Information Management and Business Review (ISSN 2220-3796)
Vol. 18, No. 3, pp. 249-262, 2026

Perceived Environmental Benefits and Beneficiary Acceptance in Malaysian Agribusiness Social Innovation Projects

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Abstract: This study examines how beneficiaries' perceived productivity, economic, employment, and environmental benefits relate to acceptance of four agribusiness social innovation projects in Malaysia's MyIS Community 2021–2022 program. Each project initially targeted 100 beneficiaries, for a combined target of 400; 142 continuing participants completed the questionnaire (35.5% of the initial target). The primary regression used 139 complete composite cases and accounted for 48.8% of the observed variance in acceptance; environmental benefits had the only statistically significant conditional association (B = .563, HC3 SE = .081, β = .626, p < .001). The researcher-developed measures showed extensive cross-loadings and insufficient separation of economic benefits from employment opportunities (HTMT = .964). In an exploratory rescoring sensitivity analysis that combined the livelihood items and removed several weak or evaluatively overlapping items, the environmental association persisted (B = .515, HC3 SE = .094; n = 140). The revised scores were derived and assessed using the same respondents and therefore require validation in an independent sample. Concurrent self-reports and uneven representation across projects limit interpretation; the data cannot establish whether perceived environmental benefits preceded acceptance or acceptance shaped those perceptions. The findings describe associations among continuing respondents' perceptions, not effects on poverty, food security, or environmental outcomes.

Keywords: *Agribusiness; social innovation; project acceptance; perceived benefits; environmental benefits*

1. Introduction

Agribusiness innovation grants can help low-income communities address persistent constraints involving finance, technology, information and productive resources. By supporting experimentation with improved farming practices, market linkages and shared infrastructure, grant-supported interventions may strengthen local production capabilities and livelihood opportunities (International Fund for Agricultural Development [IFAD] & United Nations Environment Program [UNEP], 2013; Ton et al., 2015). Technology-enabled approaches such as precision agriculture, smart farming and controlled irrigation may also reduce inefficient resource use and support more sustainable production (Kumar et al., 2024; United Nations Development Program [UNDP], 2021).

Grant funding alone, however, does not guarantee successful or equitable outcomes. Agribusiness initiatives are implemented across communities whose members may differ in their exposure to the intervention, access to benefits, and confidence in the implementing organizations. Community acceptance matters to the potential continuity of these initiatives. Evidence from agricultural and food-system research indicates that livelihood benefits, institutional support and the practical suitability of an innovation are related to willingness to participate in or support new agricultural practices (Galley et al., 2025; Ongachi & Belinder, 2025; Pollard et al., 2017).

Social exchange theory provides a useful explanation for this process. It proposes that individuals evaluate social relationships and collective initiatives partly through the benefits, costs, and reciprocal obligations they perceive (Cropanzano & Mitchell, 2005). Related research on social license to operate shows that perceived benefits, procedural fairness and trust contribute to community acceptance of development projects (Moffat & Zhang, 2014). Prior work has examined agricultural output, livelihood outcomes, adoption and acceptance in particular settings (Adeyanju et al., 2023b; Galley et al., 2025; Mokgomo et al., 2022; Pollard et al., 2017). Less is known about how multiple perceived benefit domains relate jointly to beneficiaries' acceptance across differently configured community agribusiness initiatives. The contribution here is a bounded comparison of

those perceptions within four MyIS projects, while testing whether the proposed domains are empirically distinguishable.

We examine associations between four perceived benefit scores and project acceptance among respondents from four MyIS Community 2021–2022 agribusiness projects. The simultaneous model estimates conditional associations among the measured scores, subject to their demonstrated overlap. Our evidence concerns beneficiaries' reported evaluations; it cannot establish project effectiveness or progress on SDG 1 or SDG 2.

2. Literature Review and Hypotheses Development

Theoretical Foundation

Social exchange theory suggests that beneficiaries evaluate an initiative partly through expected returns, costs, and reciprocity in an ongoing relationship (Cropanzano & Mitchell, 2005). A social license perspective adds that perceived benefits may be read alongside trust and legitimacy in judging whether a project merits continuing support (Moffat & Zhang, 2014). These are interpretive mechanisms here: the questionnaire did not measure reciprocity, trust, fairness, or legitimacy as mediators.

