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Research Article

# Predictive Modeling for Community Extension Outcomes: A Quantitative Assessment Framework

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**Abstract**
This study develops a predictive assessment framework for examining the outcomes of community extension programs, with particular attention to the influence of beneficiaries' socio-demographic and economic characteristics. Using a quantitative correlational research design, the study examined 36 beneficiaries of the Tinadtaran, Piña, Agsanayan, and San Roque Agrarian Reform Cooperative (TPAS-ARC) extension program implemented by Guimaras State University. Data were collected through a structured questionnaire and analyzed using descriptive statistics, multivariate tests, canonical correlation analysis, and regression analysis. The findings indicate that employment and household income are important predictors of improvements in knowledge, skills, and behavioral change. Household income also emerges as the strongest predictor of income change. Behavioral change, knowledge, and skills demonstrate stronger associations with the intervention outcomes than income improvement. These findings suggest that community extension programs can strengthen participants' competencies and practices, although the translation of acquired competencies into financial gains remains influenced by existing economic conditions. The study recommends integrating livelihood financing, market access, employment opportunities, and post-training assistance into community extension initiatives. Such measures may help reduce disparities in program benefits and improve the sustainability of community development outcomes.

**Keywords**
Community extension, predictive assessment, socioeconomic characteristics, behavioral change, livelihood development

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**Ethics Statement**
This study was conducted in accordance with ethical standards.

## INTRODUCTION

Community extension programs serve as important mechanisms through which higher education institutions and development organizations contribute to socioeconomic development, strengthen community capacities, and improve the livelihoods of underserved populations. These initiatives commonly provide educational interventions, technical assistance, skills development, and opportunities for community participation. Their effectiveness, however, should not be assessed solely through the number of activities conducted or beneficiaries reached, but also through the extent to which participants acquire knowledge, develop practical competencies, adopt improved practices, and experience meaningful socioeconomic changes. Community-based development outcomes are influenced by the interaction between individual characteristics, available resources, institutional support, and local conditions. Previous research emphasized the importance of examining household participation, community resilience, and community capacity when evaluating development interventions (Akamani & Hall, 2015; Brinkman et al., 2012). Similarly, systematic evaluations of extension and advisory services provided insights into program performance, implementation, and outcomes (Blockeel et al., 2023). Motivation also plays an

important role in learning and sustained engagement, particularly in relation to the conditions that support individual development and behavioral change (Ryan & Deci, 2020). From a behavioral perspective, the Theory of Planned Behavior explains that individuals' intentions to perform particular behaviors are influenced by their attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991). This perspective provides a useful theoretical basis for understanding why participation in extension activities may lead to changes in knowledge and practices, although the actual application of acquired competencies may also depend on beneficiaries' available resources and opportunities.

In the Philippine context, community extension programs are integral to the engagement of higher education institutions with local communities. Universities implement extension initiatives to address identified community needs through training, technical support, livelihood development, and institutional partnerships. Previous studies examined the outcomes and contributions of university-community partnerships and extension initiatives, including their implications for community development (Adame et al., 2022; Esteban, 2025; Montalbo, 2016; Paulican & Garcia, 2023). Esteban (2025), for instance, assessed a university community extension program through dimensions of satisfaction, effectiveness, relevance, impact, and sustainability, demonstrating the value of examining both program implementation and its outcomes in partner communities. Research on agricultural extension and advisory services likewise emphasized the importance of evaluating program performance, service delivery, and outcomes to inform extension planning and implementation (Blockeel et al., 2023; Lyne et al., 2018). Comparable assessment initiatives in other extension sectors have also demonstrated the importance of systematically examining program implementation and evaluation methods, including the assessment of community-based healthcare extension interventions (Alemayehu et al., 2023; Maizel et al., 2025). Community asset and needs assessments further provide relevant information for identifying local priorities and developing responsive extension interventions (Narine et al., 2021). These studies provide a basis for understanding why extension programs should be responsive to the socioeconomic characteristics and contextual conditions of their intended beneficiaries. At Guimaras State University, the extension program implemented for the Tinadtaran, Piña, Agsanayan, and San Roque Agrarian Reform Cooperative (TPAS-ARC) provided an opportunity to examine these relationships. Specifically, beneficiaries may experience different levels of improvement in knowledge, skills, behavioral practices, and income depending on their age, sex, employment status, household income, educational attainment, and geographical location. Examining these characteristics is important in determining whether program benefits are experienced consistently across different beneficiary groups.

