FarmIn: A Farmer's Application for Proper Inventory with Import and Export System

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A Research Proposal

presented to

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INTRODUCTION

The use of technology has become widespread in the modern era. Collins (2019) defines technology as the methods, systems, and devices that result from the application of scientific knowledge for practical purposes. Technology was derived from the Greek word *technología*, which means "systematic treatment." Alternatively, this concept could also be extended to the use of scientific methods to solve instructional problems (Torkelson, 1971). With the world's constant advancement, technology has become the cornerstone of humanity.

During the era when civilization lived in small groups as hunter-gatherers, the Neolithic Revolution, which dates back to approximately 3000 B.C.E., became the most significant development for humankind. Men hunted animals, while women gathered food such as fruit, nuts, and berries from the local area. The revolution led us to our way of life, which was supported by the tools necessary for planting and harvesting crops (German, n.d.). Archaeologists have determined that these tools were created by grinding and polishing harder stones, and then shaping them with wood or bone. According to archaeologists, the abrasive wear on the tools was caused by the contact between the stone edge and the plants during cultivation (Anderson, 1999). As humanity progressed, technology, on the other hand, began to advance and become more sophisticated during the 1900s. Technology has become essential for the efficiency of work in many different fields. According to Mathieu et al. (2023), technology has transformed our lives for the better. It has improved crop yields, and reductions in hunger were made possible thanks to advances in agricultural technologies. The long-term decline in global poverty was primarily driven by increased productivity resulting from technological change.

In the 21st century, the agricultural sector faces multiple challenges as the Neolithic Revolution advanced and addressed the issue of hunger during population growth. Despite the progress the world has witnessed, the global population is growing exponentially. The agricultural sector is expected to provide safe and nutritious food to a population that is projected to grow from 7.5 billion people today to possibly double by 2050. An obvious consequence of population growth is an increased demand for food. If food security cannot keep up with the population growth, many people will starve globally. Food production, however, is just one aspect of the food chain. Millions of people depend on the agro-food sector for their livelihood. Most individuals living in severe poverty reside in rural areas, where food production is often the primary economic activity. There are an estimated 570 million farms in the world, with millions more engaged in food-related jobs. (Brooks et al., 2019) Inventory management is a crucial aspect of the agricultural sector, involving the systematic monitoring and tracking of commodities, suppliers, and products within the business. Various strategies and technologies are used worldwide to efficiently manage agricultural inventories. While individual systems may vary, there are certain broad concepts and trends that characterize agricultural inventory management. Grant (2019) explained that contemporary technologies, such as farm management software, GPS tracking, and RFID (Radio-Frequency Identification) systems, are increasingly utilized in the agricultural sector for inventory tracking and management. Scharf et al. (2020) studied how precision agriculture techniques, which incorporate data analytics and sensors, enable farmers to monitor and manage inventory levels more accurately. This involves optimizing the use of inputs such as seeds, fertilizers, and pesticides to minimize waste. These advancements have become more reliable, efficient, and effective in the agricultural sector, increasing the productivity of many farmers around the globe.

In the Philippines, the agricultural sector is the primary source of livelihood for 25-35% of the Filipino labor force (Asian Development Bank, 2011). According to Tacio (2022), the Philippines is still classified as having low mechanization levels. The common reasons for this classification include the low buying power of farmers, an abundance of rural labor, very small landholdings per farmer, high machine costs, and government policies that are not favorable to mechanized agriculture. The Philippine agricultural sector, represented by the Department of Agriculture (DA), still requires attention to address gaps in the adoption, dissemination, and implementation of technology, necessitating action from the Philippine government. The need to narrow the technological gap in the Philippine agricultural sector is emphasized by the stagnant productivity growth of 1.7%, which lags behind that of other Southeast Asian countries (PhilSEED, 2023). This can be attributed to the slowdown in technological progress, which is a result of the Philippine government's inadequate budget allocation for the technological advancement of the agricultural sector. Farmers in the Philippines also encounter inventory

issues, mainly due to the lack of an effective inventory system and insufficient postharvest facilities. Harvests face challenges in processing or storage due to the lack of suitable postharvest facilities, prompting farmers to frequently sell their goods at lower prices to prevent rotting, losses, or infestations by pests and diseases (Mahinay, 2023).

