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Impact Assessment of Community Extension Programs of the Bachelor of Science in Biology Program on Knowledge, Livelihood, and Community Development

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Abstract: Higher education institutions play a vital role in promoting community development through extension programs that transfer scientific knowledge, practical skills, and technologies to local communities. At Isabela State University–Cabagan Campus, the Bachelor of Science in Biology program under the College of Science actively implements community extension initiatives that aim to promote environmental awareness, health practices, and livelihood opportunities among partner communities. This study assessed the impact of selected extension programs implemented by the BS Biology program in partner barangays. Specifically, the research evaluated two major initiatives: the Medicinal and Food Plants Nursery Project and the Kabutihang Kabuhayan para sa Kababaihan (KKK): Mushroom Production Project. A descriptive research design was employed, and data were collected from 65 community participants using a structured impact study questionnaire. Descriptive statistical tools, including frequency, percentage, and weighted mean, were utilized to analyze the data. The findings revealed that most respondents were female, married, and had attained either elementary or high school education. The majority of participants actively engaged in the extension activities, with most attending four or more training sessions. Results indicated that the programs had a very high impact on improving participants' knowledge, skills, and confidence in applying the practices learned. Respondents also reported that the training contributed positively to their productivity and livelihood activities. Furthermore, participants perceived that the extension programs contributed to community development, and that the practices introduced could be sustained over time. Despite the positive outcomes, several challenges were identified, including limited resources, financial constraints, and time limitations in applying the learned practices. Overall, the results demonstrate that the extension programs significantly contributed to knowledge transfer, livelihood improvement, and community empowerment. The study recommends the expansion of extension initiatives, increased institutional and community support, and the implementation of additional livelihood-oriented training programs to further enhance community development.

Keywords: *Community Extension, Impact Assessment, Knowledge Transfer, Livelihood Development, Community Development, Mushroom Production.*

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I. INTRODUCTION

Universities have a social responsibility to extend knowledge beyond academic institutions and contribute to community development. Extension programs serve as mechanisms through which higher education institutions disseminate research-based knowledge, technologies, and innovations that address local problems and improve the quality of life of communities.

At Isabela State University–Cabagan Campus, the Bachelor of Science in Biology program under the College of Science actively implements community extension initiatives that aim to promote environmental awareness, health practices, and livelihood opportunities among partner communities. Among these initiatives are the Medicinal and Food Plants Nursery Project and the Kabutihang Kabuhayan para sa Kababaihan (KKK) Mushroom Production Project.

These programs provide community members with training on medicinal plant utilization, sustainable agriculture practices, and mushroom production technologies. Through these initiatives, community participants gain practical

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knowledge and skills that can contribute to improved health practices, food security, and livelihood development.

Despite the implementation of these programs, it is necessary to evaluate their effectiveness and determine their impact on both the participants and the community. Conducting an impact assessment enables institutions to determine whether extension activities achieve their intended outcomes and identify areas for improvement to further strengthen community engagement and development initiatives.

➢ *Statement of the Problem*

This study aimed to assess the impact of the extension programs of the BS Biology program on the partner communities.

Specifically, it sought to answer the following questions:

- What is the Demographic Profile of the Respondents in Terms of:

✓ Age
✓ Sex
✓ Civil status
✓ Educational attainment
✓ Occupation
✓ Barangay/municipality

- What is the level of participation of respondents in the extension activities?
- To what extent did the extension program contribute to:

✓ Knowledge and skills improvement
✓ Application of learning
✓ Productivity and livelihood outcomes
✓ Community-level impact

- What is the level of satisfaction of the respondents with the extension programs?
- What challenges and barriers were encountered by the participants?
- What suggestions and recommendations were provided by the respondents for future extension activities?