Despite the growing attention given to community extension evaluation, important empirical and methodological concerns remain. Existing studies examined university-community partnerships, community capacity, agricultural extension performance, and community development outcomes (Adame et al., 2022; Akamani & Hall, 2015; Blockeel et al., 2023; Brinkman et al., 2012; Esteban, 2025; Paulican & Garcia, 2023). However, the simultaneous examination of beneficiaries' socioeconomic characteristics in relation to multiple outcomes—particularly knowledge, skills, behavioral change, and income—remains important within specific institutional and community settings. A further concern is the distinction between improvements in learning and behavioral outcomes and the achievement of financial gains. Participation in training may strengthen knowledge and practical competencies, but the application of these competencies may also depend on employment opportunities, household resources, access to productive assets, and the availability of institutional or community support. The evaluation of extension services therefore requires approaches that examine several outcome dimensions together rather than relying exclusively on general assessments of program participation or satisfaction. Previous methodological reviews of extension intervention evaluations have likewise highlighted the importance of examining the approaches used to assess implementation and program outcomes (Maizel et al., 2025). Quantitative assessment can contribute to this process by identifying patterns of association between beneficiary characteristics and program outcomes. Predictive and multivariate approaches may also help clarify which characteristics are most strongly associated with differences across outcome measures, although statistical associations should not be interpreted as evidence of causation. Such approaches are particularly relevant when the objective is to develop an evidence-based assessment framework that can inform institutional planning and beneficiary support.

In response to these concerns, this study examined the relationship between the socioeconomic characteristics of TPAS-ARC beneficiaries and the outcomes of the community extension program implemented by Guimaras State University. Specifically, it investigated the associations of age, sex, employment status, household income, educational attainment, and geographical location with knowledge, skills, behavioral practices, and income outcomes. It also applied multivariate analysis, canonical correlation analysis, and regression analysis to identify the dominant relationships between the predictor variables and the outcome measures. By examining these dimensions within a single quantitative assessment framework, the study sought to provide evidence that could support more responsive extension planning, beneficiary assessment, and the development of appropriate post-training interventions. The findings were intended to help the university and its community partners identify socioeconomic conditions that should be considered when designing extension activities and livelihood support mechanisms. The study was limited to 36 purposively selected beneficiaries from four communities; consequently, its findings should be interpreted within the context of the participating communities and should not be generalized automatically to other populations or extension programs.

## METHODOLOGY

### Design

The study employed a quantitative correlational research design to examine the relationships between beneficiaries' socio-demographic characteristics and community extension outcomes. The design enabled the researchers to investigate the statistical associations between predictor variables and multiple outcome measures. A predictive assessment framework was used to identify the characteristics associated with differences in knowledge, skills, behavioral change, and income. The

predictor variables consisted of age, sex, employment status, household income, educational attainment, and location. The outcome variables included changes in knowledge, skills, behavioral practices, and income.

**Locale and Participants**

The study involved beneficiaries of the community extension program implemented by Guimaras State University–Graduate School through the Tinadtaran, Piña, Agsanayan, and San Roque Agrarian Reform Cooperative (TPAS-ARC). A total of 36 beneficiaries participated in the study. The respondents were selected through purposive sampling. The participants represented different age groups, employment categories, household income levels, educational backgrounds, and geographical locations. Their characteristics provided the basis for examining variations in community extension outcomes.

**Instrument**

Data were collected using a structured survey questionnaire. The instrument gathered information about respondents' socio-demographic and economic characteristics, including age, sex, employment status, household income, educational attainment, and location. It also measured changes in knowledge, skills, behavioral practices, and income associated with participation in the extension program.

**Collection**

The questionnaires were administered personally to the beneficiaries by trained data collectors. Responses were collected, reviewed for completeness, and processed before statistical analysis.

**Analysis**

Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize respondents' profiles and reported program outcomes. Multivariate statistical procedures were employed to examine the relationships between the predictor and outcome variables. These included Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and canonical correlation analysis. Regression analysis was also used to identify the socio-demographic characteristics associated with changes in knowledge, skills, behavioral practices, and income. The analysis aimed to identify the dominant socioeconomic characteristics associated with differences in program outcomes.

