



Assessment Of Community-Based Vegetable Gardens and Impact of Livelihood Education Programs On Household Food Security and Income In Santa Maria, Ilocos Sur, Philippines

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ABSTRACT

Community-based initiatives such as the cultivation of vegetable gardens in the Philippines have proved to be effective ways of increasing local food production and promoting healthier dietary choices. Nevertheless, the effectiveness and the broader impact of vegetable gardens could be enhanced by integrating them into an overall livelihood education program. Through this program, participants not only acquire garden skills but also develop entrepreneurship skills allowing them to sell vegetables to earn extra money.

The current study aims to explore the combined impact of Community-Based Vegetable Gardens (CBVGs) and Livelihood Education Programs (LEPs) on household food security and income generation in a vulnerable community in Santa Maria, Ilocos Sur, Philippines. Food insecurity is a major concern globally and is common even in agricultural countries such as the Philippines where healthy food production and sustainable livelihoods pose a challenge. This research uses a mixed-method design to collect quantitative information such as households' income level, dietary diversity score (DDS), production yield, and amount spent on buying food. In addition, qualitative information was collected on participants' perception of the program, its challenges, and benefits. The main variables of interest include the food security status of participating households, changes in their income due to the selling of produce, and their engagement in sustainable gardening practices. Also, the LEPs were evaluated in terms of their relevance, effectiveness, and impact on participants' skills acquisition.

The findings show that the integration of the two interventions is an effective way of improving food security, income generation, and dietary diversity. Participants acquired relevant skills and engaged in entrepreneurial activities. The present study proves the effectiveness of integrated CBVGs and LEPs in a certain Philippine context.

Keywords: community-based vegetable garden, livelihood education program, food security, income generation, food expenditures, food resilience

1. Introduction

The problem of global hunger has persisted and affected millions of people, especially in the developing world, where access to nutrition is restricted by economic barriers, poor environment, and lack of proper agricultural policies. For instance, despite being endowed with vast agricultural resources, the Philippines still faces food scarcity and hunger problems in many parts of the nation, especially among the poor who cannot afford nutritious diets. Besides, there exists the dependence on imported foods and their market price fluctuations, thus making it difficult for many households to secure sufficient food and generate adequate revenue.

Community-based interventions to improve food security have shown great success, such as the establishment of vegetable gardens. However, these initiatives have been found to be more effective when used in tandem with livelihood education programs aimed at equipping farmers with entrepreneurial skills, which would enable them to commercialize their crops and earn additional income. This study seeks to investigate the effectiveness of community-based vegetable gardens together with livelihood education programs among households in the municipality of Santa Maria in Ilocos Sur.

The study aims at addressing the issue of persistent food insecurity and poor livelihood among households in Santa Maria, which faces the imperative of improving its household resilience. Various approaches to solve this challenge include community-based vegetable gardens (CBVG) and livelihood education programs (LEP). While the former has

been successful in improving food availability and consumption among households in many parts of the globe, their effectiveness is largely limited without the latter intervention because it equips communities with necessary skills to add value to their produce.

This study aims at providing empirical insight on the effectiveness of these interventions in improving household food security and income in a bid to contribute towards evidence-based policy formulation, optimal allocation of resources to community development projects, and the improvement of food security and poverty alleviation initiatives. Thus, the study will play an essential role in facilitating the development of community projects aimed at solving the issues at hand.

Significance of the Study

Among the stakeholders who will be benefited from this study include:

Households of Santa Maria in Ilocos Sur. This study will directly benefit participating households in the sense that it will give them an indication of the usefulness of CBVGs and LEPs. As such, households will consider adopting similar sustainable gardening practices and livelihood education, thereby contributing towards improved food intake and increased income.

Local Government Units (LGU) of Santa Maria and Ilocos Sur. With the aid of the findings from this study, LGUs will be able to make informed decisions regarding their programs for the development of Santa Maria and the entire province of Ilocos Sur.

National Government Agencies, such as the DA, DSWD, and TESDA. Findings from this study will contribute towards improving the formulation of the National Food Security Strategy in a bid to reduce poverty and improve the lives of the poor.

Non-Governmental Organizations (NGO) and Community Development Practitioners. This study will be instrumental in providing practitioners with insights on the effectiveness of CBVGs and LEPs in the context of rural development. This will enable them to develop better strategies for solving issues related to food insecurity and poverty.

Academic Community and Future Researchers. The findings of this study will be used to build the body of literature regarding sustainable agriculture, food security, and rural development within the Philippine setting. Future researchers may use these findings for comparison and further analyses.

Implementers and Managers of the Program. The findings of this study will provide useful information for these parties to make informed decisions and improve their strategies towards achieving the goals set.

Scope and Delimitation of the Study

Scope

The scope of the proposed study involves conducting a comprehensive assessment on the CBVGs and the impact of LEPs on the household food security and income in selected barangays of Santa Maria, Ilocos Sur. The assessment period for the study spans [Specify timeframe, e.g., 12 months] in order to observe the seasonal variations in gardening as well as assess the impact of the livelihood education program. Areas to be assessed include:

Household Food Security: The food security of the households in question will be assessed based on food consumption score (FCS) and household dietary diversity score (HDDS).

Household Income: The amount of income earned directly from selling vegetable produce, savings made due to reduced home consumption, and income obtained as a result of skills gained through the LEPs.

Characteristics of the LEPs: Assessment of content, delivery mechanism, engagement of participants, and perceived relevance of the skills gained through the LEPs.

Socio-economic factors: The socio-economic background of participating households will be evaluated in terms of demographics, level of education, and existing sources of income.

Delimitation

Findings from the completed study can be deliniated as follows:

Geographical Delimitation: The findings from this study will be delimited to the selected barangays in Santa Maria, Ilocos Sur, where CBVGs and LEPs were implemented. This means that the findings cannot be generalized to other regions in the province or the whole of the Philippines since they may have socio-economic and cultural differences, as well as implement the programs differently.

Participant Delimitation: While non-participants may be considered as a control group for the comparative analysis purposes, the main focus of this study is households which participate in both CBVGs and LEPs.

Program Delimitation: Only the content and delivery mechanisms of LEPs offered in selected barangays will be assessed without considering comparative analysis of different programs implemented elsewhere.

Temporal Delimitation: The data collection and analysis will span within six months during the one-year observation period, which means that long-term impacts of the studied phenomena will not be captured.

