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Digital Farmer's Profiling System for Decision Support Towards E-Governance



Abstract: - The "Digital Farmer's Profiling System for Decision Support in E-Governance Research" is an innovative approach harnessing digital technologies to elevate the realms of agriculture and governance. Its primary objective was to create an integrated digital profiling system for farmers, enabling the collection and analysis of essential farmer data, thereby facilitating informed decision-making for both farmers and departmental agriculture offices. Specifically, the project aimed to develop a profiling system with distinct components, including farmer profiles, land profiles, livestock and poultry information, aquaculture farmer data, service provider details, livelihood insights, and cost and return analysis information. Additionally, the system features an efficient reporting mechanism capable of generating critical information, such as lists of farmers and land forecasting data. The research employed a qualitative methodology, gathering data from sample documents and interviews involving registered farmers and agricultural stakeholders, selected through a stratified sampling approach to ensure diversity in geographical locations and farm types. Ethical considerations, including a rigorous commitment to data privacy and obtaining informed consent, were meticulously observed throughout the research process. The Agile software development model was employed for designing and developing the system. This study has not only successfully met all the requirements of a farmer's profiling system with an exceptional capability by encompassing key components. Furthermore, it features a robust reporting mechanism for generating crucial data, including lists of farmers and land forecasting information.

Keywords: profiling system, farmers information, database system for farmers.

I. INTRODUCTION

In the province of Isabela, where agriculture is not just a way of life but a vital economic pillar, the Department of Agriculture offices bear a profound responsibility. They are tasked with supporting and empowering the diverse community of farmers who work the fertile lands of this region. These farmers face a multitude of challenges, from shifting weather patterns to evolving market demands, and it's crucial for the Department of Agriculture to tailor its support to their unique needs and circumstances. In this era of rapid technological advancement, the integration of digital solutions into agriculture has opened the door to a new paradigm – e-governance for agriculture. This transformative approach aligns seamlessly with Sustainable Development Goal 17, which highlights the importance of global partnerships and collaborative efforts for sustainable development.

The "Digital Farmer's Profiling System for Decision Support Towards E-Governance" represents a groundbreaking initiative in this agricultural landscape. This research project explores how this innovative system can reshape the way the Department of Agriculture offices in Isabela manage farmers' information and address their specific needs and challenges. It serves as a comprehensive, data-driven framework for profiling farmers, providing invaluable insights into their individual requirements, obstacles, and aspirations.

This profiling system not only symbolizes a technological marvel but also embodies a broader shift toward a more inclusive, efficient, and transparent governance model. As the world grapples with the challenges of food security, sustainability, and economic development, understanding and supporting the needs of farmers have never been more critical. The "Digital Farmer's Profiling System" serves as a timely and powerful solution that can bridge the gap between the agricultural community and government bodies. It fosters a more responsive and citizen-centric approach to e-governance, creating a pathway towards a sustainable and prosperous future for the agricultural sector in Isabela. This research delves into the architecture, functionality, and potential impact of this innovative system, shedding light on its significance for modern agriculture and e-governance in the region. It underscores the imperative need for collaboration among stakeholders, policymakers, and technologists to realize the full potential of this digital revolution for agriculture, aligning with the collaborative spirit of SDG 17.

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II. OBJECTIVES

The study generally aimed to develop an integrated digital profiling system for farmers to collect and analyze farmer's data, facilitating informed decision-making by farmers and government agencies.

Specifically, it aimed to:

1. Develop a profiling system with the following components:
 - a. Farmers profile
 - b. Farmers Land Profile
 - c. Farmers Livestock information
 - d. Farmers Poultry information
 - e. Aquaculture farmer information
 - f. Farmers Service Provider
 - g. Farmers Livelihood Information
 - h. Farmers Planting Information
 - i. Cost and Return Analysis information
2. Create a reporting mechanism that generates essential reports such as list of farmers engaged in crop cultivation or aquaculture and list of all registered farmers within the system.

III. RELATED LITERATURE

A Digital farmer's profiling system for decision support refers to a technological platform or software application that is designed to collect, analyze, and manage data about individual farmers or agricultural stakeholders. The primary purpose of such a system is to provide decision support and aid in the planning, implementation, and evaluation of various agricultural activities and interventions.

Digital farmer profiling is a key component of modern agricultural development. Research by experts like Kumar and Rani (2015) highlights the importance of using digital tools to collect and analyze data about farmers, enabling governments and organizations to tailor support and resources to individual needs.

