

Socio-Economic and Demographic Profile People's Organization for National Greening Program with Visualization

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Abstract

Original Research Article

This study aimed to analyze, design, and develop a system to assist in analyzing relevant data for the National Greening Program (NGP) and to identify areas in need of intervention. Specifically, the system focused on gathering socio-economic and demographic data from beneficiaries to inform decision-making and improve program effectiveness. The system was evaluated using the System Usability Scale (SUS), a recognized instrument for assessing usability and overall user satisfaction. Data were collected from 24 beneficiaries, and statistical analysis was applied to assess the significance of the results. The system successfully generated detailed Socioeconomic and Demographic Profiles of People's Organizations (POs) involved in the NGP, providing valuable insights into income levels, education, employment status, and land ownership. Findings revealed that the system is highly usable, secure, and effective. It also demonstrated strong functionality, with the ability to process and visualize complex data sets. By examining socio-economic factors such as income, education, and employment, the system identified barriers to participation in the NGP and highlighted areas where targeted support was needed, such as financial assistance or educational programs. Additionally, the demographic analysis provided insights into age distribution, gender representation, and geographic location, which are critical for optimizing recruitment, training, and capacity-building initiatives. The study concludes that the system is a valuable tool for enhancing the NGP's efficiency and transparency. It recommends that the Department of Environment and Natural Resources (DENR) implement the system to support data-driven decision-making and improve the program's long-term sustainability. Future improvements could include predictive features to guide strategic interventions further.

Keywords: National Greening Program, Socio-Economic Data, Demographic Analysis, System Development, Usability Evaluation, Data-Driven Decision-Making, Program Effectiveness.

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INTRODUCTION

Climate change, deforestation, pollution, and biodiversity loss are urgent global challenges that severely affect food security, water availability, health, and livelihoods, particularly in developing countries (Sarile, Villanueva, & Dela Cruz, 2018). In response, the Philippine government launched the National Greening Program (NGP), a nationwide reforestation initiative aimed at restoring forest cover, reducing poverty, and enhancing climate resilience through community involvement (Department of Environment and Natural Resources [DENR], 2019). A critical component of this program is the active participation of People's Organizations (POs), local community groups responsible for carrying out tree planting, forest

rehabilitation, and land management activities. However, the effectiveness of the NGP is significantly hindered by the lack of structured and comprehensive data on the socio-economic and demographic conditions of these POs. Without accurate data, it becomes difficult for policymakers and program managers to assess the actual impact of the program or to design targeted interventions that address the specific needs of the participants. The absence of a reliable system for profiling and visualizing socio-economic and demographic data limits the ability to make informed, data-driven decisions regarding resource allocation, support services, and capacity-building initiatives. To address this problem, this study aims to design and develop a system that collects, analyzes, and visualizes the Socio-Economic and Demographic Profile (SEDP) of NGP

beneficiaries. The system will focus on key factors such as income, education level, employment status, age, gender, and land ownership essential elements for understanding the living conditions and development needs of participating communities. By providing an accurate, data-driven tool for assessing these variables, the system will assist the Department of Environment and Natural Resources (DENR) in making more effective decisions and fostering both environmental and socio-economic development.

OBJECTIVES OF THE STUDY

The primary objective of this study is to create a system that determines the contribution of the National Greening Program (NGP) to the socio-economic well-being of members within the People's Organization (PO). Specifically, the study aims to build a system that enables more efficient and productive data analysis through visualization, providing clearer insights into the program's impact. Additionally, the system will assist in determining the members' perceptions of the NGP, offering a deeper understanding of its effectiveness. It will also ensure the secure storage of confidential information for each NGP organization, protecting sensitive data. Finally, the system will be implemented and evaluated according to the ISO 25010 standards to ensure its functionalities meet quality criteria, including reliability, security, and usability.

MATERIALS AND METHODS

This study involves system development, the methodology applied is both descriptive and developmental. This study involves both descriptive and developmental research methods to address the challenges in managing and interpreting socio-economic and demographic data of the National Greening Program (NGP) beneficiaries. The descriptive method provided essential context and understanding of the needs, challenges, and profiles of program participants through data collected from surveys and interviews with stakeholders, including

DENR personnel and People's Organization (PO) members. The developmental method was applied to design and build a system that collects, processes, and visualizes this data, addressing gaps in information management and decision-making. The Agile Model of the System Development Life Cycle (SDLC) was used to promote iterative development, continuous feedback, and adaptability. During the Requirement Analysis Phase, user needs and system objectives were defined. In the Design Phase, system specifications, flowcharts, data flow diagrams (DFDs), and entity-relationship diagrams (ERDs) were created. The Implementation Phase involved the use of tools such as Visual Studio Code, PHP, MySQL, and JavaScript to code system functionalities including data entry, processing, and reporting. A key part of the methodology was the integration of data visualization using Chart.js and PHP, which allowed the system to dynamically present data in the form of pie charts, line graphs, and tabular summaries. Basic data aggregation algorithms, such as grouping, counting, and percentage calculation, were used to transform raw beneficiary data into interactive visual insights. These visualizations helped stakeholders identify trends in income, education, employment, and gender distribution, aligning directly with the study's goal of enhancing data-driven decision-making for the DENR. The Testing Phase evaluated the system based on ISO 25010 standards for usability, security, and effectiveness, followed by deployment with user training, and continued monitoring during the Maintenance Phase. This structured yet flexible approach resulted in a functional, secure, and user-centered system that supports the sustainable goals of the NGP.