The proposed domains differ conceptually. Productivity concerns the way work and output are organized; economic benefits concern monetary livelihood returns; employment concerns access to work; and environmental benefits concern resource stewardship and shared surroundings. Economic gain and employment may nonetheless be experienced as one livelihood benefit. Their empirical separation must therefore be examined rather than assumed. All constructs refer to individual perceptions, not objectively verified community outcomes.

Perceived Community Productivity and Project Acceptance

Productivity improvements are among the most visible outcomes expected from agricultural support programs. Interventions combining infrastructure, technical advice, training and productive inputs have been associated with higher production, agricultural income and food security among participating smallholders (Mokgomo et al., 2022). Innovation grants may similarly improve farmers' capacity to experiment with production and value-chain practices, although the benefits depend on implementation conditions and the validity of the program's impact pathway (Ton et al., 2015). When participants perceive that a project improves work quality, productivity, efficiency, or the use of shared resources, they may evaluate the intervention as useful and worthy of continued support. Accordingly, perceived community productivity is expected to be positively associated with project acceptance.

H1: Perceived community productivity is positively associated with agribusiness project acceptance.

Perceived Economic Benefits and Project Acceptance

Economic benefits indicate whether an agribusiness initiative is perceived as relevant to beneficiaries' livelihoods. Agribusiness participation and empowerment programs may be associated with income generation, food security and livelihood improvement when communities have access to markets, resources and appropriate institutional support (Adeyanju et al., 2023b; Manda et al., 2020). Participants may regard tangible economic returns as one reason to accept a project. From a social-exchange perspective, perceived improvements in income, business opportunities or economic resilience can strengthen the expected return from supporting an intervention (Cropanzano & Mitchell, 2005). Economic benefits are therefore expected to be positively associated with acceptance.

H2: Perceived economic benefits are positively associated with agribusiness project acceptance.

Perceived Employment Opportunities and Project Acceptance

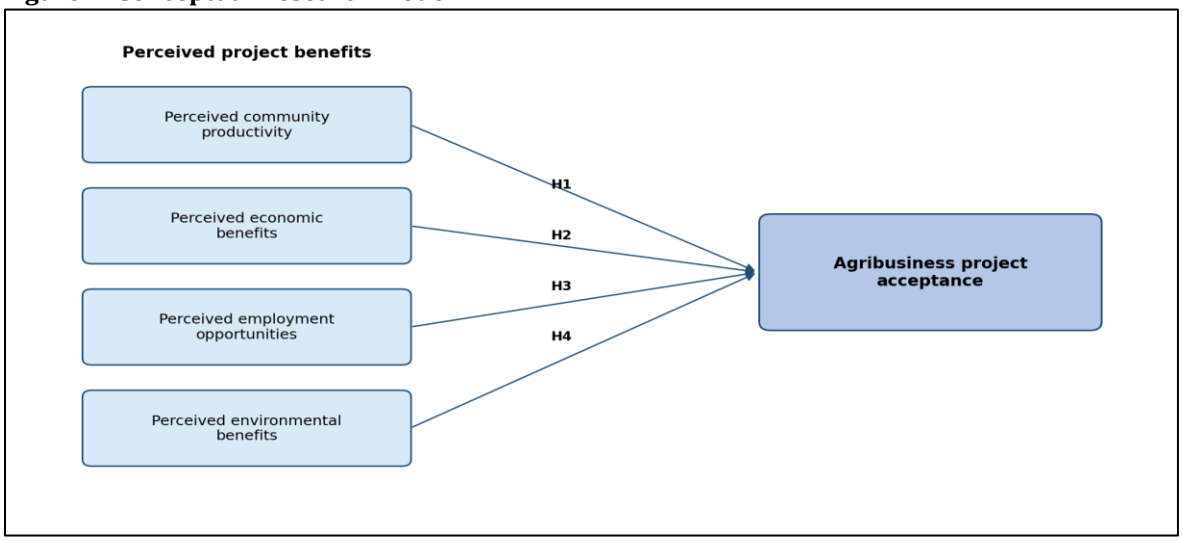
Employment opportunities are an immediate and socially visible potential benefit of agribusiness development. Agri-food system innovations may generate employment through farming, processing, packaging, transportation, and marketing activities (Berdegué et al., 2025). Employment accompanied by technical training and market support can also strengthen participants' capabilities and future livelihood opportunities (Adeyanju et al., 2023a; Balestri, 2024).