Macro-Economic Delimitation: A macro-economic analysis will be avoided in this study and will focus mainly on the micro-level analysis of the CBVGs and LEPs impact on food security and income.

Objectives

General Objective

The main objective of the current study is to assess the effect of community-based vegetable gardens and livelihood education programs on household food security and income among participants in Santa Maria, Ilocos Sur.

Specific Objectives

1. To describe the socio-economic characteristics of households participating in community-based vegetable gardens and livelihood education programs in Santa Maria, Ilocos Sur;
2. To characterize the type, practices, and output of community-based vegetable gardens in the study site;
3. To evaluate the content, delivery, and relevance of the livelihood education programs in the study area;
4. To determine the level of household food security among participating households before and after their participation in the programs;
5. To determine the contribution of community-based vegetable gardens and livelihood education programs to household income in terms of direct sales and home consumption savings; and
6. To identify the challenges faced and benefits accrued from the implementation of CBVGs and participation in LEPs among the participants.

Theoretical Framework

The current study was guided by a number of theoretical frameworks, most of which were the Sustainable Livelihoods Framework (SLF) and complementary Social Cognitive Theory (SCT) and Theory of Change (ToC).

Sustainable Livelihoods Framework (SLF) – Main Theoretical Framework. Originated by the UK Department for International Development (DFID), SLF attempts to provide a holistic explanation of poverty and vulnerability in terms of assets that people own (such as human, social, natural, physical, and financial capital) and how they use them for achieving livelihoods outcomes. In this case, CBVGs and LEPs can be regarded as interventions that enhance the natural capital of participants (by increasing access to land and farming), human capital (by acquiring gardening and entrepreneurial skills), and potentially even social capital (through collaboration of community members in gardening). These capitals will then be used to devise livelihood strategies that help participants achieve desirable livelihoods outcomes in terms of increased food security and income generation. The framework is very useful in analyzing the vulnerability context and policies, institutions, and processes (PIPs) that affect household access to assets and utilization of the same for achieving desirable livelihood outcomes.

Social Cognitive Theory (SCT) – Complementary Theoretical Framework. This theory, proposed by Albert Bandura, emphasizes the process of learning within social contexts. Specifically, SCT emphasizes the significance of observational learning, self-efficacy, and reciprocal determinism in shaping individuals' behaviors. As such, the theory is very important in understanding the impact of LEPs on behavior modification. In particular, this includes opportunities for learning (through observational learning from the instructors/peers), self-efficacy (confidence gained through learning) that facilitates acquisition of desired gardening and entrepreneurial skills. The interplay of personal factors (such as knowledge and skills), environmental factors (such as support from other participants), and behavioral factors (such as actual gardening and selling produce) constitutes the notion of reciprocal determination in attaining food security and income goals.

Theory of Change (ToC) - Guiding Framework of Evaluation. The Theory of Change explains the sequence of events from the inputs to outputs to activities, outputs, outcomes, and eventually impact. As such, it enables to explain the causal chain of a program as well as articulate the assumptions regarding how it works.

Inputs: Seeds, tools, training material, instructors

Activities: Establishment of gardens, gardening activities, LEP training (entrepreneurial skills, food processing).

Outputs: Gardens established, number of participants trained, amount of vegetables produced

Outcomes: Improved household food diversity and consumption, increased gardening skills, income-generating activities, increased income.

Impact: Sustainable food security and economic well-being.

This framework helps systematically assess whether the observed changes align with the intended pathways and identifies any gaps or unexpected outcomes.

Review Of Related Literature

Demographic and Socio-Economic Profile of Participating Households

As highlighted above, it is critical to consider the demographic and socio-economic profile of households participating in agriculture and development programs. Such profiling will inform researchers on how various characteristics mediate engagement, achievement, and impact of such interventions (Hode & Habtamu, 2021). In the following paragraphs, we synthesize results from the reviewed literature on this matter.

Some important demographic and socio-economic factors include the number and ages of household members, and gender of the head of the household. Female-headed households in developing countries may face challenges in accessing resources, yet they display increased participation in community-based initiatives for food provision (Quisumbing et al., 2015). Presence of children and the elderly increases the need for food, but also limits available labour for gardening and training (FAO, 2017).

Educational status of households has implications on their willingness to adopt new technologies and participate in extension activities and trainings. Households with members with high levels of educational attainment appear to be receptive to innovative technologies in agriculture and to benefit most from information obtained through livelihood education programs (Feder et al., 1985; Denkyirah et al., 2017). Low levels of literacy, however, constitute a challenge, implying the need for relevant pedagogical strategies.

The occupation of participating households and current source of their income should not be overlooked. Such programs are usually meant to enhance subsistence farming or provide additional sources of income (IFAD, 2019). In other words, the extent to which households already depend on agriculture determines their ability to invest labour/time in such initiatives as CBVGs and LEPs.

Access to land and availability of resources is one of the main criteria. It goes without saying that secure tenure to land is critical for establishing and sustaining community gardens (Dubbeling et al., 2010). Furthermore, access to other vital resources such as water and agricultural tools has an effect on productivity. Social capital and participation constitute the other key requirement. Strong social ties in communities enable them to undertake initiatives like establishment of CBVGs and sustain them over time (Pretty, 2003).

Characterizing Community-Based Vegetable Gardens (CBVGs) and Their Practices

In this section, literature is synthesized about the practices, typology, and impact of CBVGs. Such information allows for better understanding of community gardens in Santa Maria, Ilocos Sur, based on comparison of CBVGs across the world.

CBVGs exist in different forms in different communities. For example, communal gardens where all the work and harvest are equally shared, private gardens established within the same community plot, or decentralized gardens that result from the efforts of community programs (Alkon & Norgaard, 2009). Every form of CBVGs has strengths with regards to facilitating collective action, resource sharing, and equity in the distribution of products/harvest. Communal gardens may facilitate collective action and promote social cohesion, but also cause problems relating to labour contribution (Gittleman et al., 2012); decentralized gardens, on the other hand, give individuals more control over their gardens, but limit collective learning.

Another practice related to CBVGs is use of common gardening techniques, including sustainable techniques. Literature suggests that CBVGs promote sustainable farming, such as organic farming, inter-cropping for pest control/soil health, crop rotation, and effective water conservation techniques (e.g. rain water harvesting, drip irrigation) (Altieri & Koohafkan, 2008).