The Republic Act No. 8434, known as the 'Agricultural and Fisheries Modernization Act of 1997' (AFMA), was enacted with the primary objective of modernizing the agricultural and fisheries sectors in the Philippines. AFMA's vision is ambitious, calling for a paradigm shift from traditional methods to a new era fueled by innovation and knowledge. The National Economic and Development Authority (NEDA), mandated by Republic Act No. 7160, formulates policies and plans for agricultural development, including the adoption of modern technology. To promote greener and safer agricultural development, the Republic Act No. 10601, known as the 'Agricultural and Fisheries Mechanization (AFMech) Law,' encourages the development and adoption of modern, appropriate, cost-effective, and environmentally-safe agricultural and fisheries machinery and equipment.

Gitonga (2023) conducted a study that explores agricultural mechanization and demonstrates its capacity to produce accurate, in-situ data that guides national agricultural policies and strategies. The study enables on-field checks of agricultural support, seasonal monitoring of agricultural activity, and the planning and timing of activities like expropriation and land consolidation that may impact crops by using an online, current data warehouse and data mining services. Additionally, the study makes it possible to identify farmers impacted by natural disasters and detect production problems. Henke (2021) asserts that a productive farm operation necessitates an inventory system that functions smoothly and accounts for the goods in stock as well as the related expenses of handling, storage, risk, and servicing. Wodehouse (n.d.), a Penn State University extension educator, highlighted the importance of inventory in the balance sheet, saying that "because it has value, inventory is a critical component.".

PROJECT CONTEXT

The technological advancement in the sector of agriculture in the Philippines is currently behind with progression with the rest of the of the world. Mogato (2018) This underpinned that many Filipino farmers are still heavily reliant on manual labor and backward traditional farming methods. According to Domingo (2023) the 9.5 percent of the Gross Domestic Product (GDP) and 20 percent of the Filipino employment is accounted in the agricultural sector. These statistics proved that the sector plays a pivotal role in the Philippine trading and employment.

The Philippine agricultural sector faces persistent challenges that hinder its optimal performance, necessitating comprehensive research to bridge existing gaps. Numerous studies highlight the need for advancements in the sector to enhance productivity and sustainability. According to a report by the Philippine Institute for Development Studies (PIDS), the agriculture sector encounters challenges such as inadequate technology adoption, limited access to credit, and insufficient infrastructure development (Briones et al., 2020).

To address these issues, ongoing research aims to identify and rectify the gaps hindering the sector's progress. The researchers aim to contribute valuable insights that could lead to a transformative impact on cultivation practices. Additionally, the research aligns with the goals outlined in the Philippine Development Plan, emphasizing the importance of modernizing agriculture to achieve food security and poverty reduction (National Economic and Development Authority, 2017).

Efforts to expedite the development of the agricultural sector are crucial for the country's overall economic growth. The study endeavors to offer practical solutions to enhance the efficiency of cultivation processes, promoting the adoption of technologies and sustainable practices. By focusing on these aspects, the research aims to provide a rapid and effective transformation within the sector of the Philippine agriculture.

According to the preliminary survey carried out by the researcher, a considerable portion of farmers employ conventional inventory management techniques, resorting to manual record-keeping from the initial data entry phase to the trading stage. The findings suggest that, particularly during El Niño occurrences, certain farmers face difficulties in anticipating weather changes due to a lack of proficiency in technology. Furthermore, a prevalent issue among many farmers during the harvesting period is the management of post-harvest inventory, coupled with challenges in tracking revenue and expenditures.

The primary objective of this study is to develop a user-friendly application specifically designed for farmers. This application aims to be easily navigable and equipped with advanced technology, ensuring a swift, efficient, and proficient management system for tracking inventory, agricultural instruments, and financial revenues. The goal is to empower farmers with a tool that simplifies their daily tasks while embracing the benefits of modern technology. This approach not only addresses current gaps in the agricultural sector but also strives to enhance the overall productivity and effectiveness of farming practices. The application's user-friendly interface and technological features aim to cater to the needs of farmers, making it accessible and beneficial for those with varying levels of technological familiarity.

PURPOSE AND DESCRIPTION

The term 'FarmIn' is derived from a combination of 'Farmers' and 'Inventory,' reflecting its focus on addressing the challenges faced by farmers in managing their agricultural inventories. The researchers formulated this application not only for the farmers in the perimeter of Santa Maria but also for agricultural communities worldwide. This project intends to support the future-proofing and scalability of this application for all the agricultural sector. Which will not only help the farmers but also the community and the government.