**Ethical Considerations**

The study involved human participants who provided information about their socio-demographic characteristics and experiences with the community extension program.

**Limitations and Rigor**

The study was limited to 36 beneficiaries from four communities associated with TPAS-ARC. The use of purposive sampling and the relatively small sample restrict the generalizability of the findings. Furthermore, the use of survey-based outcome measurements may introduce response and recall biases.

**RESULTS AND DISCUSSION**

The socio-demographic profile showed that most of the 36 beneficiaries belonged to the older age group. Participants aged 51–65 accounted for 63.9% of the sample, while those aged 35–50 represented 36.1%. Female beneficiaries comprised 55.6%, compared with 44.4% male beneficiaries. In terms of employment, 69.4% were unemployed, whereas 30.6% were employed. Regarding household income, 58.3% reported earning above ₱10,000, while 41.7% belonged to households earning ₱10,000 or below. Educational attainment was concentrated at the elementary level (44.4%), followed by high school (33.3%) and college (22.2%). Geographically, Tinadtaran contributed the largest proportion of respondents (63.9%), followed by San Roque (13.9%), Piña (11.1%), and Agsanayan (11.1%). These characteristics indicated that the beneficiaries represented different socioeconomic circumstances, particularly in employment, household income, educational attainment, and geographical location. The high proportion of unemployed participants suggested that livelihood-related extension activities were particularly relevant to a population with considerable employment-related constraints. The distribution of educational attainment also highlighted the importance of designing extension activities that accommodate different levels of formal education. Community assessment provides a useful basis for identifying local resources, needs, and conditions that should inform extension planning (Narine et al., 2021). Similarly, the assessment of community capacity requires consideration of the characteristics and resources that shape participation and collective development (Brinkman et al., 2012). The geographical distribution further showed that most respondents came from Tinadtaran. This concentration should be considered when interpreting the findings because the experiences of beneficiaries from the other three communities were represented by smaller groups. Differences in community resources, access to extension activities, and local implementation conditions may influence program experiences. Previous research on community participation and agricultural extension emphasized the importance of examining local conditions and the processes through which communities engage with development interventions (Akamani & Hall, 2015; Lyne et al., 2018). Consequently, the beneficiary profile provided an important context for interpreting variations in the reported program outcomes.

Table 1. Socio-demographic Profile of TPAS-ARC Beneficiaries

| Profile | Category | Frequency | Percentage |
|---|---|---|---|
| Age | 35–50 | 13 | 36.1 |
| | 51–65 | 23 | 63.9 |
| Sex | Male | 16 | 44.4 |
| | Female | 20 | 55.6 |
| Employment | Employed | 11 | 30.6 |
| | Unemployed | 25 | 69.4 |
| Household income | ₱10,000 and below | 15 | 41.7 |
| | Above ₱10,000 | 21 | 58.3 |
| Education | Elementary | 16 | 44.4 |

| | | | |
|---|---|---|---|
| | High school | 12 | 33.3 |
| | College | 8 | 22.2 |
| Location | Tinadtaran | 23 | 63.9 |
| | Piña | 4 | 11.1 |
| | Agsanayan | 4 | 11.1 |
| | San Roque | 5 | 13.9 |
| Total | | 36 | 100.0 |

The descriptive results indicated that skills obtained the highest mean score (M = 2.81, SD = 0.16), followed by behavioral change (M = 2.42, SD = 0.15) and knowledge (M = 2.31, SD = 0.13). Income change recorded a substantially lower mean (M = 0.50, SD = 0.51). These results suggested that the most pronounced reported outcomes were associated with skills development, followed by behavioral and knowledge-related outcomes, whereas financial improvement was comparatively limited. The relatively higher mean for skills suggested that beneficiaries reported stronger outcomes in the development or acquisition of practical competencies. This finding was relevant to the role of extension services in providing technical assistance and opportunities for applying new knowledge in community settings. Evaluations of agricultural extension services have emphasized the importance of examining service performance and the outcomes experienced by beneficiaries rather than focusing exclusively on program activities (Blockeel et al., 2023; Lyne et al., 2018). Similarly, assessments of community extension initiatives have considered their contributions to community development and beneficiary outcomes (Montalbo, 2016; Paulican & Garcia, 2023). Behavioral change also recorded a higher mean than knowledge. This pattern suggested that the reported outcomes extended beyond the acquisition of information and included changes in participants' practices. Such outcomes are relevant to the motivational processes associated with learning and behavioral development. The self-determination perspective emphasizes the importance of motivational conditions in supporting engagement and the internalization of learning (Ryan & Deci, 2020). Nevertheless, the present descriptive results did not establish whether the reported behavioral changes were sustained over time. Longitudinal assessment would be necessary to determine whether these changes were maintained after the completion of extension activities.

