8. Repairs and Maintenance	100,000.00	106,000.00	106,000.00		106,000.00		21,000.00	21,000.00		21,000.00	-	85,000.00

9. Printing and Publication Expenses	10,000.00	10,000.00	10,000.00		10,000.00			-		-	-	10,000.00
10. Representation expenses	24,110.40	24,110.40	24,110.40		24,110.40	3,700.00	4,500.00	8,200.00		8,200.00	-	15,910.40
11. Transportation and Delivery Expenses	50,000.00	35,000.00	35,000.00		35,000.00			-		-	-	35,000.00
12. Aquaculture Supplies	350,000.00	410,000.00	410,000.00		410,000.00	178,822.00	144,100.00	322,922.00		322,922.00	-	87,078.00
B. Indirect Cost (Separate amounts for coordinating agency and implementing agency)								-			-	-
1. Supplies & Materials	20,000.00	20,000.00	20,000.00		20,000.00			-		-	-	20,000.00
2. Utilities	50,000.00	50,000.00	50,000.00		50,000.00		50,000.00	50,000.00		50,000.00	-	-
Sub-Total	1,119,110.40	1,292,400.00	1,292,400.00	-	1,104,110.40	300,869.53	425,619.55	726,489.08	-	726,489.08	-	565,910.92
TOTAL	1,500,000.00	1,500,000.00	1,500,000.00	-	1,311,710.40	404,669.53	529,419.55	934,089.08	-	934,089.08	-	565,910.92

CERTIFIED CORRECT:

KENNETH S. LAGUATAN, CPA, MBA
Head, Accounting Office

VERIFIED: (For NGOs or Privately owned institutions)

N/A
PTR/License No.__

NOTED:

Dr. MIGUEL ENRIQUEMA. A. AZCUNA
Program/Project Leader

APPROVED:

Dr. ENRICO M. DALANGIN
Chancellor

Note: 1) Audited Financial Report (AFR) will be submitted at the terminal year of the project; For Government Agencies, financial report duly received by COA will be submitted awaiting AFR.

2) The FR shall be itemized in accordance with the approved line-item budget (LIB).

approved by the Head of Implementing Agency (IA) and duly audited by the Auditor of the IA, List of Equipment Purchased (LEP) with corresponding Property Acknowledgement Report (PAR), Journal Entry Voucher

COMMISSION ON AUDIT
RECEIVED
24 AUG 2022
BATANGAS STATE UNIVERSITY

DOST Form 15

EXECUTIVE SUMMARY FOR THE TERMINAL REPORT

(Attach DOST Forms 8, 9 and 12)

(1) Program Title:
Project Title: Backyard Tilapia Farming in Nasugbu, Batangas in Response to the COVID-19 Pandemic
Project Leader/Gender: Dr. Miguel Enrique Ma. Azcuna / Male
Agency: Batangas State University ARASOF-Nasugbu
Address/Telephone/Fax/Email: +63 945 773 3697 / miguel.azcuna@g.batstate-u.edu.ph

(2) Cooperating Agencies

Laguna State Polytechnic University, Municipal Agriculture Office (Nasugbu), Municipal Agriculture Office (Balayan), Municipal Agriculture Office (Tuy)

(3) Site/s of Implementation (Barangay / Municipality / District / Province / Region / Country)
Base Station: Batangas State University ARASOF-Nasugbu, Brgy. Bucana, Nasugbu, Batangas
Site/s of Implementation: Brgy. Cogunan, Brgy. Malapad na Bato, and Brgy. Putat, Nasugbu, Batangas; Brgy. Tan-ag, Lian, Batangas; Brgy. Dalima and Brgy, Magahis, Tuy, Batangas; Brgy. Santol, Brgy. Gimalas, and Brgy, San Piro, Balayan, Batangas

(4) Project Duration (number of months)	
Original: 12 months **Project Start Date:** July 1, 2021 **Project End Date:** June 30, 2022	**Revised (if applicable):** **Project Start Date:** **Project End Date:**

(5) Major Accomplishments

A. Actual accomplishment of the project (via-a-vis the objectives)

OBJECTIVES	ACCOMPLISHMENTS
To introduce good aquaculture practices/technologies on Tilapia production	
• Identify 15 beneficiaries	• 15 beneficiaries identified
• Deliver Tilapia fingerlings to 15 beneficiaries	• Delivered Tilapia fingerlings to 15 beneficiaries
• Provide technical assistance to 15 beneficiaries	• Trained 15 beneficiaries on preparation and maintenance of fishponds for Tilapia culture
• Monitor growth of Tilapia, feeding rate, and mortality for 15 beneficiaries	• Conducted monitoring sessions (twice per month) for 15 beneficiaries
• Harvest Tilapia for 15 beneficiaries	• Harvested Tilapia for 8 beneficiaries
To enhance the capabilities of Tilapia farmers on culture and management practice	
• Provide training to 15 beneficiaries	• Trained 15 beneficiaries on Tilapia culture, feeding rate adjustment, and record-keeping
• Disseminate the results/output of the project to LGUs	• Disseminated the results of the project through social media platforms of LGUs and BatStateU President's Report Magazine