The FarmIn application is an innovative tool that has been developed to address the challenges faced by farmers in the Philippines. With large tracts of land to manage, farmers often struggle to keep track of their products during import and export. The Farm In application provides a highly effective inventory system that helps farmers keep track of their products, enabling them to gain greater control over their operations and rationalize their processes. With this tool, farmers can run a more efficient and profitable enterprise overall. The application aims to make farming a less daunting task for farmers and help them achieve greater success in their endeavors. The study seeks to empower farmers through technological solutions, addressing the specific needs of the Santa Maria farmer community. By conducting this study, we aim to contribute to modernizing farming practices and fostering transparency, efficiency, and sustainable agricultural development in the Philippines.

The proposed application exhibits various functionalities that can be enhanced through ongoing research and development efforts. The application aims to incorporate the following features to address the needs of farmers and improve their overall management processes:

Firstly, an Inventory System will be implemented to systematically track all available products in the farmers' inventory. This will include features such as adding and editing products, order processing with an integrated invoice system, a tracking system, archival of previous products, and the ability to export and import products in various formats (CSV, Excel, or PDF). Additionally, a product barcode scanner will facilitate efficient inventory management. Secondly, the application will include a comprehensive Reports section with features like auto-sync, the ability to export reports in different formats (CSV, Excel, or PDF), and various viewing options (daily, weekly, monthly, yearly, custom dates, etc.). Users can also access reports highlighting the best-selling products. Thirdly, an Expenditure and Income Tracker will be integrated, featuring a sales report and an archive for past sales data. Fourthly, the application will incorporate a Point of Sale (POS) System to transaction processes. Fifthly, the Calculation of Landmass Production will be included as a feature to assist farmers in determining the productivity of their land. Lastly, Weather Tracking and Alert will provide real-time weather tracking and alerts, offering valuable insights for informed decision-making related to farming activities.

Efficient inventory management plays a crucial role in empowering farmers to monitor and track the quantity, quality, and condition of agricultural products, including crops and equipment. This system ensures the maintenance of accurate and up-to-date records of inventory transactions, minimizing the potential for errors and reducing unnecessary expenditures. Additionally, efficient import and export activities are facilitated through a smooth and thorough reporting system. This allows farmers to easily check the status of these activities, enhancing overall transparency. The integration of a comprehensive database for financial reporting further supports farmers in making informed decisions by maintaining detailed records of expenditures and income. The user-friendly interface of the system is designed with the specific needs of farmers in mind, ensuring ease of navigation and understanding, accommodating various levels of technological proficiency among users. Furthermore, the system's scalability and flexibility make it adaptable to different types of agricultural products, ensuring its broad applicability across diverse farming operations. In the context of the Municipality of Santa Maria, the implementation of this innovative agricultural sector approach will provide valuable insights through interviews with local farmers. These insights aim to contribute to the ongoing growth and development of the agricultural sector within the municipality.

OBJECTIVE OF THE STUDY

General Objective:

To develop an innovative tool to address the hardships faced by many farmers in the Philippines.

Specific Objectives

1. To develop an application for proper inventory of cultivated crops during importation and exportation processes.
2. This application aims to supersede traditional methods, striving for efficient and effective cultivation.
3. To act in accordance of Republic Act No. 8434 known as the "Agricultural and Fisheries Modernization Act of 1997."
4. This application will be monitoring on the income and expenditure to prevent over-expenditure during sales.
5. To enable effective tracking of harvesting schedules.
6. To provide daily weather updates during cultivation.
7. This project will be focusing on the user-friendliness and easy operation with the application.

SCOPE AND LIMITATION

This research aims to investigate prevalent challenges faced by farmers in the Philippines, focusing specifically on those in the Santa Maria, Bulacan community. The study will explore the common issues encountered by these farmers, seeking to gain a deeper understanding of their day-to-day struggles. As highlighted in previous research by Santos and Cruz (2019), farmers often grapple with challenges such as limited access to modern agricultural technologies and financial constraints.

This application, FarmIn, is designed to work specifically on Android devices with AndroidOS 7 or higher (also known as Android Nougat). However, to ensure accessibility for users, FarmIn will also have a website version that can be accessed through any device with an internet connection.

For the technical aspects of the application, the researchers will utilize Java for the Android version and ReactJS, Tailwind CSS for the web version as the primary programming languages. To facilitate seamless operation and ensure the availability of real-time data, a Firebase database will be integrated into the application. Users will be able to sign in effortlessly through their Google accounts, enhancing user convenience.