➢ *Conceptual Framework*

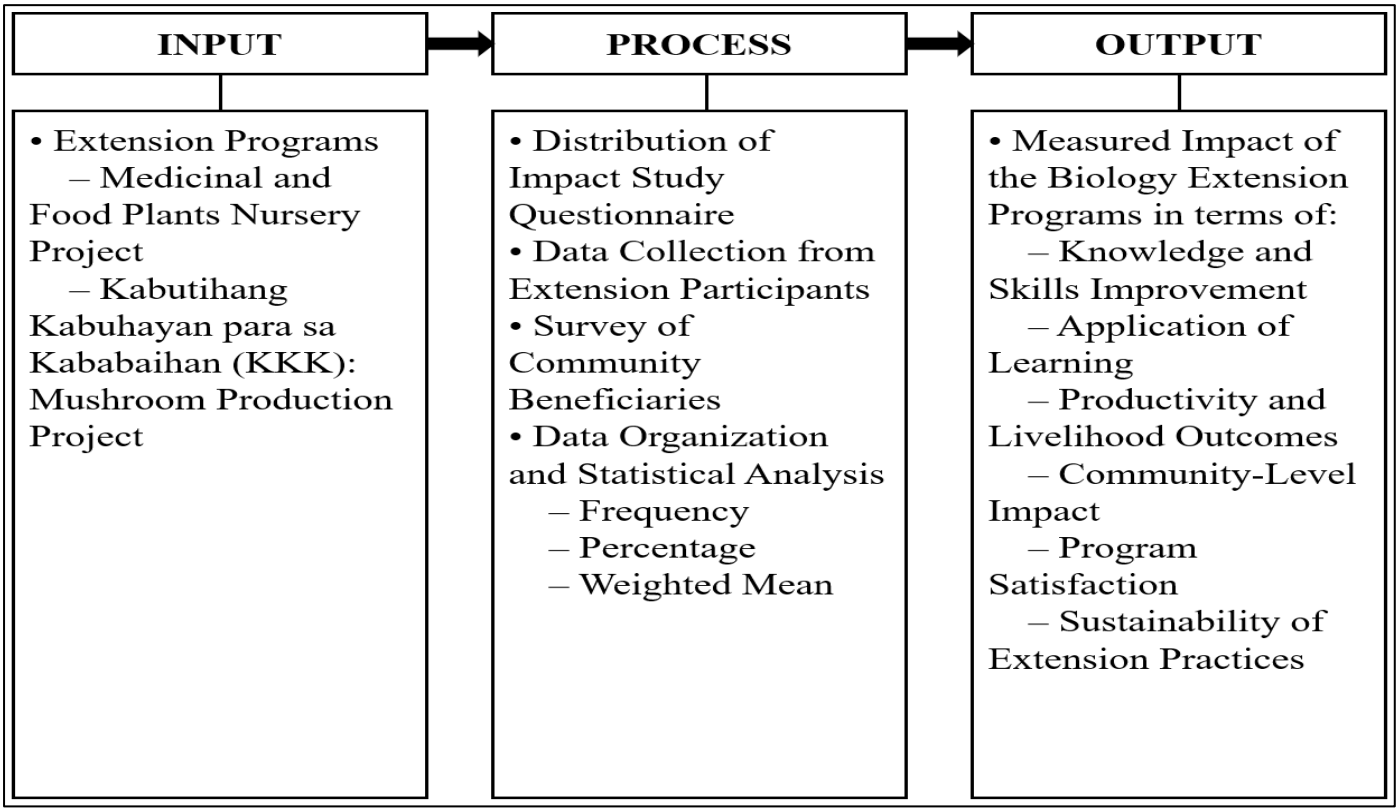

Fig 1 Conceptual Framework of the Study

The study is guided by the Input–Process–Output (IPO) model (see figure 1), which illustrates how the extension programs implemented by the Bachelor of Science in Biology program contribute to measurable community outcomes. The input component consists of the extension programs conducted in partner barangays, particularly the Medicinal and Food Plants Nursery Project and the Kabutihang Kabuhayan para sa Kababaihan (KKK): Mushroom Production Project. These programs serve as the primary interventions aimed at transferring knowledge and practical skills to community participants.

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The process involves the implementation of the impact assessment procedures, including the distribution of the impact study questionnaire, data collection from extension participants, and the survey of community beneficiaries. The collected data were then organized and analyzed using descriptive statistical tools such as frequency, percentage, and weighted mean to determine the effectiveness of the extension programs.