B. Expected Outputs / 6Ps (Expected Outputs should be measurable.)		
	EXPECTED OUTPUTS	**ACTUAL OUTPUTS**
Publications	One (1) ISI peer-reviewed publication on Backyard Tilapia Farming	One (1) manuscript submitted to The Philippine Journal of Fisheries
Patents/IP	No patents	No patents
Products	Four (4) tons of fresh Tilapia and one hundred (100) kilos of Tilanggit	4.562 tons of fresh Tilapia and 34 kilos of Tilanggit
People Services	Fifteen (15) trained beneficiaries	Fifteen (15) trained beneficiaries
Places and Partnerships	Partnerships with BFAR Region IV-A and LGUs in Batangas	Partnerships with Municipal Agriculture Offices of Nasugbu, Tuy, and Balayan, Batangas
Policy	No policies	No policies
(6) Risk Management Plan		
OBJECTIVES	**RISKS AND ASSUMPTIONS**	**ACTIONS TAKEN**
(7) Problems/Concerns Encountered There was a difficulty processing enough Tilapia to produce 100 kilos of Tilanggit. The Tilapia cultured at BatStateU ARASOF-Nasugbu were expected to yield the 100 kilos of Tilanggit. Howevere, only 112 kilos were harvested, and this was insufficient to reach the expected yield because we did not expect the dry weight to be significantly lower (17-20% of the raw fish).		**(8) Suggested solutions** In the future, Tilapia weighing 50-70 grams may be obtained from the Beneficiaries upon harvest, since about 5-10% of every harvest usually consists of small-size Tilapia. These may be processed into Tilanggit by BS Fisheries and Aquatic Science (BSFAS) students at BatStateU ARASOF-Nasugbu.

PHILIPPINE COUNCIL FOR AGRICULTURE, AQUATIC AND NATURAL RESOURCES RESEARCH AND DEVELOPMENT (PCAARRD)

Annual Program and Terminal Review of Inland Aquatic R&D Projects
Via Zoom/Video Conference
December 14-16, 2022

ACTION SHEET

Project Title: Backyard Tilapia Farming in Batangas in Response to the COVID-19 Pandemic
Project Leader: Dr. Miguel Enrique Ma. Azcuna
Implementing agency: Batangas State University
Duration: July 1, 2021 – June 30, 2022
ISP: Tilapia Industry S&T Program

Comments/ Questions / Recommendations	Action Taken
• The presence of duckweed in some farms was mentioned. Relating the presence (and abundance) of duckweed to the ABW and harvest and FCR will be a good mini-research for students.	This recommendation is acknowledged and will be suggested to thesis proposal students of BS Fisheries and Aquatic Sciences at Batangas State University ARASOF-Nasugbu
• In Methodology and Recommendation, the term "Genetically-reversed male tilapia fry/fingerlings" was used. If these fingerlings were merely all male using conventional sex reversal techniques using testosterone, then they should not be called Genetically reversed. The conventional term is SRT or Sex Reversed Tilapia. Their "Maleness" is only phenotypic. The females retain their female (XX) chromosome.	In Methodology and Recommendations, the term "Genetically-reversed male tilapia fry/fingerlings" was replced with "SRT or Sex-Reversed Tilapia fry/fingerlings"
• Data is lacking for a thorough analysis of the benefits, particularly the harvest of the 8 beneficiaries prior to project implementation. The objectives were not itemized as stipulated in the Terminal Report. • At most two cropping were done but there was no mean reported for each beneficiary (particularly the 8 beneficiaries). Proper record keeping was targeted but no sample record keeping data were presented. It can be shown in the Appendix. • The data could have been presented as bar graphs with error/deviation bars from the mean. The ABW was reported without the deviation.	Prior to project implementation, the 8 beneficiaries were not culturing tilapia in their ponds. For 2 beneficiaries that cultured tilapia in their ponds prior to project implementation, they said that their main problem was very slow growth and inability of the tilapia to reach harvestable size (150-200 g). The objectives were itemized in Form 15 (Executive Summary for the Terminal Report) which was attached to the TR. For the 8 beneficiaries with 2 croppings, the mean harvested ABW, harvested biomass, % survival, feed consumed, and FCR was included. Sample record keeping data was included in the Appendix We chose to present the data in table form because it gives a better overall view of total stock, ABW, harvested biomass, % survival, feed consumed, and FCR.

	Standard deviation was included with the measured parameters in Table 5.
• No economic analysis was shown although its computation was stipulated in the methodology. • It is suggested that economic analysis be included, i.e. the revenue/profit obtained before and after project intervention.	For the beneficiaries, there was no revenue/profit before project intervention. Revenue/profit obtained after project intervention was included.
• The final report should include the other necessary Tables: List of Equipment, List of Personnel, Audited (or COA-stamped) Financial Report, etc.	No equipment was purchased by the project, and it was advised not to submit DOST Form 12. The terminal audited financial report, List of Personnel Involved (DOST Form 12), Annual Financial Report (DOST Form 8), Schedule of Accounts Payable (DOST Form 9) were included as attachments to the TR.
Other Comments	