DETAILED RESEARCH & DEVELOPMENT PROJECT PROPOSAL

(To be accomplished by the participants)

(1) Title/Leader/Gender/Agency/Address/Telephone/Fax/Email

Program Title:	AquaPlantoPullusTech
Project Title:	**Development of MCC AquaPlantoPullusTech: A Mobile Application Driven Aquaponics System**
Leader/Gender:	**Dennis L. Tacadena, DIT** **Ernie Lee E. Pineda, MIT**
Agency/Address:	Institute of Business and Computing Education
Telephone/Fax/Email	N/A

(2) Cooperating Agencies

(3) MCC - Internalization Office

(4) Site of Implementation/Municipality/District/Province/Region

Mabalacat City College

(5) Classification

Research:

______ Biotechnology
______ Alternative Energy
_______ICT
_______Environment
_______Health Products/Pharmaceutical
______ Basic Research

Development:

(6) Mode of Implementation

___ Single Agency

___ Multi Agency

(7) Sector/Commodity

Mabalacat City College
Mabalacat City, Pampanga

BASIC INFORMATION

I. Project Title**: Development of MCC AquaPlantoPullusTech: A Mobile Application Driven Aquaponics System**

II. Project Leaders: **Dennis L. Tacadena, DIT and Ernie Lee E. Pineda, MIT**
IBCE Program Head and Faculty

III. IMPLEMENTING AGENCY:

Mabalacat City College
Mabalacat City, Pampanga

IV. FUNDING AGENCY:

C/O: OVPGROW

V. Duration: 2 **Year Project**

VI. TOTAL BUDGET COST: **300,000.00**

(2) Table of contents

(3) **Introduction**

One of the main issues the world is now experiencing, according to the Frontiers, is meeting the nutritional needs of a growing human population that is anticipated to reach 10 billion by 2050. Despite the development of high-yield crop varieties and enhanced food production methods, it is anticipated that the world's food demand by 2050 cannot be satisfied by current food production patterns. Agriculture field reductions will worsen the problem. The technique quickly moves from being primarily a backyard technology to being produced on an industrial scale, thanks to practical improvements in design and practice that have significantly increased fish and crop output capacity and production efficiency [1].

Climate change and the availability of food for a population with high growth rates are additional challenges in this area. There are significant concerns about climate change; to start, a rise in global temperatures that leads to floods, droughts, and other natural calamities. Hydroponics utilizes 20% of the water used for watering because of these climate circumstances. Water use is substantially lower than in conventional agriculture [2].

Inventions like aquaponics systems today do more than just reuse water; they also efficiently recycle wastewater and reuse energy [3]. Household and commercial aquaponics activities have been directly linked to ensuring food security in rural and urban settings in Egypt and South Africa. The amount of output from aquaculture is positively connected with the spread of aquaponics across the continent. Egypt, Nigeria, Kenya, and South Africa are among the nations driving the implementation of aquaponics and are major contributors to the continent's aquaculture [4]. According to the 2020 State of Food Security and Nutrition in the World Report, 59 million Filipinos experience moderate to severe inconsistency in access to food on a daily basis [5], making them the nation with the greatest percentage of food insecure people in Southeast Asia from 2017 to

2019. In addition to efficient water use, it also benefits the environment. Since deforestation and its damaging effects on the soil are avoided, there is no need for more agricultural land. The ecosystems of the neighboring land and water are not harmed by pesticide or fertilizer runoff. Aquaponics offers a clean and environmentally beneficial system, allowing local farmers and customers to always have access to fresh fish and leafy vegetables [6].

Farming, which takes place on a farm, is the management of a biological process, such as cultivating crops or raising livestock, with the aim of gathering products or replicating a natural mode of production [7]. The farming system method is essential for managing farm resources effectively in order to boost farm productivity, lessen environmental damage, enhance farmers' quality of life, and—most importantly—maintain sustainability in farm productivity and production. The farming system approach is essential for the efficient use of farm resources in order to raise farm productivity, lessen environmental damage, enhance farmers' quality of life, and most significantly, keep farm production and productivity sustainable [8].

The research study aims to develop sustainable farm-household systems for urban and rural communities. It will improve the effectiveness of farm output that leads to additional household income or sustainable food needs of households. The goal of the project is to build an intelligent aquaponics system, which is described as a hybrid of hydroponics, aquaculture, and chicken farming that produces an ecosystem by filtering fish waste through plant beds.