The output represents the measured impact of the Biology extension programs. This includes improvements in participants' knowledge and skills, the application of learned practices, productivity and livelihood outcomes, community-level impact, program satisfaction, and the sustainability of extension practices. Through this framework, the study evaluates how the extension initiatives contribute to knowledge transfer, livelihood improvement, and community development.

II. MATERIALS AND METHODS

This chapter presents the methodology of the study, including the research design, population and locale of the study, data collection instruments, data collection procedures, treatment of the data and ethical consideration.

➢ *Research Design*

A research plan was developed which specified the methods and procedures for collecting and analyzing the needed information. This study utilized a mixed-method approach, combining both quantitative and qualitative research methods using a descriptive research design.

Qualitative research involves collecting non-numerical data to understand the perceptions, experiences, and insights of participants regarding the extension programs. This method focuses on meanings, concepts, descriptions, and interpretations of respondents' experiences in the extension activities (Creswell & Creswell, 2018).

Quantitative research emphasizes objective measurement and statistical analysis of numerical data gathered through surveys and questionnaires (Field, 2022). In this study, quantitative data were obtained using structured questionnaires to determine the impact of the extension programs in terms of knowledge and skills improvement, application of learning, livelihood outcomes, community-level impact, satisfaction, and sustainability indicators (Creswell & Creswell, 2018).

➢ *Population and Locale of the Study*

The respondents of the study were the beneficiaries of the extension programs implemented by the Bachelor of Science in Biology program in selected partner communities. A total of 65 beneficiaries participated in the study. These respondents were individuals who attended and participated in the extension activities conducted by the biology program.

The respondents came from the following partner barangays in the municipality of Cabagan, Isabela:

- Barangay Catabayungan
- Barangay Cubag
- Barangay Angan

These barangays serve as partner communities of the university's extension initiatives, particularly the Medicinal and Food Plants Nursery Project and the Kabutihang Kabuhayan para sa Kababaihan (KKK): Mushroom Production Project.

➢ *Data Collection Instruments*

This study utilized a structured questionnaire as the primary data-gathering instrument. The questionnaire was developed by the researcher to assess the impact of the extension programs on the beneficiaries.

The questionnaire consisted of the following parts:

- Respondents' Profile
- Participation in Extension Activities
- Knowledge and Skills Improvement
- Application of Learning
- Outcomes on Productivity or Livelihood
- Community-Level Impact
- Satisfaction and Perceived Effectiveness
- Challenges and Barriers Encountered
- Sustainability Indicators
- Suggestions and Recommendations

A Five-Point Likert Scale was Used to Measure the Respondents' Perceptions Regarding the Impact of the Extension Programs.

Scale	Description
5	Strongly Agree
4	Agree
3	Neutral
2	Disagree

The use of Likert scales allows the measurement of attitudes, perceptions, and opinions of respondents in survey research (Joshi et al., 2015).

Prior to the administration of the questionnaire, the instrument underwent content validation by three experts in community extension and research methodology to ensure the clarity, relevance, and appropriateness of the items. The Content Validity Index (CVI) was computed to determine the level of agreement among the validators (Polit & Beck, 2021).

➢ *Data Collection Procedures*

To attain the objectives of the study, the researcher secured permission to conduct the study from the appropriate authorities and local government officials of the partner barangays. A formal request letter was submitted to the concerned officials prior to the data collection.

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After permission was granted, the researcher coordinated with the extension program coordinators and barangay officials to identify the participants who attended the extension activities. The researcher then explained the purpose and objectives of the study to the respondents before administering the questionnaire.

➢ *Treatment of the Data*

To obtain valid and reliable results, the following statistical tools were used in the analysis of the collected data:

- Frequency distribution – to determine the number of responses in each category
- Percentage – to describe the proportion of respondents for each variable
- Weighted Mean – to determine the level of impact of the extension programs

Descriptive statistical analysis is commonly used in survey research to summarize and interpret data collected from respondents (Field, 2022).

The weighted mean was used to interpret the respondents' perceptions regarding the impact of the extension programs.