In contrast, the lower mean for income change suggested that improvements in financial circumstances were less evident than improvements in skills, knowledge, and behavior. This distinction indicated that the development of competencies did not necessarily correspond to immediate financial gains. Community development outcomes may depend on several interconnected conditions, including household resources, access to productive opportunities, and the capacity of beneficiaries to participate in livelihood activities. Previous studies emphasized the relevance of household participation, community capacity, and extension service conditions in understanding development outcomes (Akamani & Hall, 2015; Brinkman et al., 2012; Lyne et al., 2018). Therefore, the difference between the learning-related outcomes and income change highlighted the need to integrate skills development with practical livelihood support. The scoring scale and interpretation categories used for the descriptive means should, however, be confirmed before assigning categorical descriptions to these values.

Table 2. Descriptive Statistics of Community Extension Outcomes

| Variable | Mean | SD |
|---|---|---|
| Knowledge | 2.31 | 0.13 |
| Skills | 2.81 | 0.16 |
| Behavioral change | 2.42 | 0.15 |
| Income change | 0.50 | 0.51 |

The multivariate analysis indicated statistically significant relationships between the combined socio-demographic predictor variables and the four community extension outcomes. Pillai's Trace was 1.62632, with an approximate F-value of 3.31156 ($p < .001$). Wilks' Lambda was 0.06456, with an approximate F-value of 4.57052 ($p < .001$). Hotelling's Trace was 6.05796, with an approximate F-value of 6.18417 ($p < .001$). These results indicated that the combined set of beneficiary characteristics was significantly associated with the combined outcome measures. The findings suggested that knowledge, skills, behavioral change, and income should not be examined exclusively as isolated outcomes because their relationships with beneficiaries' socioeconomic characteristics were statistically evident at the multivariate level. This approach was consistent with the broader emphasis on evaluating community development through multiple dimensions of capacity, participation, and program performance (Akamani & Hall, 2015; Brinkman et al., 2012; Blockeel et al., 2023). In particular, the findings demonstrated the relevance of considering the interaction between beneficiary characteristics and different forms of program outcomes when assessing extension initiatives.

Wilks' Lambda indicated a substantial multivariate relationship under the fitted model. However, its value of 0.06456 should not be interpreted directly as evidence that 93.54% of the total outcome variance was explained. Wilks' Lambda is a multivariate test statistic and does not independently provide that percentage interpretation. The reported statistical significance also does not establish causal relationships or demonstrate the predictive accuracy of the model for beneficiaries outside the study sample. Prediction-model research has emphasized the importance of examining model development, performance, and validation before drawing conclusions about its application to new observations (Chan et al., 2023; Debray et al., 2019). Accordingly, the present findings are best interpreted as evidence of statistically significant multivariate associations within the observed sample.

Table 3. Multivariate Tests of Significance

| Test | Value | Approx. F | Hypothesis df | Error df | p |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Pillai's Trace | 1.62632 | 3.31156 | 24 | 116 | < .001 |
| Wilks' Lambda | 0.06456 | 4.57052 | 24 | 91.91 | < .001 |
| Hotelling's Trace | 6.05796 | 6.18417 | 24 | 98 | < .001 |
| Roy's Largest Root | 0.82867 | — | — | — | — |