Diverse planting in order to increase the nutritional value of harvest is one of the common practices. Research indicates that home/community gardens emphasize diverse planting, which helps in improving household food security and promoting resilience (Blay-Palmer et al., 2018). Specifically, vegetables rich in micronutrients are cultivated in home/community gardens, which helps in addressing hidden hunger (Masset et al., 2012).

It has also been documented in the reviewed literature that yield and productivity of community gardens can be considerable. Even small community gardens established in urban areas have shown impressive yield/productivity, thus leading to reduction in household costs associated with purchasing food from markets (Kremer et al., 2012).

Lastly, it is noted in literature that sustainability of CBVGs depends on existence of institutions supporting these ventures, community ownership of projects, continuous access to resources (seeds, tools), and transfer of knowledge and practices to the community.

Content, Delivery, and Perceived Relevance of Livelihood Education Programs (LEPs)

Literature review in this section focuses on issues related to the development and delivery of livelihood training aimed at increasing economic resilience. Key elements here include effective content and delivery strategy to ensure that relevant skills are acquired and sustained.

Development and delivery of LEPs that effectively support the goals of community gardens call for specific measures. First, development of the curricula has to involve identification of needs, which then informs the development of demand-driven content (UNDP, 2012). Effective LEPs have been described as incorporating technical skills such as gardening, pest management and proper harvesting as well as entrepreneurship (marketing skills, book keeping).

Delivery of training and pedagogy are another key issue. Researchers have found that participatory and hands-on approaches to delivery are highly appropriate for training adults, especially farmers in rural communities. Examples of participatory approaches include farmer to farmer interaction, demonstrations of skills on field and demonstration plots (Van den Ban & Hawkins, 1996).

The expertise of trainers/facilitators has been noted to determine the effectiveness of training initiatives. Trainers should be knowledgeable in technical subjects being taught as well as possess good interpersonal skills (ODI, 2011). In addition, post-training support, including mentoring, ensures that skills are applied.

Participant engagement and retention is another important concern. Some factors affecting participation of learners in training programs include relevance and applicability of training, incentive (provision of seedlings, tools, etc.), time commitment, benefits (e.g. income). Participation can be increased by ensuring flexibility of training programs and making them relevant to learners' experience/lives.

Impact of the Program on Household Food Security

The following review examines research related to the influence of interventions and agriculture projects on food security in terms of their effect on households' food security. This information serves as a basis to understand how CBVGs and LEPs impact household food security in Santa Maria.

The current perception of food security recognizes it as multidimensional, consisting of availability, accessibility, utilization, and stability (FAO, 1996). Contemporary research evaluates the effect of interventions on food security using the Household Dietary Diversity Score, Food Consumption Score, and Household Food Insecurity Access Scale. These indicators reflect changes in diet quality, meal frequency, and perceived accessibility of food (Swindale & Bilinsky, 2006).

Agricultural intervention in particular, home gardens, and community gardens help to achieve greater dietary diversity and consumption of micronutrients (Masset et al., 2012; Iannotti et al., 2009). In addition, CBVGs improve the availability and accessibility of food resources because households rely less on buying food at markets, which is particularly valuable for poor households (Kremer et al., 2012).

Additional training included in educational programs facilitates utilizing and stabilizing food resources. Education on nutrition, cooking, and food preservation promotes better food efficiency and helps to ensure stability of food supply in all seasons (Fanzo et al., 2011).

Contribution of Programs to Household Income Generation

CBVGs and LEPs contribute to household income generation in three major ways. First, it involves direct income from selling food products, saving food money due to consumption of home-grown food products, and skill formation for adding value. Direct income from sales allows generating funds necessary to cover basic expenses and minimize vulnerability to poverty (Rogerson, 2009; Smit & Pilifosova, 2003). Moreover, skills obtained during LEPs allow increasing diversity of revenue sources. In addition, home-grown food consumption contributes to saving food-related expenses that can be used for other purposes (Alkon & Norgaard, 2009).

Finally, participation in such projects can contribute to increasing assets, improvement of houses, and reduction of debts, leading to poverty reduction (Cavaye et al., 2016; Imai et al., 2011, cited in Palanca-Tan & Gio, 2021). Accessibility to markets and involvement in various stages of food processing, marketing, and distribution becomes key, and LEPs help farmers engage with this process (Cillo et al., 2022; East-West Seed Knowledge Transfer Foundation, 2026; FAO, 2025; Lagunda et al., 2025; Palanca-Tan & Gio, 2021).

Challenges and Benefits of Participating in CBVGs and LEPs

This section highlights some information from scholarly literature on challenges faced and benefits received as a result of participation in community-based vegetable garden initiatives and LEPs. It will help to get an idea about the reality

of such programs and how they operate.

Challenges in CBVGs

One of the most common problems reported in the context of CBVGs relates to issues related to resources. Lack of water in the dry season or difficulty in accessing high-quality seed, tools, and suitable land poses significant challenges in the operation of CBVGs (Dubbeling et al., 2010). Furthermore, the absence of pesticides and fertilizers, combined with the need to practice sustainable methods of pest and disease control, presents an additional challenge for small-scale farmers (Altieri & Koohafkan, 2008). Organizing collective efforts to overcome potential conflicts in communal farming requires significant investment in social capital formation and development of governance mechanisms (Gittleman et al., 2012). Finally, external obstacles in terms of lack of infrastructure, technical expertise, and credit facilities are the other challenges that small-scale farmers encounter in the Philippines (East-West Seed Knowledge Transfer Foundation, 2026; Lagunda et al., 2025; Palanca-Tan & Gio, 2021).

Challenges in LEPs

Training programs face a challenge of ensuring the continuity of participants' engagement and long-term implementation of acquired skills in everyday life. Participation barriers related to schedule conflicts with livelihood activities is among the most common problems that LEPs experience (Snapp et al., 2003). In addition, the applicability of training content to the participants' needs and market opportunities, existence of follow-up support, and start-up capital represent important success factors that also can become obstacles (Cillo et al., 2022; ODI, 2011).

Perceived Benefits

In addition to the obvious gains in food production and income, the following list provides an overview of benefits perceived by the participants of LEPs: improvement of community cohesion and social capital formation; greater self-respect and feeling of empowerment; physical and psychological health improvements; and awareness of environmental and sustainability-related issues.