Weighted Mean	Interpretation
4.21 – 5.00	Very High Impact
3.41 – 4.20	High Impact
2.61 – 3.40	Moderate Impact
1.81 – 2.60	Low Impact
1.00 – 1.80	Very Low Impact

➢ *Ethical Considerations*

Ethical standards were strictly observed throughout the conduct of the study. The respondents were informed about the purpose of the research and their voluntary participation before answering the questionnaire. They were assured that their responses would remain confidential and would be used solely for research purposes.

No personal identifying information was collected, and all data were reported in aggregate form to maintain anonymity. The respondents were also informed that they had the right to decline participation or withdraw from the study at any time without any consequences. These procedures were followed to protect the rights and welfare of the participants (Resnik, 2020; Creswell & Creswell, 2018).

III. RESULTS AND DISCUSSION

This chapter presents the results of the study and the discussion of the findings based on the data gathered from the respondents.

➢ *Respondents' Profile*

➢ *Sex of Respondents*

Table 1 presents the distribution of respondents according to sex.

Table 1 Respondents by Sex (N = 65)

Sex	Frequency	Percentage
Female	55	84.62
Male	10	15.38
Total	**65**	**100**

The results show that the majority of respondents were female (84.62%), while 15.38% were male, indicating that women were the primary participants in the extension programs conducted by the Biology program. This may be attributed to the nature of the activities, which involve plant cultivation and livelihood practices commonly managed by women in rural households.

Despite the higher number of female participants, the involvement of both men and women reflects the principle of gender equality, where extension programs provide equal opportunities for all community members to participate and benefit from training and capacity-building activities. Gender-inclusive development initiatives are important in promoting equitable participation and sustainable community development (UN Women, 2022).

Moreover, empowering women through extension programs has been shown to improve household welfare, food security, and local economic development, as women often play key roles in livelihood and community activities (Ongachi, 2025; Briones et al., 2023).

➢ *Age Distribution*

The age distribution of respondents revealed that most participants belonged to the 41–60 age group, representing economically productive individuals in the community. Individuals in this age bracket are typically actively engaged in livelihood activities and community participation.

Extension programs that involve economically active individuals tend to achieve higher adoption rates because participants have the capacity to apply and sustain the knowledge and technologies introduced during training (Kalogiannidis, 2024). Moreover, middle-aged participants often influence other members of the community, facilitating the diffusion of innovations and promoting broader adoption of improved practices (Rogers, 2003).

➢ *Participation in Extension Activities*

Table 2 presents the number of training sessions attended by the respondents.

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Table 2 Number of Training Sessions Attended

Sessions	Frequency	Percentage
1 session	7	10.77
2–3 sessions	12	18.46
4 or more sessions	46	70.77
Total	**65**	**100**

The results show that 70.77% of the respondents attended four or more training sessions, indicating strong engagement and sustained participation in the extension programs.

High levels of participation are important indicators of program effectiveness. According to recent studies, repeated exposure to extension activities improves knowledge retention and enhances participants' ability to adopt new technologies and practices (Abu Harb et al., 2024). Continuous training sessions also allow participants to reinforce their understanding and develop practical skills through hands-on learning experiences.

➢ *Knowledge and Skills Improvement*

Table 3 presents the respondents' perceptions regarding the impact of the extension programs on knowledge and skills development.

Table 3 Knowledge and Skills Development

Indicator	Weighted Mean	Interpretation
Gained new knowledge	4.38	Very High Impact
Improved understanding	4.31	Very High Impact
Developed useful skills	4.35	Very High Impact
Increased confidence	4.35	Very High Impact
Composite Mean	**4.35**	**Very High Impact**

The results indicate that the extension programs had a very high impact on participants' knowledge and skills. Respondents strongly agreed that the training helped them gain new knowledge, improve their understanding of the subject matter, develop useful skills, and increase their confidence in applying the learned practices.

Extension programs play a critical role in building human capital in rural communities by providing access to training, information, and technologies. Studies have shown that extension initiatives significantly improve the knowledge and technical capacity of participants, enabling them to adopt innovative practices and improve their productivity (Ongachi, 2025; Kalogiannidis, 2024).