The canonical correlation analysis identified four canonical functions describing the relationships between the socioeconomic predictor set and the community extension outcome set. The first canonical function produced an eigenvalue of 4.837, accounting for 79.8% of the sum of the reported canonical eigenvalues. Its canonical correlation was 0.910, with a squared canonical correlation of 0.829, and was statistically significant ($p < .001$). The second function produced an eigenvalue of 0.723, representing 11.9% of the eigenvalue sum, with a canonical correlation of 0.648 and a squared canonical correlation of 0.420 ($p = .018$). The third and fourth functions were not statistically significant based on the reported results. The first canonical function represented the dominant relationship between the predictor and outcome sets. Its canonical correlation of 0.910 indicated a strong association between the two derived canonical variates. The squared canonical correlation of 0.829 represented the proportion of shared variance between these canonical variates. Meanwhile, the 79.8% value described the proportion of the sum of canonical eigenvalues represented by the first function. These two statistics describe different aspects of the canonical relationship and should not be treated as interchangeable. The significant second canonical function further indicated that another statistically meaningful relationship existed between the predictor and outcome sets. However, the first function accounted for the largest proportion of the reported canonical eigenvalue sum. This result supported the use of multivariate assessment when examining community extension outcomes because the relationships among socioeconomic characteristics and program outcomes involved more than one dimension. Previous assessments of community capacity and extension performance similarly emphasized the value of examining multiple indicators and dimensions when evaluating development interventions (Brinkman et al., 2012; Blockeel et al., 2023). Nevertheless, the interpretation of the canonical functions should remain limited to the statistical relationships represented by the fitted model.

Table 4. Canonical Correlation Analysis

| Function | Eigenvalue | Proportion of eigenvalues | Cumulative proportion | Canonical correlation | Squared canonical correlation | p |
|---|---|---|---|---|---|---|
| 1 | 4.837 | 0.798 | 0.798 | 0.910 | 0.829 | < .001 |
| 2 | 0.723 | 0.119 | 0.918 | 0.648 | 0.420 | .018 |
| 3 | 0.391 | 0.065 | 0.982 | 0.530 | 0.281 | > .05 |
| 4 | 0.107 | 0.018 | 1.000 | 0.311 | 0.097 | > .05 |

The structure coefficients of the outcome variables showed that behavioral change had the strongest association with the first canonical function (0.976), followed by knowledge (0.971), skills (0.941), and income change (0.887). All four coefficients were positive and relatively high, indicating that each outcome contributed to the dominant canonical dimension. The comparatively higher coefficients for behavioral change, knowledge, and skills suggested that the first canonical function was strongly characterized by learning and behavioral outcomes. Income change also demonstrated a substantial positive association, although its coefficient was comparatively lower. This pattern corresponded with the descriptive findings, in which skills, behavioral change, and knowledge recorded higher mean scores than income change. Taken together, the results suggested that the dominant dimension of program outcomes was characterized more strongly by improvements in competencies and practices than by financial change. This finding was relevant to the broader evaluation of extension programs because community interventions are expected to contribute to both individual development and improvements in community conditions. Assessments of university-community partnerships and community extension initiatives have examined the contribution of institutional engagement to community development outcomes (Adame et al., 2022; Montalbo, 2016; Paulican & Garcia, 2023). The present results added a multivariate perspective by showing that behavioral change, knowledge, skills, and income were positively associated with the dominant canonical dimension, although their relative contributions differed. The lower relative coefficient for income change suggested that financial outcomes may involve conditions beyond the acquisition of knowledge and practical competencies. Beneficiaries may develop skills and adopt improved practices without immediately experiencing corresponding increases in income. Community capacity, household participation, and the conditions surrounding extension service delivery are relevant considerations when interpreting such differences (Akamani & Hall, 2015; Brinkman et al., 2012; Lyne et al., 2018). Thus, extension programs may need to combine competency development with support that enables beneficiaries to apply their skills in productive and income-generating activities.

Table 5. Structure Coefficients of Outcome Variables

| Outcome variable | Structure coefficient |
|---|---|
| Behavioral change | 0.976 |
| Knowledge | 0.971 |
| Skills | 0.941 |
| Income change | 0.887 |

The predictor structure coefficients indicated that household income had the strongest positive association with the first canonical function (0.948), followed by employment (0.912). Education (-0.249), age (-0.334), location (-0.129), and sex (-0.043) demonstrated comparatively weaker associations. These results indicated that household income and employment were the dominant socioeconomic characteristics associated with the first canonical dimension. The relatively high

coefficients for household income and employment suggested that beneficiaries' economic circumstances were important in understanding differences across the combined extension outcomes. Participants' access to financial resources and employment-related opportunities may be relevant to their capacity to engage in program activities and apply the competencies developed through extension interventions. Previous studies on household participation and community resilience emphasized the importance of socioeconomic and contextual conditions in shaping community development processes (Akamani & Hall, 2015). Likewise, research on extension services highlighted the importance of considering local conditions when evaluating program performance and outcomes (Blockeel et al., 2023; Lyne et al., 2018). The comparatively weaker coefficients for age, sex, education, and location indicated that these variables had smaller associations with the dominant canonical dimension in the reported analysis. However, these coefficients should not be interpreted as evidence that these characteristics were unimportant in all aspects of extension participation or program effectiveness. Their relationships may differ across individual outcomes and may depend on how the categorical variables were coded. Furthermore, canonical structure coefficients represent associations with the canonical variate rather than independent causal effects. The results therefore emphasized the importance of household income and employment within the observed multivariate relationship without establishing that either variable independently caused improvements in the extension outcomes.