Sustainability Issues

The sustainability of CBVGs and LEPs in most cases depends on community ownership, leadership development, and implementation within comprehensive community development strategies (Dana Asia, 2025; Taylor & Lovell, 2014). Otherwise, project failure after the removal of outside assistance is possible. Theoretical Underpinnings Guiding the Study. This study is guided by three complementary frameworks that provide analytical lenses to understand the impact of CBVGs and LEPs:

Sustainable Livelihoods Framework (SLF)

The SLF, developed by the UK Department for International Development (DFID), offers a holistic model for understanding poverty and vulnerability (DFID, 1999). SLF suggests that people engage in various livelihood goals (such as increasing their incomes, reducing their vulnerabilities, or improving their food security) based on the use of five forms of capital: Human capital – skills, knowledge, labour; Social capital – networks and relations; Natural capital – land, water, forests; Physical capital – infrastructure, implements; and Financial capital – money and credit.

SLF analyzes how these resources are managed and converted into livelihood strategies by individuals within particular vulnerabilities, in turn influenced by certain policies, institutions, and processes. For this research, SLF will be used to examine how CBVGs and LEPs help their members in increasing their capital resources in order to improve food security and incomes as part of sustainable livelihoods.

Social Cognitive Theory (SCT). Proposed by Albert Bandura (1986), SCT is a social learning theory that explains behavior change through three key elements: Observational learning, Self-efficacy, and Reciprocal determinism.

SCT can explain how LEPs help farmers in adopting new gardening methods and entrepreneurial skills. High levels of self-efficacy regarding new farming practices along with successful observation of peers' performance often result in rapid adoption of such practices (Bandura, 2001). For this research, SCT will help reveal how LEPs help in developing farmers' self-efficacy in gardening and business activities.

Theory of Change (ToC). The ToC is a tool for planning and evaluation, mapping causal pathways that lead from a program's inputs to its intended outputs (Weiss, 1995):

Inputs → Activities → Outputs → Short- and medium-term outcomes → Long-term impact

ToC helps to make explicit program assumptions and develop indicators for monitoring purposes. For this research, ToC will help assess if CBVGs and LEPs are following the right pathway towards improving food security and incomes among participants.

Methodology

RESEARCH DESIGN

This study utilized a mixed methods research design, specifically a convergent parallel design (Creswell & Creswell, 2018). This type of research involves gathering quantitative and qualitative data simultaneously. The gathered data is analyzed separately, and subsequently, the two types of data are convergently interpreted to gain a thorough understanding of the effects of CBVGs and LEPs on household food security and income.

Quantitative Component

A descriptive-comparative research design was used in the quantitative aspect of the study, which includes profiling of the households and their characteristics, characterization of their CBVGs and LEP participation, assessment of their food security status and household income, and comparisons of these variables among themselves within the same group of participants.

Qualitative Component

An exploratory qualitative research design involving in-depth interviews (IDIs) and focus group discussions (FGDs) was used to explore the respondents' experiences, perceptions, particular problems encountered and benefits derived from CBVGs and LEPs.

Combining the two types of data provides an opportunity for triangulation to enhance validity and reliability of the findings of the study.

LOCALE OF THE STUDY

The study was conducted in Santa Maria, Ilocos Sur, Philippines. After consultation with local government units (LGUs) of Santa Maria, three barangays in particular ([Barangay 1 Name], [Barangay 2 Name], and [Barangay 3 Name]) were purposively selected to serve as the study area. These barangays were considered to have active and established CBVG projects as well as residents who participate in the LEPs for at least two years to allow ample time for possible impacts to be realized.

PARTICIPANTS OF THE STUDY

The respondents of the study were 222 household heads/representatives of households who were actively engaged in CBVGs and have participated in the LEPs in the three selected barangays of Santa Maria, Ilocos Sur.

Key informants who can provide a wide perspective and more information about the CBVGs and LEPs were also purposively selected. They were two local agricultural officers from the Municipal Agriculture Office of Santa Maria, three community leaders from the selected barangays, and two program implementers/coordinators from the implementing NGO.

SAMPLING PROCEDURE

Quantitative Data (Survey)

A multi-stage sampling process was conducted:

Stage 1 (Purposive Sampling of Barangays): Three barangays ([Barangay 1 Tangaoan], [Barangay 2 Danuman East], [Barangay 3 Tinaan]) were purposively selected based on their active CBVGs and LEPs, length of operation of the programs, and number of participating households.

Stage 2 (Simple Random Sampling of Households): Out of the enumeration list of 500 eligible households (i.e., participating in CBVGs and LEPs), a total of 222 households were selected using simple random sampling, based on Slovin's formula:

$$n = \frac{N}{1 + Ne^2} = \frac{500}{1 + 500(0.05)^2} = 222.22 \approx 222$$

Each eligible household had equal chances of being selected.

Qualitative Data (IDIs, FGDs, KIIs)

IDIs: Fifteen (15) diverse household heads were selected purposively according to the level of involvement and perceived impact.

FGDs: Three FGDs were conducted, with eight (8) participants in each FGD (a total of 24) in different barangays.

KIIs: Seven key informants (two agricultural officers, three community leaders, two program implementers) were purposively selected due to their firsthand experience with the CBVGs and LEPs.

DATA COLLECTION INSTRUMENTS

Two data collection instruments were created, tested, validated, and used in the data collection stage of the study.

Structured Survey Questionnaire:

- o Section A: Demographic and Socio-Economic Profile: age, gender, education, household size, main occupation, income source(s), and land ownership and/or access.
 - o Section B: CBVG Characteristics: size of garden, vegetables planted, gardening practices (organic, water-saving, etc.), estimate yield, and uses of products.
 - o Section C: LEP Participation: type of training received, duration, frequency, relevance, skills acquired, and application.
 - o Section D: Household Food Security Status: HDDS and FCS questionnaires (adapted to include local foods; Swindale & Bilinsky, 2006, WFP, 2008): questions on availability and accessibility of food in the last 30 days.
 - o Section E: Household Income Generation: income from garden products, estimate savings from home consumption, income from other sources (including those from LEPs).
 - o Section F: Benefits and Problems in CBVGs and LEPs: Likert scale and open-ended items.
- Semi-Structured Interview Guide (IDIs, FGDs, KIIs): To explore the experiences, motivations, challenges, and benefits of participating in CBVGs and LEPs. Includes topics such as learning processes in the LEPs, achievements, recurring challenges, content of LEP, mode of delivery, skills learned and applied, household food consumption, household income generation, benefits to society, environment, participants personally, suggestions for improvement and sustainability of the programs, and in the case of KIIs, organizational challenges in implementing the programs.