Research by Rao and Joshi (2017) focuses on the benefits of digital farmer profiling for decision support in agriculture. These benefits may include improved resource allocation and better-targeted agricultural extension services.

Studies, such as the one by Singh et al. (2018), discuss the challenges and opportunities involved in implementing digital profiling systems for farmers. These challenges may include data privacy concerns and technological barriers.

As digital systems involve the collection and management of sensitive farmer data, research on data privacy and security considerations is crucial. Articles by authors like Smith and Brown (2020) discuss these aspects.

Mishra and Verma (2019) stated that the Digital Farmer's Profiling System for Decision Support offers a transformative approach to agriculture, leveraging technology to benefit both farmers and the agricultural sector as a whole. By collecting and analyzing data about individual farmers, decision-makers can make informed, data-driven choices, resulting in more efficient resource allocation and personalized support for farmers. This, in turn, leads to improved crop yields and productivity, while encouraging sustainable agricultural practices.

These systems also facilitate the ongoing monitoring and evaluation of programs, allowing for the development of more effective and targeted agricultural policies. Farmers gain access to vital information, resources, and markets, reducing risks and vulnerabilities.

Furthermore, such systems can streamline administrative processes, saving time and labor for both farmers and governmental organizations (Choudhary, 2017).

A digital farmer's profiling system for decision support system aims to enhance the efficiency and effectiveness of agriculture-related decision-making processes. It enables governments, agricultural organizations, and policymakers to make informed choices and deliver more targeted support to farmers, thereby contributing to improved agricultural productivity and sustainability.

IV. METHODOLOGY

This chapter presents the research methodology and gives an idea regarding the research design (process model), research method, methods of data collection, participants in the study, and analysis of the data. The research design for "Digital Farmer's Profiling System for Decision Support towards E-Governance" employed qualitative data collection methods.

Data were gathered through interviews and the analysis of reports. Participants included registered farmers and agricultural stakeholders, selected through a stratified sampling method to ensure geographical and farm-type diversity. Ethical considerations, including data privacy and informed consent, were rigorously observed throughout the research process. Findings will be subsequently disseminated through academic publications and reports, contributing to the advancement of digital solutions in agriculture and e-governance.

Development phase

One of the software development approaches that was used to designed and defined for the development process of the software is the Software Development Models. This process model has different life cycle or process that was being followed and used as a guide to ensure the success of the software that was developed.

Thus, this study employs Agile process model with distinct phases namely: 1) Plan; 2) Design; 3) Develop; 4) Test 5) Evaluate and; 6) Meet

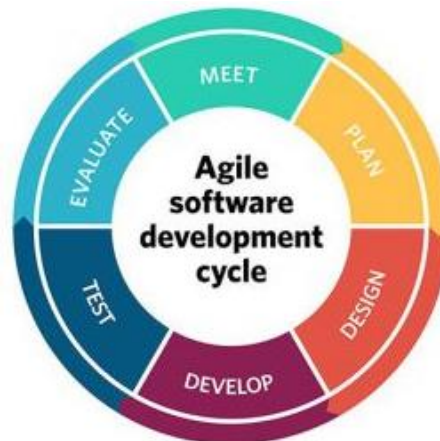


Figure 1. Agile Software Development

Throughout the project's lifecycle, several key phases were executed to ensure the successful development and maintenance of the system.

In the **planning phase**, a thorough analysis of the current situation and system visualization were undertaken to define its utility and benefits for users. The team gathered requirements, defined the system's scope, and identified inputs and outputs using sample evaluation forms. Additionally, hardware and software requirements, system specifications, and user interface design were established.

In the **design phase**, test scenarios were prepared for each task, and task breakdown and regression automation frameworks were set up. The input, process, and output (IPO) method helped determine the system's features and functions. A transactional database design was employed, facilitating the creation, reading, updating, and deletion of information.

In the **development phase**, the team focused on coding and system analysis, with particular emphasis on decision support. Risk analysis was conducted to identify potential issues and provide alternative solutions. Interviews and feature identification were used to address risks. A system prototype was developed, serving as a model for the system's design and development.

The **testing phase** ensured optimal study results. The application or system underwent immediate testing after each module or page was coded. If errors were identified, re-coding and testing were performed. Component testing assessed module connections using real data.

During the **evaluation phase**, a pilot launch and staff training for the Department of Agriculture will be conducted. Staff members will be provided with hands-on demonstrations of system usage. Their feedback on system performance will be solicited and integrated into future iterations.

Finally, in the **maintenance phase**, regular meetings and updates will be conducted. User feedback will be accepted and incorporated into subsequent iterations. Perfective maintenance will also be done to handle new features, enhanced functionalities, and changing user requirements, ensuring the system's continuous improvement.