Table 6. Structure Coefficients of Predictor Variables

| Predictor | Structure coefficient |
|---|---|
| Household income | 0.948 |
| Employment | 0.912 |
| Education | −0.249 |
| Age | −0.334 |
| Sex | −0.043 |
| Location | −0.129 |

The regression results showed that employment (β = 0.527, p = .001) and household income (β = 0.410, p = .008) were significantly associated with knowledge outcomes. Age, sex, education, and location did not reach the reported .05 significance level. These findings indicated that employment status and household income were the principal reported predictors of knowledge within the fitted regression model. The positive coefficients suggested that the categories represented by higher predictor values were associated with higher knowledge outcome scores. However, the substantive direction of these relationships depended on the coding of employment and household income categories, which should be verified against the original statistical output. The findings nevertheless suggested that beneficiaries' economic circumstances were relevant to differences in reported knowledge outcomes.

This result highlighted the importance of considering the conditions under which beneficiaries participate in extension activities. Community extension programs are implemented within social and economic environments that may influence access to learning opportunities and the application of acquired knowledge. Previous research on community participation and extension service delivery emphasized the relevance of household and local conditions in understanding intervention outcomes (Akamani & Hall, 2015; Lyne et al., 2018). Accordingly, extension planning should consider differences in beneficiaries' economic circumstances when determining training schedules, learning resources, and follow-up assistance. However, the correlational design did not establish that employment or household income directly caused the observed differences in knowledge.

Table 7. Regression Coefficients and Significance Levels

| Predictor | Knowledge β (p) | Skills β (p) | Behavior β (p) | Income β (p) |
|---|---|---|---|---|
| Age | −0.074 (.438) | −0.043 (.672) | −0.075 (.422) | 0.035 (.747) |
| Sex | 0.161 (.089) | 0.168 (.096) | 0.166 (.074) | −0.048 (.651) |
| Employment | 0.527 (.001) | 0.397 (.014) | 0.572 (< .001) | −0.013 (.938) |
| Household income | 0.410 (.008) | 0.520 (.002) | 0.387 (.011) | 0.887 (< .001) |
| Education | −0.064 (.487) | −0.094 (.340) | −0.007 (.941) | −0.019 (.858) |
| Location | 0.150 (.100) | 0.220 (.027) | 0.151 (.092) | 0.124 (.229) |

Employment (β = 0.572, p < .001) and household income (β = 0.387, p = .011) were significantly associated with behavioral change. Age, sex, education, and location were not statistically significant at the .05 level. Employment recorded the largest coefficient, suggesting that it had the strongest reported association with behavioral outcomes among the predictors included in the regression model. The results indicated that beneficiaries' employment and household income circumstances were relevant to differences in their reported behavioral changes. Although extension activities may provide opportunities to develop new knowledge and practices, the ability to implement these practices may depend on the resources and circumstances available to participants. This interpretation was consistent with research emphasizing household participation and community capacity as relevant dimensions of development interventions (Akamani & Hall, 2015; Brinkman et al., 2012). The finding also had implications for the sustainability of extension outcomes. Behavioral change may require continued opportunities to practice newly acquired competencies and an environment that supports their application. The motivational perspective presented in self-determination theory emphasized the importance of conditions that encourage engagement and the maintenance of behavior (Ryan & Deci, 2020). Therefore, post-training mentoring, practical reinforcement, and community-based support may help beneficiaries apply the practices introduced during extension activities. However, the present analysis did not directly measure the mechanisms through which

employment and income were associated with behavioral change. Further research would be necessary to examine these processes.