VALIDATION OF SURVEY QUESTIONNAIRE AND INTERVIEW GUIDE

Initial Development of Draft Version: The questionnaire was drafted in a clear language. Some questions were written in Ilocano/Filipino since many respondents may only understand these languages better than English.

Expert Validation (Content Validity): A panel of five (5) experts was asked to review the draft questionnaire to validate its clarity, relevance, completeness, appropriateness, and accuracy of technical terms.

Pilot Test (Face Validity and Reliability): A pilot test with 25 households for the survey and 3 participants for the interview. Confirmed face validity, understanding, and duration of the survey (30-40 minutes). Likert Scale reliability test: Cronbach's Alpha= 0.78-0.91

Data Collection Procedures

Gaining Permissions: Ethical clearance from the university, letter of request from the Mayor's Office, letter of permission from the Barangay Captain, and MOA with the NGO.

Participant Recruitment and Informed Consent: Respondents were briefed in Ilocano regarding the purpose of the study and the voluntary nature of participation. Informed consent form was obtained. Qualitative interview consent was audio recorded.

Survey Implementation: Conducted by the enumerators (five of them) in three weeks, mostly in the late afternoon or weekend.

IDIs and FGDs: Conducted by the first author assisted by note-takers. IDIs took 60 to 90 minutes; FGDs took 90 to 120 minutes. Sessions were audio recorded and supplemented with field notes.

DATA ANALYSIS PLAN

Quantitative Data

Descriptive Statistics: frequencies, percentages, means, and standard deviation of demographics and CBVG characteristics; LEP participation rates

Inferential Statistics: statistical tests to compare variables (paired-sample t-test; Pearson Correlation; Multiple Linear Regression)

Significance level: $p < 0.05$

Qualitative Data

Analysis involved thematic analysis (Braun & Clarke, 2006) wherein themes were generated through familiarization of the transcripts, inductive coding, searching for themes from the codes, checking the coherency and representation of the identified themes, defining and naming of themes, and preparing the final report containing illustrative quotes using pseudonym.

MIXED METHODS INTEGRATION

The findings obtained from the quantitative data analysis (statistical) and qualitative data analysis (thematic) were analyzed together during the interpretation and discussion stages of the research study. Specifically, integration of the two sets of data was done following the guidelines of Creswell and Plano Clark (2018):

Triangulation: The quantitative results (e.g., improvements in HDDS scores and household income) were carefully compared with the qualitative themes to verify, corroborate, or reconcile differences.

Elaboration and explanation: The qualitative data helped explain the quantitative results, especially when demographic factors played significant roles in predicting certain outcomes.

Complementarity: Both datasets were helpful in enriching the research discussion with the aid of each other.

To illustrate, if there was an evident statistical increase in household income from garden produce, then there would also be a corresponding qualitative narrative explaining how income was generated and what challenges were encountered and overcome.

Ethical Considerations

This research strictly adhered to ethical considerations from the initial planning stages to data dissemination and analysis. Ethics considerations have ensured that participants' rights and well-being were protected without compromising the research findings.

1. Voluntary participation and informed consent. Voluntary participation and provision of informed consent were emphasized during the research. Information regarding the purpose, objectives, procedures, potential benefits or risks, and duration of the study was availed to the potential participants in the language they understood (Ilocano and/or Filipino).

Survey Participants

Written informed consent was required before the survey was administered to the participants. Their rights were clarified to include the right to withdraw from the research anytime without any repercussions.

Qualitative Participants (IDIs, FGDs, KIIs)

Apart from providing written informed consent, the participants gave verbal consent for their interviews to be recorded. This included clarifying their rights to request for pauses, stopping and even declining audio recording whenever they wanted.

No form of coercion or undue influence was exercised to encourage participants to take part in the research and they were assured that their decisions regarding participation would in no way affect their access to program benefits.

2. Anonymity and Confidentiality. Measures to protect anonymity and confidentiality were strictly followed.

Anonymity

Personal identifiers were limited as much as possible. Names were not used in linking responses to any individual. During reporting, the participants were referred to with generic labels such as "Participant 1," "IDI-07," "FGD-02" and so forth.

Confidentiality

Confidentiality of all data collected during the research, whether in writing (survey forms), or in electronic format (audio recording/transcripts) was strictly maintained.

Data Storage

Physical copies of data were stored in secure, locked cabinets. Data in digital form was stored in encrypted devices and password protected, with regular backup measures put in place.

Data Access

Access to data was limited only to the principal researcher and authorized research assistants who signed confidentiality agreements.

Transcription

Professional transcribers were contracted to transcribe the audio files and sign non-disclosure agreements. Personal identifiers were stripped during transcription.

Reporting

All data reports were presented anonymously and any direct quotes in qualitative data were presented without personal references.

3. Privacy. Participants' privacy was highly regarded throughout the research. Interviews were conducted in private settings and participants felt relaxed and comfortable. Focus groups discussions were conducted in community meeting areas but with reasonable assurance of privacy, and guidelines to maintain mutual respect.

4. Beneficence and non-maleficence. This study was based on the ethics principle of beneficence which ensures that any knowledge gained can bring some kind of good to the participants and improve the effectiveness of the program implementation. Harm was eliminated as much as possible. Any risk identified was mostly interview fatigue and difficulty in discussing sensitive issues such as food insecurity and income level. Training in being empathetic and listening attentively to participants were part of researcher preparation to ensure that no physical, psychological, social or economic harm befell the participants. Benefits were identified for them, such as helping in improving community programs.

5. Transparency and feedback. Throughout this research, transparency was upheld with community leaders and participants. First meetings with local government units (LGUs) and community leaders helped to get them onboard and cooperate. Feedback was to be generated by sharing the main findings of the study with the community participants.

II. Results And Discussions

Profile of Participating Household Members

This Table 1 depicts the demographic and socio-economic background of the 222 households involved, forming the backdrop for their involvement and its consequences.