Moreover, to provide accurate weather information, FarmIn will integrate the AccuWeather API during its development. This integration aims to enhance the functionality of the application, ensuring precise weather tracking for effective agricultural planning.

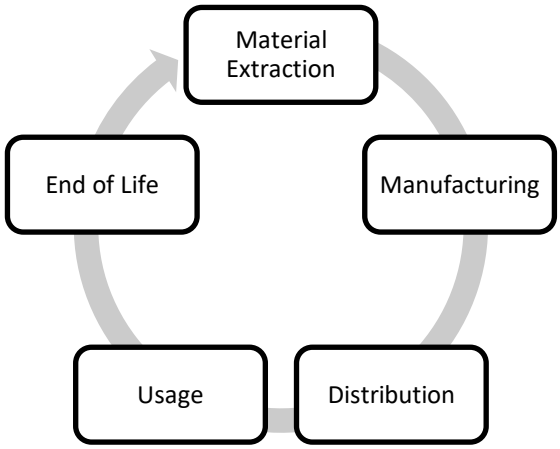
CHAPTER II: REVIEW OF RELATED LITERATURE AND STUDIES

This chapter presents the related literature and studies after the thorough and in-depth search conducted by the researchers. It also presents the relevant theory and conceptual framework of the study to provide a comprehensive understanding of the research.

RELATED THEORY

Inventory Management Theory. The theory underpinning this work serves as the foundation for mapping inventory management systems as well as research into more complicated inventory theory models. Polanecký and Lukoszová (2016) argue that during the 20th century, businesses have prioritized increasing efficiency. The development of operational research methodologies and their application using current information technology has helped to reduce company expenditures. Which was then stressed and stated utilizing the deterministic model to identify the relationship between inventory and the ongoing growth in efficiency in company activities.

Sustainable Materials Management. It is a systematic strategy to utilizing and recycling materials in more effective ways across their full life cycle. It indicates a shift in our society's attitudes on the use of natural resources and environmental protection. Investigate how materials are used throughout their entire cycle. The cycle below describes the product's whole life cycle, from material extraction to end-of-life management, allowing us to identify new options to decrease environmental impacts, save resources, and lower prices.



Technological Determinism. According to the University of Southern California (2006), the idea that technology has important effects on our lives. Technological Determinism has also had a long and controversial history in the social sciences in general and in organization studies in particular. Critics argued that technology itself is socially determined, that technology and social structures co-evolve in a non-deterministic, emergent process, or that the effects of any given technology depend mainly on how it is implemented which is in turn socially determined.

REVIEW OF RELATED LITERATURE

This section comprises materials typically found in print sources such as books, encyclopedias, professional journals, magazines, newspapers, and other published materials.

FOREIGN LITERATURE

In recent years, technology has played a significant role in transforming rural villages across China, leading to substantial improvements in transportation infrastructure and accessibility to logistic services in these areas. These advancements have had a profound impact on the behavior of farmers, who are increasingly turning to e-commerce platforms for conducting transactions. This shift is expected to not only increase their income but also create opportunities for self-employment (Asian Development Bank, 2019). According to Andreas et al. (2022), many farmers continue to rely on traditional farming methods, highlighting the importance of user-friendly agricultural technologies. Farmers prefer technologies that are easy to use and can help reduce their workload. In line with this, smart devices have become increasingly popular in various agricultural activities, including land demarcation, data recording, and precision agriculture (Juliano et al., 2022). Additionally, Córdoba et al. (2020) suggest that devices with processing capacity, mobility, and integrated geological systems have the potential to enhance agricultural operations. However, the effectiveness of statistical analysis and data cleaning processes relies on the availability of user-friendly applications that integrate these analytical steps. Furthermore, spatial data analysis techniques often require advanced skills, underscoring the need for assistive technologies in this process. Thomas (2023) emphasizes the importance of improving agricultural productivity to meet the needs of a growing population. Through embracing innovation and scientific advancements, the agricultural sector can enhance its productivity, resilience, and sustainability.