V. RESULTS AND DISCUSSION

System Development

In light of the data collected concerning the farmers information, a profiling system was designed and developed. This phase involved the presentation of the system's functionalities and interface designs.

1. System Components

a. Farmers profile

The farmer’s profile is shown in Figure 2. This form is a digital profile or dossier containing key information about individual farmers or agricultural stakeholders. This profile often includes details such as the farmer's name, age, location, land holdings, crop preferences, production history, and possibly a photo. The administrator can add, edit, and update the information about farmers.

FarmerCode	Lastname	FirstName	MiddleName	Region	Province	District	Municipality	Barangay
2	ALBANO	HERSON	BANSON	REGION II	ISABELA		CABAGAN	GARITA
1	BALISI	VINCE LLOYD	QUIOAN	REGION II	ISABELA		MALLIG	CASILI
3	LUCAS	JOSE DOMINIC	CUMAGUN	REGION II	ISABELA		CITY OF ILAGAN	ALIBAGU
5	UDASCO	JUN-JUN	TAGUIBAO	REGION II	ISABELA		CABAGAN	MAGASSI
4	UMAYAM	MARIO	TAN	REGION II	ISABELA		CABAGAN	CATABAYUNGA
11	zipagan	jade						

Figure 2. Farmers Profile

b. Farmers farm and livelihood profile

Figure 3 presents the record or document containing essential information about a specific farmer's agricultural activities and practices on their farm and livelihood. This profile includes details such as the farmer's name, farm location, land size, crop varieties, livestock, farming techniques, and historical yield data. It also includes the farm water source, tenurial status, the latitude and longitude of the farm land.

FarmerCode	FarmCode	Area	Type	TenurialStatus	Region	Province	District	Municipality	Barangay	Source
2	21	2.00			REGION II	ISABELA	District I	CABAGAN		

FarmCode: Water Source:

Type: Area: Tenurial Status:

Region: Latitude: Longitude:

Province: Latitude1: Longitude1:

District: Latitude2: Longitude2:

Municipality: Latitude3: Longitude3:

Barangay: Latitude4: Longitude4:

Figure 3.a. Farmers Farm Land Profile

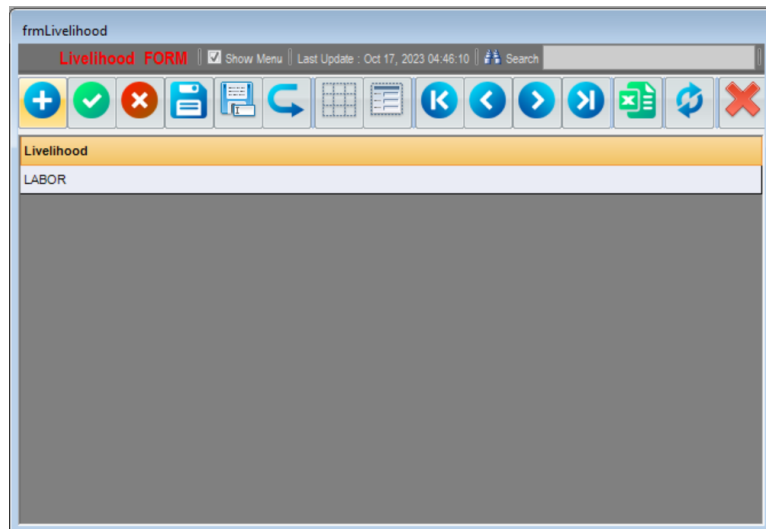


Figure 3.b. Farmers Livelihood Information

c. Livestock information

The livestock details of farmers are shown in Figure 4. This data encompasses the categories and breeds of livestock, the quantity of animals, their health and welfare conditions, as well as feeding and care practices. Additionally, it encompasses information pertaining to the income generated by farmers through their livestock.