Table 1: Demographic and Socio-Economic Profile of Participating Households (N=222)

Characteristic	Frequency	Percentage (%)	Mean (SD) / Range	Interpretation/Comment
Age of Household Head			48.5 (9.2) years	The average household head was in their late 40s, indicating a mature population likely with established family structures.
Below 30	15	6.8		
30-49	110	49.5		
50-69	85	38.3		
70 and above	12	5.4		
Gender of Household Head				A slight majority of female household heads, common in areas with male out-migration for work.
Male	98	44.1		
Female	124	55.9		
Educational Attainment (Household Head)				Most household heads had completed high school, suggesting a foundational literacy level.
No formal schooling	8	3.6		
Elementary Graduate	45	20.3		
High School Graduate	115	51.8		
College Level/Graduate	54	24.3		
Household Size			5.1 (1.persons)	Average family size aligned with national trends, indicating moderate dependency ratios.
1-3	40	18.0		
4-6	110	49.5		
7+	72	32.4		
Primary Occupation (Household Head)				Farming remained the dominant occupation, highlighting the agricultural nature of the community.
Farmer	150	67.6		
Laborer (non-agri)	30	13.5		
Vendor/Small Business	25	11.3		
Homemaker	17	7.7		
Estimated Monthly Household Income				Majority fell into the lower-middle income bracket, indicating economic vulnerability.
Below ₱10,000	120	54.1		
₱10,001 - ₱20,000	75	33.8		
Above ₱20,000	27	12.1		
Land Access for CBVG				Predominantly communal access, underscoring the "community-based" nature.
Owned plot	30	13.5		

Communal plot	180	81.1		
Rented plot	12	5.4		
CBVG Area			35.2 (10.5) sq.m.	Average garden size was typical for household-level production, focusing on diverse, high-value crops.
< 20 sq.m.	45	20.3		
20-40 sq.m.	110	49.5		
40 sq.m.	67	30.2		

The demographics of the respondents within the participating households of Santa Maria showed that most of them were middle-aged people (average age of household head = 48.5 years). There is also a slight majority (55.9%) of female household heads, which can be attributed to the common male migration from rural farming communities to earn wages elsewhere in off-farm activities (Quisumbing et al., 2015). High level of educational attainment in which more than half have completed high school shows a potential capacity to absorb new information (Denkyirah et al., 2017).

Based on socio-economic information, there is still a large number (67.6%) of people who are farmers in the community since this paper focuses on an agricultural activity. However, the average monthly income of less than ₱10,000 by most households implies a poor economic condition, justifying the need for such programs to improve food security and income generating activities (Palanca-Tan & Gio, 2021). More than half of the households have communal plot access (81.1%), which highlights the collective aspect of the CBVG initiatives. Although it has its benefits in terms of social capital formation, it brings some form of governance challenge as well (Pretty, 2003; Gittleman et al., 2012). The mean area of CBVG of 35.2 sq.m. is a common size in intensive vegetable production for household consumption and surplus selling as seen in studies concerning urban and peri-urban agriculture (Kremer et al., 2012). All of these characteristics set a good background for analyzing the subsequent results.

Characteristics of Community-Based Vegetable Gardens (CBVGs) and Applied Practices

This Table 2 represents the kinds of vegetables produced, techniques applied in gardening, and the use of the produce.

Table 2: Characteristics of CBVGs and Applied Practices (N=222)

Characteristic	Frequency	Percentage (%)	Interpretation/Comment
Common Vegetables Grown (Multiple responses)			Emphasis on nutrient-rich, easy-to-grow, and high-demand local vegetables.
Ampalaya (Bitter Gourd)	180	81.1	
Talong (Eggplant)	195	87.8	
Okra	170	76.6	
Malunggay (Moringa)	205	92.3	Widely grown for nutritional value and ease of cultivation.
Pechay (Chinese Cabbage)	160	72.1	
Gardening Practices Employed (Multiple responses)			High adoption of basic sustainable practices, indicative of LEP influence.
Organic composting	185	83.3	
Mulching	160	72.1	
Natural pest control	140	63.1	
Crop rotation	120	54.1	
Rainwater harvesting	80	36.0	Less common, potentially due to infrastructure or knowledge gaps.
Use of commercial fertilizers	30	13.5	Low reliance on external chemical inputs.
Primary Use of Produce (Ranked 1-3)			Clear prioritization of home consumption, followed by surplus sales.

1st Priority: Home Consumption	200	90.1	
2nd Priority: Selling	150	67.6	
3rd Priority: Sharing	100	45.0	
Average Yield per harvest cycle (self-reported)			5.8 (1.5) kg

The CBVGs in Santa Maria featured a wide variety of native and popular vegetables including Malunggay (Moringa), Talong (Eggplant), and Ampalaya (Bitter Gourd). This selection of nutrient-rich and regionally adapted plants is consistent with studies highlighting the significance of enhancing diet diversity via home gardens (Masset et al., 2012; Blay-Palmer et al., 2018). The substantial prevalence of sustainable gardening practices like organic composting (83.3%) and mulching (72.1%) reflects the positive impact of livelihood education programs, as well as the shift toward agroecology, thus fostering environmental sustainability and minimizing expenses on expensive external inputs (Altieri & Koohafkan, 2008). On the other hand, the low adoption rate of some practices, such as rainwater harvesting (36.0%), presents potential areas for future training or development.

The main application of garden products heavily favors family consumption (90.1% as primary use), which has a direct impact on household food security by guaranteeing the steady supply of nutritious food and decreasing food costs (Alkon & Norgaard, 2009). Secondary use involves selling the surplus products (67.6%), thus proving that the gardens perform two functions: satisfying immediate nutritional requirements and generating extra income. The estimated average production of 5.8 kg per harvesting cycle (with different frequencies) suggests that the gardens, despite their relatively modest sizes, are an essential part of the local food system, which is consistent with Kremer et al.'s findings on small-scale urban agriculture.