LOCAL LITERATURE

CHALLENGES OF FILIPINO FARMERS

Statista Research Department (2024**)** asserted that the Philippines is primarily an agricultural country with a large portion of Filipinos living in rural areas. Preliminary figures for 2022 reported about a quarter of employed Filipinos work in the agricultural sector which is made up of four sub-sectors: farming, fisheries, livestock, and forestry. According to President Marcos, one of the Philippines' most pressing vulnerabilities lies in food insufficiency and the underperformance of the agricultural sector. Andrew (2022) corroborates this, highlighting the formidable challenges faced by Filipino farmers in advancing agricultural productivity. Despite the vast expanse of agricultural land, totaling 13.2 million hectares, the nation remains heavily reliant on importing major crops. The agricultural sector's dull performance can be attributed to a multitude of factors, including suboptimal farm sizes, inefficient cooperative networks, and limited mechanization opportunities due to economies of scale constraints. Briones (2021) contends that despite substantial budget allocations over the years, government agricultural programs have yielded meager tangible outcomes, emphasizing the need to shift focus towards prioritizing public goods support over private goods provision. Budgetary allocations predominantly favor input subsidies for credit, farm machinery, irrigation services, agricultural insurance, and seeds, neglecting crucial investments in public goods, which only account for 4 percent of the agricultural output value. Furthermore, Williams (2019) underscores the historical challenge of technological inadequacy within Filipino farming systems, prolonging a mismatch between input and output harvests and resulting in diminished profitability. Inadequate infrastructure exacerbates this issue, as many farmers lack access to essential resources such as irrigation systems and milling towers, essential components for establishing a sustainable agricultural framework in contemporary society.

FARMING ADVANCEMENT

Awae, et al. (2023) conducted a comprehensive review highlighting the advantages associated with the integration of IoT (Internet of Things) technologies in contemporary agriculture. Awae, et al. (2023) emphasized the many benefits, including but not limited to crop monitoring, livestock tracking, weather surveillance, automated irrigation systems, precision agriculture through steering mechanisms, greenhouse automation for optimal environmental control, and sophisticated field mapping techniques. This examination highlighted the transformative potential of IoT in enhancing agricultural practices, promoting efficiency, and sustainability across the agricultural sector.

REVIEW OF RELATED STUDY

This section encompasses a review of existing studies, inquiries, and investigations that bear similarity to the proposed study. Typically, these materials consist of manuscripts, theses, and dissertations, providing valuable insights into related research endeavors.

FOREIGN STUDY

FARMING ADVANCEMENT

In the study conducted by Auler et al. (2020), the safety of food supply chains was analyzed utilizing the Six T's Framework to assess food safety management. It was noted that traceability emerged as the most extensively studied aspect within the original framework. Additionally, the research identified investigations that integrated the elements of "tactics" and "targets" in their examination of safety within supply chains. This article introduced an enhanced framework, serving as a tool for classifying research and identifying areas for progress in identifying quality indicators across global food chains for current research agendas. Moreover, Muraoka et al. (2019) proposed that enhancing crop yield and ensuring sustainable grain production necessitates the adoption of integrated farm management systems by farmers. Furthermore, the study underscores the growing body of research on social network or farmer-to-farmer technology extension, which seeks to establish more efficient extension systems compared to traditional public-sector approaches. According to Fielke (2019), digitalization is widely recognized for its potential to enhance productivity and sustainability within the agricultural sector. The study delves into three primary conclusions concerning the current state-of-the-art. Firstly, it anticipates a continual increase in the connectivity between humans and technologies within agricultural knowledge networks and value chains. Secondly, the transparency of agricultural practices and the exchange of information among farmers, advisors, agri-businesses, consumers, and regulators are expected to drive and be driven by this growing connectivity. Lastly, the study identifies potential challenges in balancing the priorities of diverse agricultural stakeholders as digitalization continues to reshape agricultural innovation systems.

MARKETING

Marketplaces have seen a significant rise in recent years, with a notable example highlighted in Jones' (2020) study titled "Virtual Farmers Markets." This research delves into the inception, structure, operation, and transition of an online virtual farmers market in rural Ohio during the pandemic, marking it as a newfound fixture in the state. In this model, customers place orders online and subsequently collect their fresh, locally sourced produce at designated times and locations. Through the market's evolution and informal conversations with individuals involved in its development and management, both positive and negative aspects of the online market structure and implementation have emerged. Additionally, critical steps necessary for extending this model to other communities have been identified through these discussions. Thong, et al. (2022) stated that the value chain lacks market news, short-term storage, information for product and processing, quality check, and market power. Which means that the profit and welfare will not be reached due to the lacking factors. A new method can estimate market power by Lerner index through the stochastic cost frontier once the inputs data price is unavailable and the existence or non-existence of constant returns to scale.