RESULTS AND DISCUSSION

During testing and evaluation, the system was evaluated by the respondents. It was noted that the system was able to carry out its capabilities. The summary of the evaluation of the system by the IT Experts. With the use of a survey questionnaire, the respondents rated the systems.

Table 1. Results of System Testing and Evaluation as Rated by the IT Experts

USABILITY	MEAN	SD	DESCRIPTION
Understandability	3.80	0.45	Very High
Documentation	3.80	0.45	Very High
Buildability	3.80	0.45	Very High
Installability	3.80	0.45	Very High
Learnability	4.00	0.00	Very High
SUSTAINABILITY AND MAINTAINABILITY			
Identity	3.60	0.55	Very High
Copyright	3.40	0.55	Very High
Licensing	3.40	0.55	Very High
Community	3.80	0.45	Very High
Accessibility	4.00	0.00	Very High
Testability	3.60	0.55	Very High
Portability (3.80	0.45	Very High
Supportability	3.60	0.55	Very High
Analyzability	3.80	0.45	Very High
Changeability	4.00	0.00	Very High
Evolvability	3.80	0.45	Very High
Interoperability	3.60	0.55	Very High

As rated by the IT experts and the clientele, the system received high ratings for functionality, design, security, effectiveness, usability, sustainability, and maintainability. The data collected from experts and users provides valuable insights. The system had a rating of 3.80 in usability, indicating high usability. This indicates that these factors are well-managed, adaptable, and can be upheld over time, ensuring the program's

longevity and effectiveness. Such high ratings enhance the NGP's ability to analyze socioeconomic and demographic profiles efficiently, derive meaningful insights, make informed decisions, and address the needs of its participants effectively. The overall results show that the system can work with all the respondents' answers. It showed that the system was ready to be implemented.

Table 2. Results of System Testing and Evaluation as rated by the Users

USERS			
SYSTEM CAPABILITIES	MEAN	SD	DESCRIPTION
Functionality	4.72	0.33	Very High
Design	4.36	0.17	Very High
Security	4.31	0.40	Very High
Effectiveness	4.36	0.38	Very High

User data security is crucial in today's tech landscape, and a "very high" security rating indicates robust protection against unauthorized access and breaches. With a design assessment grand mean of 4.36, the device is visually appealing and user-friendly, enhancing user

experience. The effectiveness assessment, also at 4.36, signifies that the device meets expected functions efficiently, performing tasks seamlessly. These high security, design, functionality, and effectiveness ratings highlight the device's strong performance, reliability, and user satisfaction.



Figure 1. System Dashboard

To create a profiling and visualization system for the People's Organizations (POs) under the NGP. The system was successfully developed and implemented to collect, manage, and visualize the socio-economic and demographic data of POs. It features modules for user

management, member records, organizational profiles, and questionnaire handling. Figure 1 shows the dashboard presenting a visual summary of organization member distribution and gender distribution through pie charts, which enables easy monitoring of the beneficiary composition.

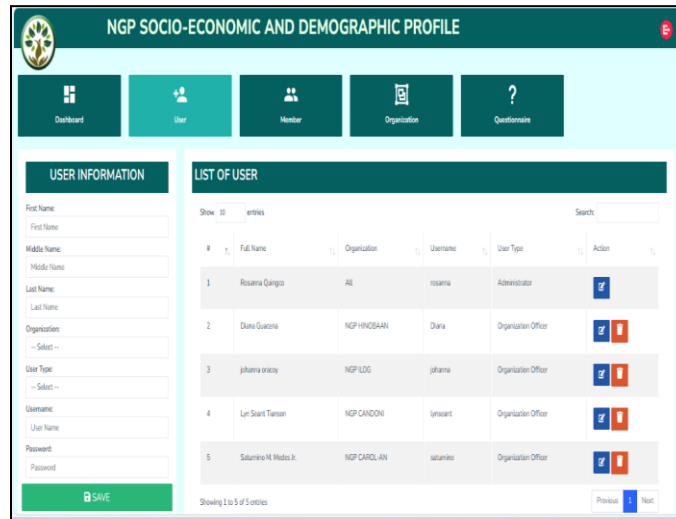


Figure 2. User Management

To analyze the socio-economic and demographic data using statistical tools. The system includes data visualization tools and statistical summaries that allow administrators to observe patterns in age, income, gender, education, and assistance

received. For instance, technical recommendations are tabulated and scored, as shown in Figure 3. This allows the DENR and other stakeholders to assess the delivery and effectiveness of project support services based on user inputs.