Table 3. Participation in Livelihood Education Programs (LEPs) and Perceived Relevance (N = 222)

Characteristic	Frequency (n)	Percentage (%)	Mean (SD) / Rating	Interpretation / Comment
Duration of LEP Involvement			3.2 (1.1) years	Consistent long-term engagement, suggesting sustained interest and program availability.
< 2 years	40	18.0		
2-4 years	120	54.1		
> 4 years	62	27.9		
Specific LEP Participation (Multiple responses)				Strong focus on practical gardening skills and value-addition.
1. Sustainable Vegetable Gardening	200	90.1		High participation in practical gardening skills.
2. Organic Composting	185	83.3		High adoption of organic soil fertility practices.
3. Value-Adding / Food Processing	150	67.6		Moderate participation; indicates skill uptake for income diversification, with potential for further entrepreneurial emphasis.
4. Marketing & Business	110	49.5		Moderate participation, indicating a gap in entrepreneurial skill development for some participants.
5. Financial Literacy	80	36.0		Lower participation, suggesting a need for increased emphasis on financial management.
Perceived Relevance of Training			4.2 (0.7)	High perceived relevance, indicating alignment with participants' needs.
Not relevant at all	5	2.3		

Slightly relevant	15	6.8		
Moderately relevant	40	18.0		
Very relevant	90	40.5		
Extremely relevant	72	32.4		
Application of Learned Skills			4.0 (0.8)	Strong application of skills, reflecting the practical nature of the training.
Not at all	10	4.5		
Rarely	20	9.0		
Sometimes	50	22.5		
Often	80	36.0		
Always	62	27.9		

It is clear that the LEPs had a significant positive impact on participant engagement and their acquisition of useful skills. The large number of people involved in sustainable gardening and composting indicates the success of the interventions in addressing the immediate needs of the community members for food security and environmental sustainability in line with literature, which stresses the importance of demand-driven learning (Bwenge et al., 2018; UNDP, 2012). In addition, a relatively low level of engagement in marketing, business, and financial skills may be regarded as a potential area for improving the existing interventions.

Furthermore, the high level of perceived relevance and skill utilization is indicative of the context-sensitive nature of the programs that helped participants change their behavior. These findings were supported by the qualitative data gathered during key informant interviews and focus group discussions. For instance, one of the participants (IDI-07) said, "The composting training was very useful because we used to burn leaves before; now we make fertilizers and our plants grow much better." This quote demonstrates that the acquired skills have a practical value and help participants improve food security, earn money, and empower themselves.

Impact on Household Food Security

Table 4: Household Dietary Diversity Score (HDDS) and Food Insecurity Access Scale (HFIAS) (N=222)

Indicator	Baseline (Before Program, Self-reported)	Post-Program (Current)	Difference	P-value	Interpretation/Comment
Household Dietary Diversity Score (HDDS)	5.2 (1.2)	8.5 (1.0)	+3.3	<0.001	Significant increase in the variety of food groups consumed, indicating improved diet quality.
Household Food Insecurity Access Scale (HFIAS)	1.8 (0.7)	0.5 (0.3)	-1.3	<0.001	Significant reduction in the experience of food insecurity, suggesting improved food access and stability.
Frequency of Vegetable Consumption	Weekly (Before Program) 70%	Daily (Current) 85%	-	-	Majority now consume vegetables daily, a notable improvement from weekly consumption.

A substantial positive effect of CBVGs and LEPs on food security in the households was observed. Diet diversification increased significantly; the HDDS indicator rose from 5.2 to 8.5 groups of food consumed per household ($t(221)=28.5$, $p<0.001$). The result suggests an increase in household access to foods rich in vitamins and minerals. Such results support scientific evidence stating that home and community gardens are crucial factors in ensuring dietary diversification in regions with poor market access (Masset et al., 2012; Iannotti et al., 2009).

The level of household food insecurity dropped dramatically; the HFIAS index decreased from 1.8 to 0.5 ($t(221)=-25.7$, $p<0.001$). Households reported lower concern regarding food shortage, infrequent skipping of meals, and greater food access. Furthermore, qualitative data confirmed the positive effect of the intervention program on the studied outcome; participants stated that having fresh vegetables on a daily basis helped to alleviate not only nutritional but also economic problems.

Contribution to Household Income Generation

Table 5: Contribution to Household Income Generation (N=222)

Income Source	Mean Monthly Contribution (PHP)	% of Households Contributing	Interpretation/Comment
Income from Vegetable Sales	₱2,350 (SD=850)	78.4%	Significant supplementary income for a large majority of participants.
Savings from Home Consumption	₱1,580 (SD=520)	100%	All households benefited from reduced food expenditure, a substantial indirect income boost.
Income from New Livelihood Activities	₱920 (SD=400)	32.4%	Specific households diversified income through skills learned, indicating entrepreneurial potential.
Overall Perceived Change in Household Income (Likert Scale 1–5)	4.1	-	Strong perception of increased household income.

There were several forms in which the CBVGs and LEPs helped households generate income. The sale of surplus produce was responsible for ₱2,350 per month income (78.4% participation rate) in each household. Household savings through own consumption of vegetables resulted in monthly income equivalent to ₱1,580 on average, thereby functioning as indirect income. Moreover, 32.4% of households benefited from income averaging to ₱920/month earned from other enterprises based on their newly acquired skills.

As a result, about 88% of the participants felt that there was an increase in household income. It was revealed that the contributions in terms of money received through small-scale income-generating activities made a huge difference to their lives in areas such as health care and education..

Challenges and Perceived Benefits of Community-Based Interventions

Table 6: Perceived Benefits (Likert Scale 1=Strongly Disagree, 5=Strongly Agree)

Statement (Benefits)	Mean (SD)	Interpretation/Comment
Our household eats more vegetables now because of the garden.	4.6 (0.6)	Extremely high agreement, reinforcing direct dietary impact.
Our diet is more diverse now.	4.5 (0.7)	High agreement, supporting improved dietary quality.
We worry less about not having enough food.	4.4 (0.7)	Strong agreement, indicating enhanced food security.
Income from selling garden produce helps meet needs.	4.3 (0.0)	High agreement on financial utility.
We save money on food expenses because of the garden.	4.7 (0.5)	Highest agreement, highlighting economic relief.
Skills learned from LEPs have been very useful.	4.2 (0.0)	High utility of acquired skills.
I feel more confident in my ability to grow food/earn income.	4.1 (0.9)	Strong personal empowerment.
CBVG program improved community cooperation/unity.	4.0 (0.9)	Significant social capital building.

There is a generally positive perception of the benefits that participants derive from the interventions; all mean scores range from 4.0 to 4.7, meaning high levels of agreement on different aspects of the interventions.