INVENTORY SYSTEM

Huang (2020) conducted a study on the inventory system utilized by Chinese farmers, highlighting prevalent challenges associated with limited storage skills and facilities. These issues have led to substantial household storage losses in China compared to developed nations. With resources being a constraint, mitigating postharvest losses has emerged as a crucial strategy to bolster food supply in China. The findings revealed that corn, among the four primary crops examined, exhibited the highest storage quantity and loss rate in Chinese farmers' households. In a related study, farmers in Tanzania adopted local practices for harvesting and crop preparation, storing the produce in standard woven polypropylene bags for a duration of 30 weeks. The study monitored various parameters including grain moisture levels, insect populations, insect damage, mold/disease/discoloration of grain, rodent damage, shriveled grain, broken grains, non-consumable grains, impurities, and overall losses (Abass, 2019).

LOCAL STUDY

INVENTORY SYSTEM

According to recent research conducted by Asuncion and Muyot (2022), a considerable number of farmers in the Philippines are encountering significant challenges related to insufficient storage facilities and ineffective inventory management practices, particularly during the crucial harvesting stage. This deficiency not only leads to logistical complexities but also contributes to a notable decrease in revenue among these agricultural stakeholders. Moreover, Galvez (2019) highlights in his study the indispensable components of an effective Warehouse and Distribution system, which include protection against pests such as insects, rodents, and birds, seamless loading and unloading processes, optimal space utilization, simplified maintenance and management procedures, and the prevention of moisture re-entry into grains after the drying process. Given that, Napa (2023) argued that Inventory Management encompasses various crucial tasks, including monitoring supply levels, predicting demand, and strategically planning when and how to procure goods. Maintaining excessive inventory not only leads to financial losses but also occupies valuable physical space and heightens the risks of damage, spoilage, and loss. Conversely, insufficient inventory often results in operational disruptions and increases the likelihood of dissatisfied customers, both of which can significantly impact a company's reputation negatively. Therefore, effective inventory management is essential for optimizing resources, minimizing costs, and enhancing overall business performance. As highlighted by Galvez (2019), ensuring an ample inventory of mass-produced goods stands as a paramount concern for farmers worldwide. Additionally, Espaldon et al. (2020) emphasized the critical role of biosecurity measures in farms and agricultural produce to mitigate the spread and control of diseases. Their research findings indicated that adherence to biosecurity protocols varied significantly among layer farms in Central Luzon, as evidenced by the divergent external and internal biosecurity scores. This variance underscores the necessity for layer farms to enhance their biosecurity practices comprehensively.

LAND MANAGEMENT

According to a survey conducted by Velasco (2019), MASIPAG farmers applied an average of 55.66 kilograms of seed per hectare. In discussing crop farming methodologies, Ong et al. (2020) highlighted crop rotation scheduling as a traditional practice within organic farming. Their study aims to enhance the efficiency of organic farming in the second and third highest agricultural land areas in the Philippines. To achieve this, they propose the development of a technologically-advanced system for crop rotation scheduling. Unlike traditional methods, this system is expected to significantly reduce time requirements. Initial results suggest success in generating a comprehensive crop rotation schedule, specifying the types of crops to be planted, quantities, and timing over a twelve-month period, including fallow periods.

CHAPTER III: METHODOLOGY

This chapter outlines the research design utilized in this study, offering insight into the methodology employed for this research endeavor. It furnishes essential information regarding the selection of participants and sampling techniques, delineates the procedural aspects and flow of data collection, and elucidates the approach to data analysis.

RESEARCH METHOD

In this study, a mixed-method design is employed by the researchers. A mixed methods research design is a procedure for collecting, analyzing, and "mixing" both quantitative and qualitative research and methods in a single study to understand a research problem. (Cresswell, 2012) Additionally, mixed method approaches allow researchers to use a diversity of methods, combining inductive and deductive thinking, and offsetting limitations of exclusively quantitative and qualitative research through a complementary approach that maximizes strengths of each data type and facilitates a more comprehensive understanding (Harvard Catalyst, n.d.)

The researchers concluded that employing a mixed-method approach is particularly advantageous for investigating the impact of modernizing the agricultural sector for several reasons. Firstly, this approach allows for a holistic understanding of the phenomenon by integrating quantitative data, which provides numerical insights into the frequency of challenges encountered by farmers with traditional methods and the level of satisfaction among respondents with proposed applications. Concurrently, qualitative data aims to discern nuanced user experiences and perceptions. This methodological approach facilitates a comprehensive exploration of research questions from diverse perspectives, ensuring a thorough investigation of the topic and yielding in-depth insights into the implications of adopting new agricultural management practices in the Philippines.