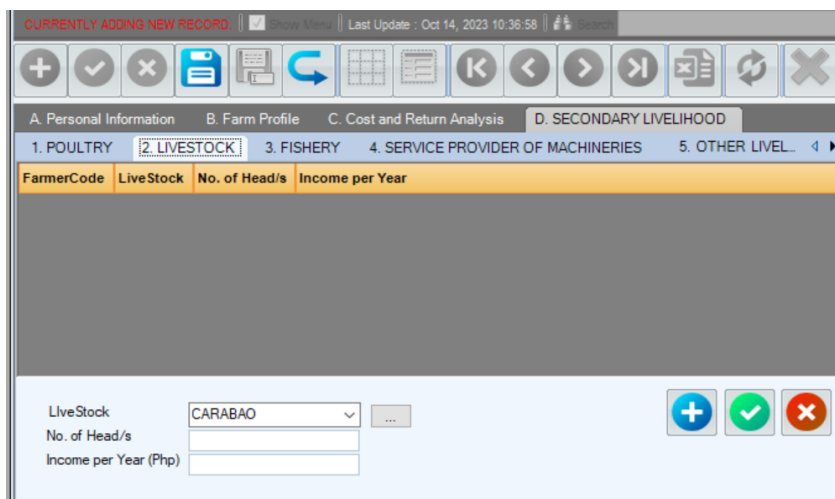


Figure 4.a. Livestock Information

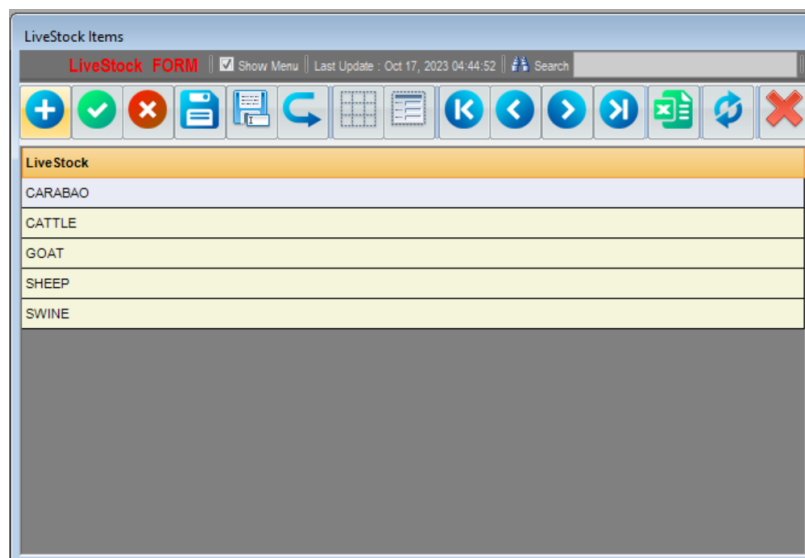


Figure 4.b. List of Livestock

d. Farmers Poultry Information

Figure 5 presents the poultry details of farmers. This form includes the types and breeds of poultry raised, the number of birds, their health status, feeding and management practices, and egg or meat production data. It also encompasses information pertaining to the income generated by farmers through their livestock.