(4) Program/Project Title:

Development of MCC AquaPlantoPullusTech: A Mobile Application Driven Aquaponics System

(5) Program/project leaders

Project Leaders

Name: **Dennis L. Tacadena, DIT**
Field of Specialization: BSIT
Designation/Position: Instructor III
Contact Address: MCC, Mabalacat City, Pampanga

Name:
Field of Specialization: Ernie Lee E. Pineda, MIT
Designation/Position: BSIT Program Head
Contact Address: MCC, Mabalacat City, Pampanga

Percentage Time for Research: 20%

(6) Implementing agency

Mabalacat City College, Mabalacat City, Pampanga

(7) Cooperating agency

(9) **Study Area**

The goal of the project is to create "AquaPlantoPullusTech" for Pampanga Province residents who rely on agriculture for a living, particularly those who practice simple fish, chicken, and plant farming. For this study, the researcher would utilize poultry, catfish or tilapia, and curly green lettuce. These three types will be used by the researcher in farming since they can be self-sufficient when grown together. One of the advantages of fish and chicken to plants that the researcher has examined is the use of their dung as organic fertilizer. Micronutrients are also included in fish feces in addition to naturally occurring nitrogen, phosphorus, and potassium minerals.

(10) Objectives

Objectives of the Study

The goal was to develop an Aquaponics System entitled "AquaPlantoPullusTech: A Mobile Application Driven Aquaponics System". By this, the researchers were able to accomplish the following specific goals:

1. To gather information through both online and physical interviews; online articles; and published academic research studies.
2. To identify the hardware and software requirements needed for system and prototype development.
3. To design the system using the following analysis tools.
   3.1. Storyboard
   3.2. Architectural design
   3.3. Block diagram
4. To construct a microprocessor-based and microcontroller-based prototype with an attached sensory modules, linear actuators, motors for living things ambience controlling, watering and feeding system integrated in the miniature fish pond, aquaponics, and chicken coop
   4.1 Create a user control and an automatic fish tank water re-filler capable to egest water from the reservoir
   4.2 Create an automatic and automated fish tank feeding module for fishes
   4.3 Install a sensory modules in the fish tank that capable to read ambience temperature, water level, and pH level
   4.4 Create an automatic and automated chicken's coop feeding module for poultry
   4.5 Install a sensory modules in the chicken coop that capable to read ambience temperature.
   4.6 Create a lighting system for Aquaphonics
5. To create a mobile application capable to control and monitor the following parameters:
   5.1. Fish Tank Monitoring and feeding controller

5.1.1 Fish tank water level
5.1.2 Fish tank water temperature
5.1.3 Fish tank water pH level
5.1.4 Fish feeding sytem

5.2 Chicken Coop Monitoring and feeding controller
5.2.1. Chicken's coop temperature
5.2.2. Chicken feeding system
5.2.3 Chicken coop cooling system

5.3 Aquaponics lighting system

6. To test and evaluate the mobile application and prototype using the Software Quality Standards of ISO 25010 in terms of Functional Suitability, Compatibility, Usability, and Portability

(11) Expected Output (s): 6 Ps metrics

Publications	• Locale publication / Unpublished research
Products	• The Aquaponics System output
People Services	• Community household
Places and Partnerships	• LGUs and allied organizations
Socio-economic importance	• See significance of the study above

(12) End-users/target beneficiaries

The community household

(13) Program/project duration

This project will be conducted for a period of 5 years.

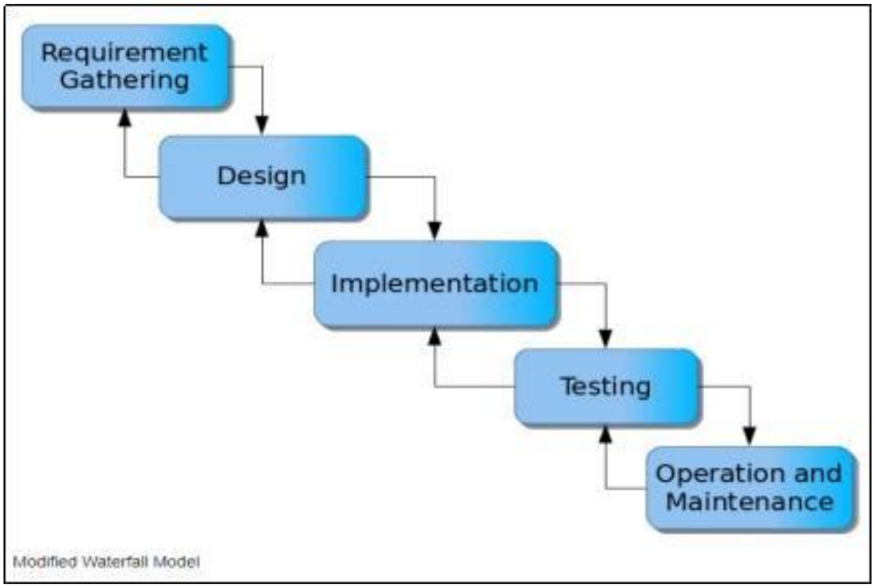
(14) Methodology

This section presents the outline of the methodology.