RESEARCH DESIGN

The researchers utilize a descriptive-developmental approach to thoroughly analyze the data and provide a comprehensive analysis. As Manjunatha (2019) elucidates, this methodology entails describing the characteristics of the population or phenomenon under study, focusing primarily on the "what" rather than the "why" of the research subject. Additionally, developmental research, as defined by Richey (1994), involves the systematic study of designing, developing, and evaluating instructional programs, processes, and products to ensure internal consistency and effectiveness. In essence, the descriptive-developmental method involves the systematic study of designing, developing, and carefully evaluating instructional programs, processes, and products to meet established standards or criteria.

The descriptive-developmental research method will be employed to analyze the impact of advancing the agricultural sector by eliminating traditional practices. This methodology entails a systematic approach to planning, creating, and evaluating instructional programs, which aligns with the objective of assessing the effectiveness of the application in question. Furthermore, it enables a comprehensive examination of the product development process, providing insights into both the design and implementation phases of the application. The evaluation of the application's influence on farmers' experiences closely aligns with developmental research principles, which focus on understanding the effects of new technologies on users or organizations. Through this approach, researchers can systematically investigate how the application influences the efficiency, accuracy, and operational performance, thereby offering valuable perspectives on its effectiveness in enhancing the agricultural sector and increasing profits.

PARTICIPANTS OF THE STUDY

In order to set-forth with the study conducted by the researchers, the respondents of the study are chosen according the following criterion:

For the Farmers

a. A citizen of the Municipality of Santa Maria which must be in the perimeter of 10 to 15 Km.
b. Owns a land mass for mass farming produce.
c. Does import/export processes by his/her own.
d. Had a previous experience with import/export processes in the past (3) three years using traditional methods.

Additionally, in order to investigate any potential variations in the farmers adoption and use of the FarmIn application, the criterion will be including farmers who are in age range of 60 years old and above. Therefore, age will not be limited as it will be open for everyone who is within the criterion. The determination of an appropriate sample size will be guided by statistical considerations to ensure the validity and reliability of the study's findings.

SAMPLING PROCEDURE

A population comprises the entire group that you want to draw conclusions about. It doesn't always refer to people. It can mean a group containing elements of anything you want to study, such as objects, events, organizations, countries, species, organisms, etc. (Bhandari, 2020) A part of population that represents it completely is known as sample. It means, the units, selected from the population as a sample, must represent all kind of characteristics of different types of units of population. (Shukla, 2020) In terms of source accuracy, the researchers have utilized non-probability sampling. Non-probability sampling is a technique where the probability of any member being selected for the sample cannot be calculated. Unlike probability sampling, which involves random selection, non-probability sampling relies on the subjective judgment of the researcher (Nikolopoulou, 2023).

For this study, the researchers will employ purposive sampling procedure to obtain the sample data. Purposive sampling is suitable for mixed-method research as it allows the researcher to select participants with relevant experiences and perspectives related to the research question. In this case, the study will focus on the farmers experience with migration from traditional farming techniques to the new farming techniques. To ensure that the sample represents the target population accurately. Moreover, employing purposive sampling methodology facilitates researchers in obtaining comprehensive insights from individuals strategically selected for their ability to offer valuable feedback on the application's efficacy in performing efficient and truly innovative work.

RESEARCH INSTRUMENT

Research instruments are systematic tools designed to facilitate data collection on a specific topic of interest, such as questionnaires, interview protocols, or any device utilized by the researcher to measure a given phenomenon (Takona, 2002). In this study, a structured survey was employed by the researchers to gather pertinent data. As noted by Bhat (n.d.), surveys involve obtaining information from a group of individuals through a series of questions, which can be administered via various mediums including paper and pencil, online platforms, telephone, or face-to-face interviews. However, for the purposes of this study, the structured survey was conducted using a paper-and-pencil format to optimize time efficiency and ensure timely completion of data collection. Anonymity was maintained throughout the survey process to enhance respondent comfort and facilitate candid responses.

Structured surveys serve as a versatile research instrument capable of efficiently capturing insights from a diverse pool of participants, making them a practical and cost-effective choice for evaluating the efficiency and effectiveness of the application to the respondents. To evaluate the efficacy of the FarmIn application, the researchers devised a set of survey questions below:

1. How effectively do you manage your inventory tracking system?
2. How precise is your timing for harvesting? (Considering delays or early harvesting)
3. What methods do you use to monitor weather conditions for your farming operations?
4. Have you experienced any discrepancies in calculating profits and expenses?
5. In your opinion, what specific features do you believe would significantly enhance the agricultural sector?
6. On a scale of 1 to 10, how comfortable are you with utilizing technology such as mobile apps and websites to enhance the Agricultural Sector in the Philippines?
7. Could you provide any feedback on your experience with the FARMIN Development initiative?