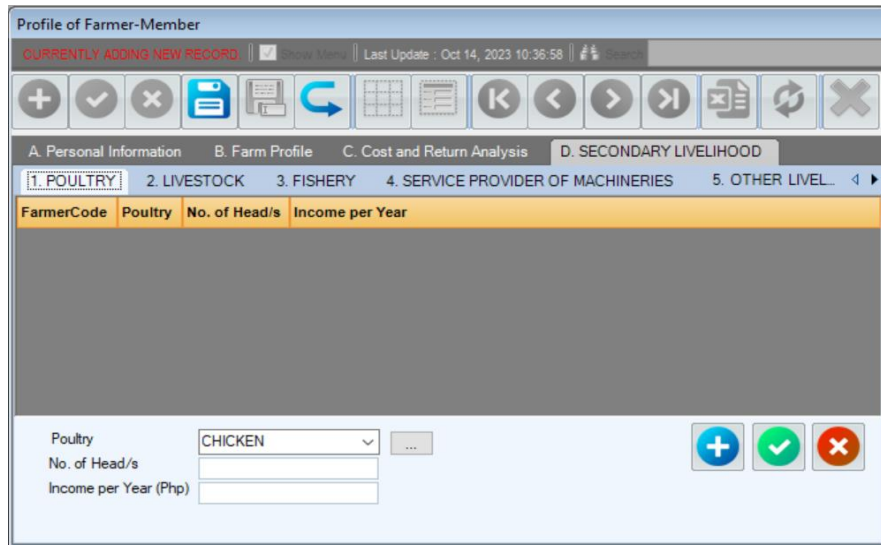


Figure 5.a. Poultry Information

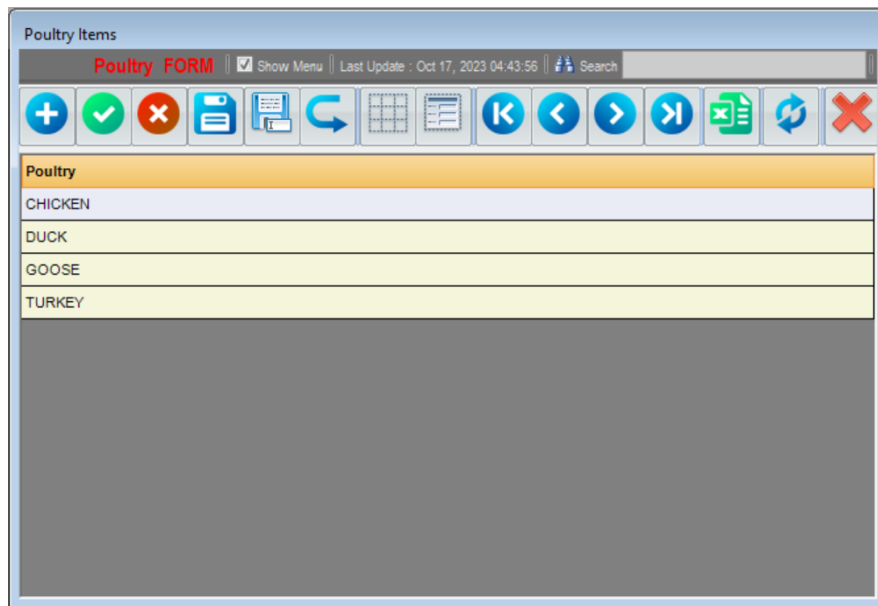


Figure 5.b. Poultry Items

e. Aquaculture farmer information

The aquaculture information of farmers is shown in Figure 6. This record encompasses the type of aquaculture conducted, the species of aquatic organisms being cultivated, the scope of operations, practices for water quality and management, methods for feeding and harvesting, and historical production statistics. It also covers data related to the income earned by farmers through their poultry.

CURRENTLY ADDING NEW RECORD | Show Menu | Last Update : Oct 14, 2023 10:36:58 | Search

A. Personal Information | B. Farm Profile | C. Cost and Return Analysis | D. SECONDARY LIVELIHOOD

1. POULTRY | 2. LIVESTOCK | 3. FISHERY | 4. SERVICE PROVIDER OF MACHINERIES | 5. OTHER LIVELIHOOD

FarmerCode	LiveStock	No. of Head/s	Income per Year

Fishery: HITO
 No. of Head/s:
 Income per Year (Php):

Figure 6. Aquaculture farmer information

f. Farmer's Service Provider

Figure 7 shows the farmers service providers form which includes data related to the rental fee of farmland per hectare and the annual income of farmers.

CURRENTLY ADDING NEW RECORD | Show Menu | Last Update : Oct 14, 2023 10:36:58 | Search

A. Personal Information | B. Farm Profile | C. Cost and Return Analysis | D. SECONDARY LIVELIHOOD

1. POULTRY | 2. LIVESTOCK | 3. FISHERY | 4. SERVICE PROVIDER OF MACHINERIES | 5. OTHER LIVELIHOOD

FarmerCode	ServiceProvider	Rental Fee per Hectare	Income per Year

Service Provider: FORWARD FARM TRA
 Rental Fee per Hectare:
 Income per Year (Php):

Figure 7. Farmer's Service Provider

g. Farmers Livelihood Information

Figure 8 shows the livelihood information of the farmer's This form includes information about the various livelihood sources of farmers and their annual income from these sources.