**Regression Analysis of Income Change**

Household income was the only statistically significant predictor of income change ($\beta = 0.887$, $p < .001$). Age, sex, employment, educational attainment, and location were not statistically significant at the .05 level. The relatively large coefficient indicated a strong reported association between household income and income change within the fitted regression model. This result highlighted the relationship between beneficiaries' existing economic circumstances and their reported financial outcomes. It also reinforced the distinction between improvements in knowledge and skills and the achievement of measurable income gains. While the descriptive and canonical results indicated that income was associated with the broader extension outcome dimension, the regression analysis showed that household income was the only individually significant predictor of income change among the variables examined. The result suggested that beneficiaries' financial circumstances were particularly relevant when examining economic outcomes. However, the study did not directly assess access to capital, markets, productive assets, or other livelihood resources. These factors should therefore be considered possible areas for further investigation rather than established explanations for the observed relationship. Previous research on community capacity and extension services emphasized the importance of examining the resources and conditions that shape the outcomes of development interventions (Brinkman et al., 2012; Blockeel et al., 2023; Lyne et al., 2018). In this context, extension programs may benefit from complementary livelihood support and institutional partnerships that help beneficiaries apply acquired competencies in income-generating activities.

**Synthesis of the Findings and Implications for Community Extension**

The canonical correlation analysis identified a dominant relationship characterized by behavioral change, knowledge, and skills, while the predictor structure coefficients highlighted household income and employment as the strongest socioeconomic characteristics associated with this dimension. The regression analyses further showed that employment and household income were significantly associated with knowledge and behavioral change, while employment, household income, and location were significant predictors of skills. Household income was the only statistically significant predictor of income change.

The findings suggested that the outcomes of community extension programs should be assessed through multiple dimensions rather than through a single measure of program effectiveness. Improvements in knowledge, skills, and behavioral practices represented important outcomes, but these did not necessarily correspond to immediate financial improvement. This distinction emphasized the importance of considering community resources, household circumstances, and the conditions surrounding extension service delivery when assessing program outcomes (Akamani & Hall, 2015; Brinkman et al., 2012; Lyne et al., 2018). The findings also highlighted the importance of systematic and multidimensional evaluation. Assessments of extension and advisory systems have emphasized the value of examining program performance and outcomes through structured evaluation approaches (Blockeel et al., 2023). In the present study, the use of descriptive statistics, multivariate tests, canonical correlation, and regression analysis provided complementary perspectives on the relationships between beneficiary characteristics and extension outcomes. Nevertheless, the relatively small purposively selected sample, the concentration of respondents in one community, and the absence of reported external model validation limited the generalizability and predictive application of the findings. Research on prediction-model implementation and evaluation has emphasized the need to examine model performance and validation before applying predictive results beyond the development sample (Chan et al., 2023; Debray et al., 2019).

**CONCLUSION AND RECOMMENDATIONS**

The study demonstrated that beneficiaries' socioeconomic characteristics were significantly associated with the outcomes of the TPAS-ARC community extension program. The multivariate and canonical correlation analyses revealed substantial relationships between the predictor and outcome variables, with behavioral change, knowledge, and skills strongly associated with the dominant canonical function. The regression results further identified employment and household income as significant predictors of knowledge and behavioral change, while employment, household income, and geographical location were significantly associated with skills outcomes. Household income emerged as the only significant predictor of income change. These findings indicated that community extension programs contributed more evident outcomes in learning, skills development, and behavioral practices than in financial improvement. The study therefore highlighted the importance of considering beneficiaries' socioeconomic circumstances when evaluating extension program effectiveness. However, the findings should be interpreted within the limitations of the small purposively selected sample and the specific communities covered by the investigation.

Based on these findings, Guimaras State University should strengthen its community extension initiatives by integrating skills training with livelihood financing, access to productive resources, market opportunities, and employment-related support. Beneficiaries with limited economic resources should receive differentiated assistance, including practical tools, mentoring, and post-training guidance to facilitate the application of acquired competencies. Institutional partnerships with local government units, cooperatives, industries, and community enterprises should also be expanded to provide sustainable opportunities for livelihood development. Regular post-training monitoring should be implemented to assess the continued application of knowledge, skills, and behavioral practices and to identify additional beneficiary needs. Furthermore, future studies should employ larger and more diverse samples, longitudinal research designs, and appropriate model validation procedures to examine the sustainability of extension outcomes and determine whether improvements in competencies eventually translate into measurable and sustained income growth.

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