"High mean score of 4.7 for 'We save money on food expenses because of the garden'" denotes an important economic benefit, thus, providing "economic relief." It corroborates the existing studies that demonstrate that community

gardens can help lower the food expenses of participating households, particularly poor families (Alaimo et al., 2008). "We eat more vegetables due to the garden" (Mean = 4.6) and "Diet has become more diverse due to the garden" (Mean = 4.5) highlight the immediate benefits related to the diet and food intake. They align with the literature evidence on the positive effect of the availability of fresh products in community gardens on eating behaviors and diversification of the daily diet (Litt et al., 2011). Another important aspect to consider is "Food insecurity decreases since we have our garden" (Mean = 4.4), denoting the enhancement of "food security," which is a key benefit of community-based interventions. This result is also supported by the literature, which states that food production initiatives can increase food security by ensuring constant food supply (Gattrell et al., 2018).

"The income earned through selling garden produce helps cover needs" (Mean = 4.3) indicates the "high agreement on financial utility," suggesting that the interventions provide additional economic benefits to participants apart from savings on food. It supports the evidence of the two-sided nature of community gardens in terms of subsistence and economic activity (Saldivar-Tanaka & Krasny, 2004). "The skills obtained in LEPs have been very helpful" (Mean = 4.2) is evidence of the "high utility of acquired skills." It implies that the Livelihood Education Programs (LEPs) succeeded in transferring essential knowledge and competencies to participants, which may be further used for agricultural activities and entrepreneurship (Teixeira et al., 2020). "My confidence in growing food or earning income increased greatly" (Mean = 4.1) is an indicator of "strong personal empowerment." It is a frequent outcome of community development programs that contribute to developing self-efficacy and autonomy of participants (Perkins & Zimmerman, 1995). Lastly, "The CBVG program increased community cooperation/unity" (Mean = 4.0) suggests "significant social capital building." It underlines the potential role of the interventions in enhancing social capital in communities, which is also widely discussed in the literature as an important effect of common community spaces and activities (Putnam, 2000).

Table 7: Perceived Challenges (Likert Scale 1=Strongly Disagree, 5=Strongly Agree)

Statement (Challenges)	Mean (SD)	Interpretation/Comment
Access to water is a significant problem.	3.9 (1.0)	Moderate to high agreement; environmental constraint.
Pests and diseases frequently destroy crops.	4.1 (0.9)	High agreement; persistent agricultural challenge.
Lack of sufficient tools or good quality seeds.	3.5 (1.1)	Moderate agreement; input access limitation.
Finding buyers for surplus produce is difficult.	3.8 (1.0)	Moderate agreement; market access limitation.
LEPs were not frequent/long enough.	3.2 (1.2)	Neutral to slight agreement; desire for more training.
Difficulties applying skills learned from LEPs.	2.8 (1.2)	Neutral to slight disagreement; mostly effective application.
Lack of time prevents full engagement.	3.7 (1.0)	Moderate agreement; time constraints common.
Community does not always cooperate in maintaining the garden.	3.1 (1.1)	Neutral; occasional collective action challenges.

Participants perceived the benefits of the program highly favorably, especially the nutritional value and economic gains associated with the project. They appreciated its social value through increased confidence and strengthened community bonds.

Summarizes the main difficulties experienced by participants in implementing the CBVGs and LEPs. Participants identified pests and diseases and a lack of adequate water supply, especially during dry periods, as the most common obstacles. The two factors adversely affected production, causing a decrease in family consumption and potential income from surplus vegetables. Participants also faced some difficulties in establishing steady markets for the sale of vegetables, affecting their capacity to earn maximum income. In addition, the lack of good-quality seeds and proper gardening tools was a challenge for participants.

The programs were still helpful in ensuring food security and incomes despite these difficulties. Nevertheless, the results indicate that technical support, efficient water management, enhanced market linkages, and availability of agricultural resources are important for enhancing sustainability.

Conclusions

From the results of the study, the following conclusions have been drawn:

1. There was a marked improvement in food security among households involved in the CBVGs and LEPs program. There is evidence in the significant improvement in the Household Dietary Diversity Score (HDDS) and the Household Food Insecurity Access Scale (HFIAS). The households accessed diverse and nutritious foods more

regularly. Most importantly, there was an increased consumption of vegetables because of the gardening practice that was encouraged, thus improving their diets while reducing their food insecurity.

2. Contributions towards economic well-being through direct income earning were evidenced in this program through the sale of the surplus garden products, highlighting the economic viability of small scale vegetable production. Moreover, there were marked savings due to home consumption, making households save financially because they consumed food produced from their farms. Additionally, the LEPs helped households diversify sources of income because apart from selling their vegetable garden products, they got skills to engage in other income earning activities.

3. Learning skills through the LEPs program was seen to be quite relevant, and this led to high application of the skills acquired. This conclusion shows the strength of the use of demand-driven education methods in helping households become self-reliant in terms of food and income earning.

4. There was notable improvement in the societies' well-being by way of developing the personal confidence of the households, improvement in knowledge regarding sustainable agriculture, and social cohesion.

5. Although the intervention showed numerous gains, there were various limitations such as the emergence of pests and diseases and lack of water needed for gardening. Market access and tool accessibility were among the moderate limitations in the project.

III. RECOMMENDATIONS

In light of the findings, it is thus recommended that the policymakers, implementers of the program, and the community leaders in Santa Maria, Ilocos Sur do the following:

1. Ensure there is a continuous implementation of technical assistance in IPDM in organic and sustainable ways. There should also be investments towards community-based water management like rainwater harvesting, efficient irrigation practices (like drip system), and watershed management for assured water supplies.
2. Facilitate linkage of CBVG participants to the local or institutional markets (schools, hospitals, and restaurants). The establishment of community-based farmers' market, online platforms, or marketing schemes will do the trick. They need to have advanced training on value-added goods, branding, and entrepreneurship so as to make a move from selling raw vegetables to selling higher valued produce.
3. Continue implementing relevant and practical LEP but also add to the curriculum intensive courses in financial literacy, business planning, and specialized technical skills depending on market needs. There is also need to put in place follow-ups like mentorship and peer learning or even access to some funds for startup purposes.
4. Integrate the CBVG and LEP interventions in the wider community development strategies ensuring that it fits together with health, nutrition, and environment programs. Social capital should also be enhanced by empowering communities in CBVG governance and conflict resolution.
5. Ensure access to quality climate-resilient seeds and gardening tools either through community seed banks or collaboration with seed companies or gardening tool providers.

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