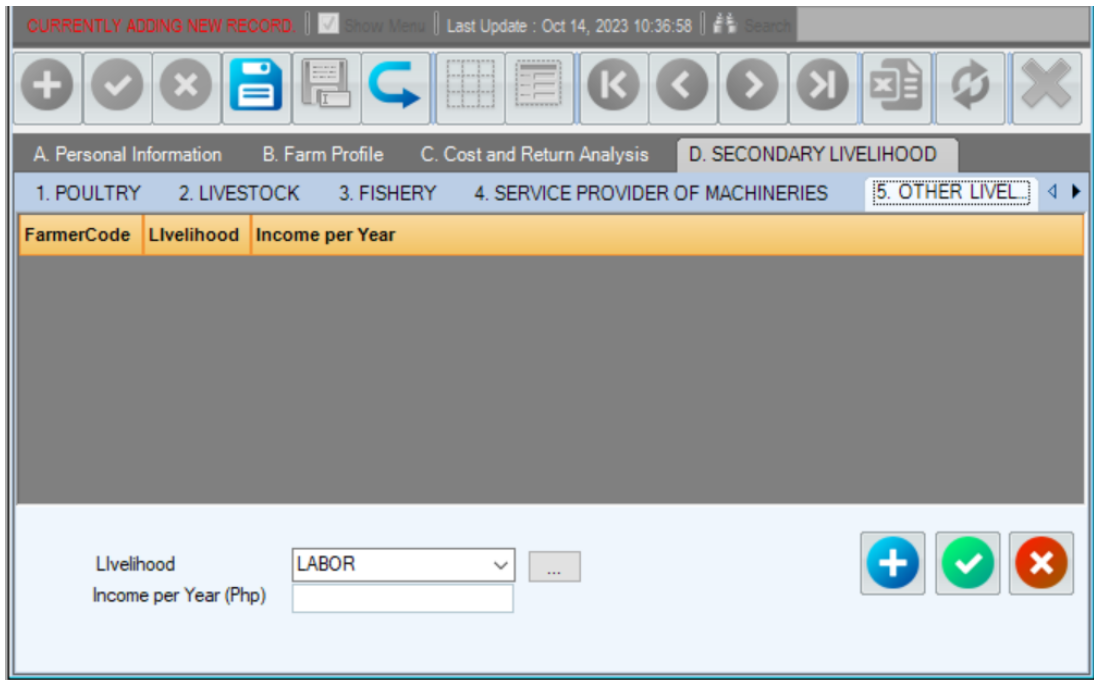


Figure 8. Farmers Livelihood Information

h. Farmer’s Planting Information (FPI)

The farmer’s planting information is shown in Figure 9. This form contains the data and details that pertain to a farmer's planting activities and practices. This information encompasses various aspects of crop cultivation, providing valuable insights into what, when, where, and how crops are planted. FPI is a fundamental tool for farmers and agricultural authorities, aiding in informed decision-making, optimizing resource usage, and enhancing agricultural productivity.

FarmerCode	FarmCode	Activity	Classification	Type	DateofActivity	Area	Date
4	20	PLANTING	GMO	YELLOW	2023-09-14 12:00:00	3.00	2023-09-14 12:00:00
2	21	PLANTING	GMO	WHITE	2023-09-14 12:00:00	2.50	2023-09-14 12:00:00
3	22	PLANTING	HYBRID	YELLOW	2023-09-14 12:00:00	1.00	2023-09-14 12:00:00
2	23	PLANTING	GMO	WHITE	2023-10-05 12:00:00	2.00	2023-10-05 12:00:00
1	24	PLANTING	GMO	WHITE	2023-10-05 12:00:00	2.00	2023-10-05 12:00:00

Figure 9. Farmer’s Planting Information

i. Cost and Return Analysis

Figure 10 presents the Cost and Return Analysis window. This form entails a detailed evaluation of the financial components within agricultural or farming operations. It encompasses an assessment of the expenses, such as those related to seeds, fertilizers, labor, equipment, and other inputs, as well as the income generated from the sales of crops or other agricultural products.