DATA GATHERING PROCEDURE

Data collection is an important stage in the research process, employing considerable influence over the quality and validity of study outcomes. It serves as a fundamental juncture where meticulous attention must be paid to minimize the potential for errors that could compromise the integrity of the research project. Hence, in conjunction with an appropriate research design, dedicating ample resources and effort to the data collection phase is imperative to yield reliable results. Insufficient or inaccurate data not only undermines the credibility of findings but also hinders the researcher's ability to establish the accuracy and validity of their conclusions. (Kabir, 2016)

1. **PREPARATION**

   The initial phase of the study entails the submission of a permission letter to the III/Research adviser for potential revisions. Subsequently, a comprehensive review of the researchers' study will be conducted to ascertain the appropriateness, accuracy, and relevance of the questions intended for inclusion in the survey questions.

2. **SAMPLE OF THE POPULATION**

   To ensure the precision of respondent selection in this study, a systematic approach will be adopted by the researchers. Initially, the target population, consisting of farmers, will be delineated. Subsequently, a purposive sampling method will be employed to classify the respondents based on predetermined criteria. The survey will be administered exclusively to the targeted sample within specific temporal and spatial parameters, namely, within a (10) ten to (15) fifteen (km) kilometers radius from the Municipality of Santa Maria, Bulacan and during designated time frames. Lastly, the determination of an appropriate sample size will be guided by statistical considerations to ensure the validity and reliability of the study's findings.

3. **ADMINISTERING THE "LETTER OF APPROVAL/CONSENT LETTER"**

   The researchers will then distribute the letter of approval/consent letter to the respondents asking for their permission to participate in the study. It is important to note that the participants have the right to decline or withdraw from the study at any point if they feel uncomfortable answering the questionnaires, and their decisions will be respected.

4. **SURVEY ADMINISTRATION**

   Each survey, the researchers will only allot (3) three to (5) five minutes to complete the survey questions.

5. **DATA COLLECTION**

   Confidentiality will be strictly maintained for all data and results obtained from the interviews, respecting the privacy of the participants. Only the researchers and a few selected teachers at STI Sta. Maria will have access to the results. To analyze the data collected in this study, the researchers will utilize In Vivo Coding. In Vivo Coding is a technique for analyzing qualitative data that focuses on the participants' actual spoken words (Manning, 2017). In Vivo Coding will only be used on the farmers' experiences and perception as well as the feedback with FarmIn Application. Data sorting is any process that involves arranging the data into some meaningful order to make it easier to understand, analyze or visualize. (Ali, n.d.) Data sorting will then be used to create charts (Pie Chart, Bar Graphs, etc) to directly analyze and visualize all the data collected.

6. **APPLICATION DEVELOPMENT**

   The collected data from the respondents will serve as the foundation for the app development process. This dataset will serve as a guiding framework for app developers to discern essential features, determine the most effective design approach, and establish optimal protocols for managing user data within our database.

ETHICAL CONSIDERATION

In pursuit of this paper's objectives, the researchers aim to systematically gather requisite data and resources to assess and discern potential advancements in the agricultural sector of the Philippines. Upholding ethical standards to safeguarding the rights and welfare of participants, strict ethical considerations have been established. Prior to conduct the study, informed consent forms were meticulously prepared and disseminated among all potential respondents. Ensuring the prevention of any potential risks and facilitating informed decision-making, the researchers will transparently articulate the study's objectives to participants. Moreover, prior to survey administration, participants' explicit agreement and acknowledgment of their right to decline participation were sought. To safeguard participant privacy and confidentiality, stringent measures were employed, including secure data storage and anonymization protocols to shield personal information. Mitigating harm, researchers refrained from posing intrusive questions and extended assistance to participants as needed. Fundamental to ethical conduct, all participants were treated equally regardless of demographic distinctions, with voluntary participation respected. Throughout the researchers aim to adhere the principles of honesty, integrity, and transparency, ensuring disclosure of any conflicts of interest with the aim of benefiting participants and society at large. Adherence to these ethical guidelines not only supports the validity and reliability of the study but also prioritizes the safety and well-being of respondents.

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