➢ *Application of Learning*

Table 4 shows the respondents' perceptions regarding the application of knowledge and skills acquired from the training programs.

Table 4 Application of Learning

Indicator	Weighted Mean	Interpretation
Applied what was learned	4.28	Very High Impact
Practice techniques regularly	4.05	High Impact
Practices applicable to setting	4.26	Very High Impact
Composite Mean	**4.20**	**High Impact**

The findings indicate that the participants were able to apply the practices introduced during the extension programs in their daily activities. Respondents reported that the techniques taught were practical and applicable within their local context.

This supports the Diffusion of Innovations Theory, which explains that individuals are more likely to adopt new technologies when they perceive them as useful, practical, and compatible with their existing practices (Rogers, 2003). Recent studies also highlight that extension programs that incorporate practical demonstrations and hands-on activities significantly increase the likelihood of technology adoption among participants (Abu Harb et al., 2024).

➢ *Productivity and Livelihood Outcomes*

Table 5 presents the perceived impact of the extension programs on productivity and livelihood activities.

Table 5 Productivity and Livelihood Outcomes

Indicator	Weighted Mean	Interpretation
Productivity improved	4.28	Very High Impact
Livelihood improved	4.17	High Impact
Positive work changes	4.20	High Impact
Composite Mean	**4.22**	**Very High Impact**

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The results indicate that the extension programs had a very high impact on productivity and livelihood outcomes. Participants reported improvements in their work activities and livelihood opportunities after participating in the training sessions.

Extension services are widely recognized as effective strategies for improving rural livelihoods by providing access to new knowledge and technologies that enhance productivity and income generation. Recent studies highlight that community-based extension programs contribute to livelihood diversification, poverty reduction, and economic resilience in rural communities (Ongachi, 2025; Kalogiannidis, 2024).

➢ *Community-Level Impact*

Table 6 presents the perceived community-level impact of the extension programs.

Table 6 Community-Level Impact

Indicator	Weighted Mean	Interpretation
Contributed to community development	4.49	Very High Impact
Addressed community needs	4.49	Very High Impact
Others benefited indirectly	4.49	Very High Impact
Practices adopted by others	4.45	Very High Impact
Composite Mean	**4.48**	**Very High Impact**

The findings indicate that the extension programs had a very high community-level impact. Respondents agreed that the programs addressed community needs and contributed to broader community development.

Community extension initiatives implemented by higher education institutions are recognized as powerful tools for social transformation and sustainable development. Universities that actively engage with communities through extension programs help bridge the gap between academic knowledge and practical application in real-world settings (Mandaing, 2025).

➢ *Sustainability Indicators*

Table 7 presents the sustainability indicators of the extension programs.

Table 7 Sustainability Indicators

Indicator	Weighted Mean	Interpretation
Can continue practices independently	4.34	Very High Impact
Plan to continue using knowledge	4.42	Very High Impact
Community support exists	4.51	Very High Impact
Long-term benefits created	4.43	Very High Impact
Composite Mean	**4.43**	**Very High Impact**

The high composite mean indicates that the extension programs have strong sustainability potential. Participants expressed confidence in their ability to continue applying the practices introduced during the training programs.

Sustainable extension programs are characterized by community ownership, capacity building, and continued application of knowledge beyond the duration of the project. When communities develop the ability to independently implement learned practices, extension programs can generate long-term benefits and contribute to sustainable development (Ongachi, 2025; Abu Harb et al., 2024).

IV. CONCLUSION

The findings of the study indicate that the community extension programs implemented by the Bachelor of Science in Biology program had a significant positive impact on the partner communities. The majority of respondents actively participated in multiple training sessions, reflecting strong engagement in the extension activities. The programs contributed substantially to improving participants' knowledge, skills, and confidence in applying the practices learned. Moreover, the initiatives positively influenced productivity, livelihood opportunities, and community development. Although some challenges such as limited resources and financial constraints were encountered, the overall results demonstrate the effectiveness of the extension programs in promoting knowledge transfer and community empowerment. These findings highlight the important role of university-based extension initiatives in supporting sustainable livelihood and community development.

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