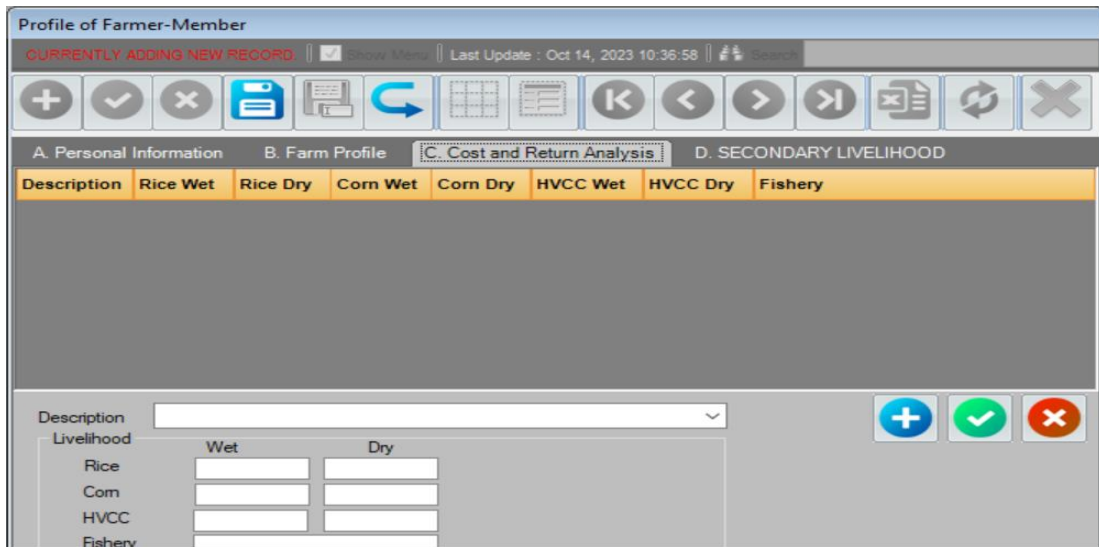


Figure 10. Cost and Return Analysis

2. Reports

Figure 10 presents a tabulated list that compiles the names and essential information of farmers actively involved in crop cultivation and aquaculture practices. The sample report is organized in rows and columns, providing easy access to pertinent data. Each row typically includes the farmer’s name, farm location, type of farming, crop or aquatic species information, and farm size. In this component a report on crop forecasting, field list was also included, and this information can be printed in case it is needed.

FarmerCode	Name	Address	ContactNo	Sex
11				
4	UMAYAM, MARIO TAN	CATABAYUNGAN CABAGAN ISABELA REGION II	09364723351	MAL
2	ALBANO, HERSON BANSON	GARITA CABAGAN ISABELA REGION II	09171234567	MAL
5	UDASCO, JUN-JUN TAGUIBAO	MAGASSI CABAGAN ISABELA REGION II	09187654321	MAL
3	LUCAS, JOSE DOMINIC CUMAGUN	ALIBAGU CITY OF ILAGAN ISABELA REGION II	09757653895	MAL
1	BALISI, VINCE LLOYD QUIOAN	CASILI MALLIG ISABELA REGION II	09175660026	MAL