Study Area

A system development methodology is a tool used to organize the developing systems in a systematic and most effective way. It includes frameworks for describing the activities involved in defining, building, and implementing a system. The framework that the researchers used and the execution in every phase will be discussed.

Researchers used the Waterfall methodology as an internal process, placing little emphasis on the end user or client involved in a project. Its primary goal has always been to assist internal teams in moving more efficiently through project phases, which can benefit the software world.



(https://www.researchgate.net/figure/Modified-Waterfall-Model_fig1_332095882)

The waterfall model, also known as the Linear-Sequential Life Cycle Model, is another name for the waterfall model. This refers to the entire software being structured in a systematic manner, and it is also known as the Strict Waterfall Model because the model is strictly followed like a waterfall in the valley.

(16) Research utilization

(17) Estimated budgetary requirements Please see attached sheet

Line Item Budget (LIB)

Estimated budgetary requirements

Funding Requirement

Particulars	Source of Fund (PhP	
	(Unknown)	**MC**
I. Honoraria		
Project Leader		
Project Staff		
Laboratory Aide		
Sub-Total		
II. Maintenance and Other Operating Expenses		
Supplies and Materials (Office and Lab supplies)		
Travelling, Transportation/Gasoline Expenses		
Representation/Training Expenses		
Communication Expenses		
Printing and binding expenses for draft book and report		
Other Professional Expenses & Services (Statistician, Consult Methodologist, Photography services, Taxonomist, etc.		
Rental expenses (Lab services)		
Sub-Total		
PS + MOOE		
III. Administrative Cost (7.5%PS + MOOE)		
TOTAL		

References

[1] S. Bernstein, Aquaponic Gardening: A Step-By-Step Guide to Raising Vegetables and Fish Together. Books, October 11, 2011. Accessed on November 10, 2022.[Online]. Available: https://books.google.com.ph/books/about/Aquaponic_Gardening.html?id=TT30AgAAQBAJ&redir_esc=y

[2] I. Ezzahoui et al., Hydroponic and Aquaponic Farming: Comparative Study Based on Internet of thing IoT technologies, ScienceDirect, Sep 8, 2021. Accessed on November 2, 2022. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S1877050921014642

[3] S. Goddek, et al., Aquaponics Food Production Systems. Scholar, February 2019. Accessed on November 10, 2022. [Online]. Available: file:///C:/Users/Bea%20Pinero/Downloads/1007278.pdf

[4] K. A. Obirikorang, et al., Aquaponics for Improved Food Security in Africa: A Review, Frontiersin.org., August 2022. Accessed on November 10,2022. [Online]. Available: https://www.frontiersin.org/articles/10.3389/fsufs.2021.705549/full?fbclid=IwAR0_gSKxSoGWl0ma_fHXSGPoHo1V-uobjMOMA5YHaymW5ldkiSpwCr1vsmc

[5] "The FAO Legislative Advisory Group-Philippines (FLAG-PH) initiative", United Nations: Department of Economic and Social Affairs Sustainable Development. Accessed on November 2, 2022. [Online]. Available: https://sdgs.un.org/partnerships/fao-legislative-advisory-group-philippines-flag-ph-initiative#:~:text=In%20the%202020%20State%20of,of%20consistent%20access%20to%20food.

[6] "CHAPTER 2: Advantages & Disadvantages of Aquaponics: Environmental Benefits", Philippines Aqua-Hydroponic Prime Ventures Corp, September 19, 2022. Accessed October 15, 2022. [Online]. Available: https://philprimeventures.com/aquaponics-101/chapter-2-advantages-disadvantages-of-aquaponics/

[7] “Conceptual Issues: Defining Farming, Farms, Farmers, and Agriculture”, National Academies of Sciences, Engineering, and Medicine, 2019. Accessed on May 2, 2022. [Online]. Available: https://nap.nationalacademies.org/read/25260/chapter/6

[8] Dr. M. A. Kareem, Farming Systems Approach, Manage.gov. Accessed on May 2, 2022. [Online]. Available: https://www.manage.gov.in/studymaterial/FSA-E.pdf