#	Code	Question	Total	Recommendation
1	#001	Technical assistance provided on site identification.(Nagahatag teknikal nga bulig sapag-kilala sang lugar.)	2.6	Accepted
2	#006	Technical assistance provided on project commodities identification(Nagahatag bulig teknikal sa pagkilala sang mga produkto para sa proyekto)	2.6	Accepted
3	#007	Technical assistance on the survey and mapping of areas.(Nagahatag sang bulig teknikal sa pag-survey kag pag-mapa sang lugar.)	2.8	Accepted
4	#008	Provision of EC (Paghatag training parte sa Information Education and communication)	2.8	Accepted
5	#009	Technical assistance provided on the seedling production activities.(Nagahatag nga bulig para sa pag'paluto sang mga seedling)	2.8	Accepted
6	#010	Technical assistance provided on the site preparation activities.(Nagahatag teknikal nga bulig para sa pag'prepar sang lugar.)	2.8	Accepted
7	#011	Technical assistance provided on plantation establishment.(Nagahatag teknikal nga bulig para sa plantasyon himo sang plantation)	2.4	Needs to be
8	#012	Assistance on the preparation and execution of the letter of the agreement.(Bulig para sa pag'preparar kag pag'atuman sang sulat nga gin kasugtan.)	2.7	Accepted
9	#013	Technical assistance on the preparation of project reports for evaluation.(Nagahatag teknikal nga bulig para sa pag'preparar sang mga report sang proyekto para sa evaluation)	2.6	Accepted
10	#014	Technical assistance on the preparation of project reports for payment.(Nagahatag teknikal nga bulig para sa pag'preparar sang report para sa balayran.)	2.6	Accepted

Figure 3. User Dashboard

To support the DENR in making data-driven decisions through the system. By providing real-time access to user data, summaries, and insights, the system empowers decision-makers to identify gaps in service, monitor participation across organizations, and plan future interventions. Figure 2 presents a list of users and their roles, indicating role-based access which helps ensure data integrity and secure access.

The system captured key indicators that reflect the NGP's contribution to participating People's Organizations (POs), revealing that many members gained short-term employment through activities such as tree planting, nursery maintenance, and site development—providing alternative income sources, particularly in rural areas. In addition, several POs received training and support that enhanced their capacity in forest management, agroforestry, and organizational

governance, validating the program's economic and environmental impact. However, the study also identified critical needs among POs, including the lack of sustained financial assistance during off-planting seasons, the demand for more technical training, equipment support, and help in securing land tenure. These needs were visualized and ranked using system-generated charts and summaries to guide decision-makers in prioritizing interventions. Furthermore, integrated survey modules revealed that while most members viewed the NGP positively—citing increased income and environmental awareness—issues such as delayed payments, insufficient ongoing support, and limited participation in decision-making processes were also raised, highlighting areas for further improvement.

CONCLUSION AND RECOMMENDATION

The study successfully achieved its primary objective of developing a system that determines the contribution of the National Greening Program (NGP) to the socio-economic well-being of People's Organization (PO) members by efficiently collecting and processing socio-economic and demographic data for comprehensive profiling. It enabled productive data analysis through visualizations such as graphs, charts, and tabulated summaries, allowing decision-makers to interpret trends and insights with ease. The system also incorporated survey modules to assess members' perceptions of the NGP, providing valuable community-level feedback. Furthermore, it ensured secure storage and handling of sensitive information through role-based access, authentication, and restricted user privileges. Evaluated using ISO 25010 standards, the system earned high ratings in functionality, usability, security, maintainability, and overall effectiveness, confirming its reliability and readiness for full-scale deployment.

To enhance the profiling and impact analysis capabilities of the system, future versions should integrate artificial intelligence (AI) and machine learning algorithms to automatically detect patterns, predict socio-economic trends, and improve program monitoring. Incorporating advanced visualization tools, such as interactive dashboards, heatmaps, and real-time filters, would facilitate deeper insights from collected data. To improve the analysis of feedback and perceptions, adding natural language processing (NLP) or sentiment analysis features could help interpret qualitative responses for better decision-making. For stronger data security, integrating two-factor authentication (2FA) and exploring blockchain technologies would ensure immutable and transparent data storage. Additionally, implementing a continuous improvement process with regular updates, usability testing, and scalability planning will help maintain system quality and adaptability to handle growing datasets and expanding user groups.

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