Figure 11.a. List of Farmers

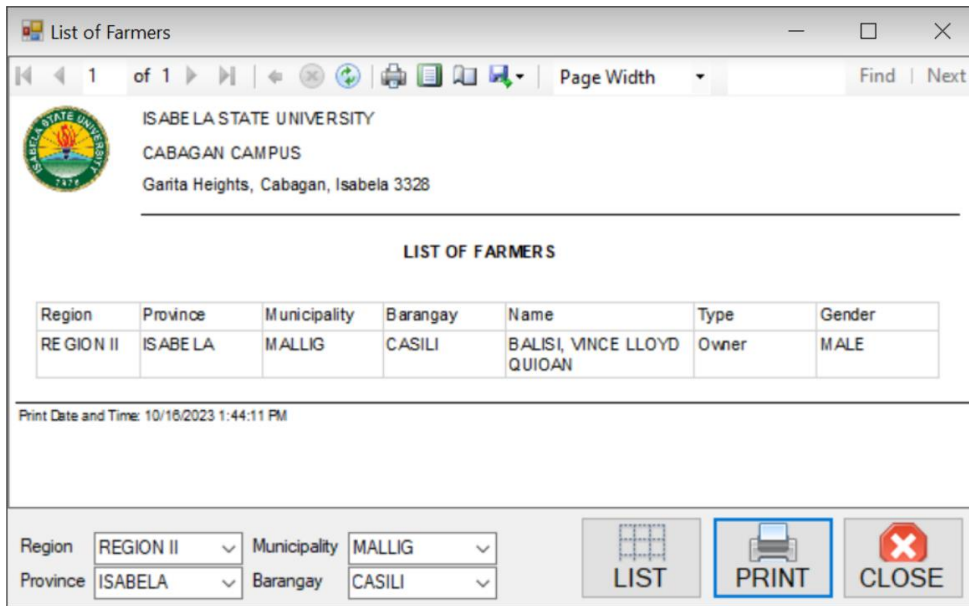


Figure 11.b. Sample Report of the List of Farmers

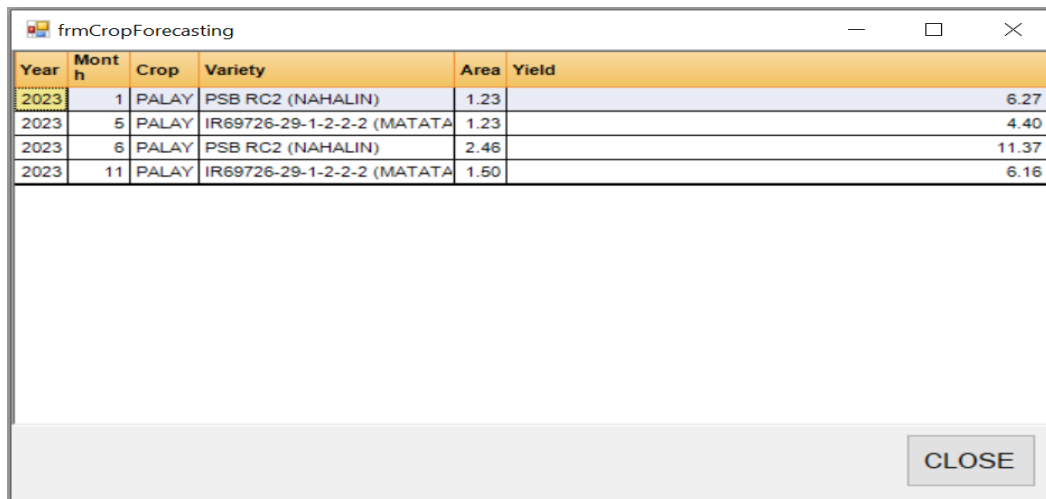


Figure 11.c. Crop Forecasting Report

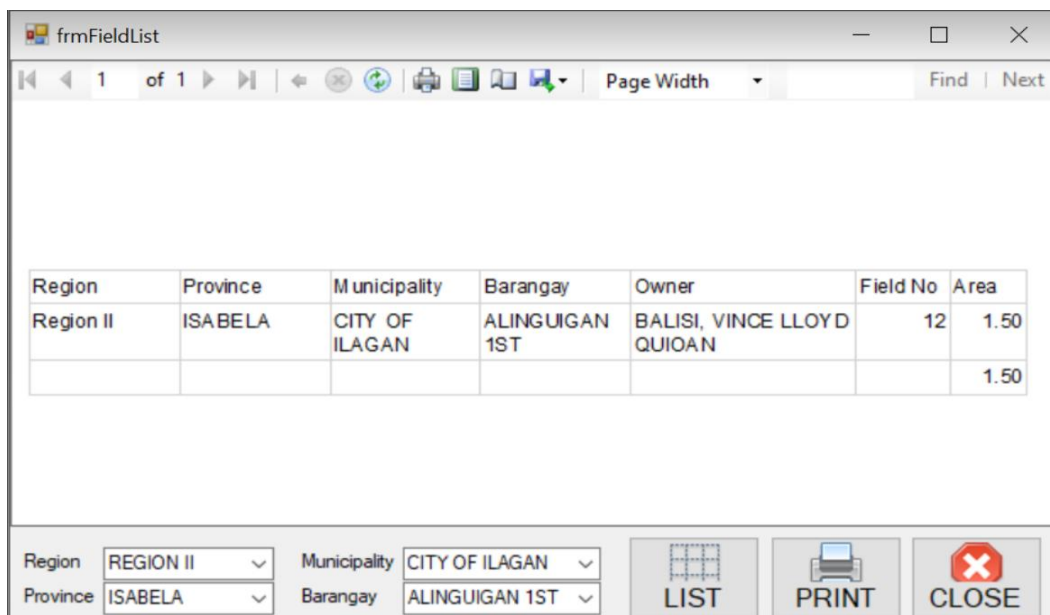


Figure 11.d. Farmer's List of Field

1	2	3	* Municipality	GMO_YELLOW	GMO_WHITE	HYBRID_YELLOW	HYBRID_WHITE	OPV_YELLOW	OPV_WHITE
Grand Total				0.00	10.50	0.00	0.00	0.00	0.00
District I				0.00	8.50	0.00	0.00	0.00	0.00
CABAGAN				0.00	8.50	0.00	0.00	0.00	0.00
District V				0.00	2.00	0.00	0.00	0.00	0.00
MALLIG				0.00	2.00	0.00	0.00	0.00	0.00

Figure 11.e. Farmers Planting Report

VI. SUMMARY AND CONCLUSION

In conclusion, the objectives of this project were successfully achieved, resulting in the development of farmer’s profiling system encompasses key components, including farmer's profile, detailed land profile, livestock and poultry information, aquaculture farmer data, information about service providers, and livelihood insights. Furthermore, components and an effective reporting mechanism for list of farmers and land forecasting.

Furthermore, an effective reporting system capable of generating vital information such as farmer lists and land forecasting data was created. This system component represents a significant leap in agriculture and decision support within the agricultural and e-governance domains.

Recommendations

The following recommendations have been formulated based on the findings of the study:

1. Establish comprehensive training and capacity-building programs for both farmers and government officials to ensure their proficient navigation and utilization of the system. These programs should encompass areas such as data entry, data security, and system functionalities.
2. Institute a consistent system maintenance and update schedule to address issues, enhance features, and safeguard the platform's long-term sustainability and relevance.
3. Develop comprehensive documentation and training materials to aid users in understanding and effectively utilizing the system.

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