Where community members perceive that an initiative creates accessible and meaningful work, they may be more willing to endorse the project. Employment opportunities are therefore expected to be positively associated with project acceptance.
H3: Perceived employment opportunities are positively associated with agribusiness project acceptance.

Perceived Environmental Benefits and Project Acceptance
Environmental practices can be salient in aquaponics, precision agriculture, smart-hive farming, and fertigation through visible resource management, even when individual income or jobs have not yet accrued. Such a perceived collective return could be associated with reciprocity toward the initiative; it might also serve as a cue that implementers act responsibly, which could be related to trust, legitimacy, and acceptance (Cropanzano & Mitchell, 2005; Moffat & Zhang, 2014). This offers a reason to examine environmental perceptions separately, but the present design cannot test this sequence or establish that the association should be stronger than those of other benefits. Environmental outcomes were not independently measured, and trust was not assessed as a separate mediator. The expectation is therefore a positive association between perceived environmental benefit and acceptance. Its relative size against other domains is an empirical question, particularly where benefit measures overlap.
H4: Perceived environmental benefits are positively associated with agribusiness project acceptance.

Conceptual Research Model
Figure 1 presents four proposed perceived-benefit domains and project acceptance. H1–H4 concern positive associations rather than causal paths. The four domains are entered together to describe conditional associations, but that interpretation depends on whether the questionnaire separates them adequately. The diagram does not represent measured mediation through reciprocity, trust or legitimacy.

Figure 1: Conceptual Research Model



Income-Group Differences
Personal monthly income was available in ordered categories. A secondary, exploratory comparison used a RM3,000 split for a simple descriptive contrast. This threshold does not identify a validated poverty group, household resources or income attributable to a project; dichotomization discards the ordering and reduces information. Income did not enter the primary model and no moderation hypothesis was tested. Respondents reporting no income to RM3,000 per month were classified in the ≤RM3,000 group, while those reporting RM3,001 or more were classified in the >RM3,000 group. Seven respondents who selected "prefer not to answer" were excluded from the income-group comparisons.

3. Methodology

Project and Study Context

The study pooled respondents from four agribusiness social innovation projects supported under the MyIS Community 2021–2022 program and administered through Yayasan Inovasi Malaysia (YIM). Project descriptions and locations were drawn from YIM grant documentation (Yayasan Inovasi Malaysia, 2022). The projects covered aquaponics, precision agriculture capability development, smart-hive stingless-bee farming, and smart green chili fertigation across Kelantan, Selangor, and Terengganu. Table 1 summarizes the project settings and the surveyed participants.

Table 1: MyIS Community 2021–2022 Agribusiness Projects Represented in the Survey

Dataset label	Official project description and setting	Primary agribusiness focus	n (%)
Aquaponics	Aquaponics Program for the B40 Group (Persons with Disabilities & Asnaf); Kampung Pulau, Kubang Kerian, Kota Bharu, Kelantan	Aquaponics and livelihood-skills development	57 (40.1)
Kapitani	Empowerment of B40 Agropreneurs through Precision Agriculture Data (Kapitani); Telok Panglima Garang, Selangor	Precision agriculture, digital and financial capability	44 (31.0)
Smart-Hive Stingless-Bee Farming	Stingless Bee (Kelulut) Farming Innovation Using 'Smart Hive' Technology; Kampung Pengkalan Gelap, Setiu, Terengganu	Smart-hive stingless-bee farming and income generation	36 (25.4)
Smart Green Chilli Fertigation	Green-Technology Smart Fertigation Chilli Farm; Kampus UniSZA Cawangan Besut, Terengganu	Green smart fertigation and community income generation	5 (3.5)

Note. Each project initially targeted 100 beneficiaries. The figures in the final column show respondents as a percentage of all 142 surveyed participants. Relative to each project's initial target, survey coverage was 57% for Aquaponics, 44% for Kapitani, 36% for Smart-Hive Stingless-Bee Farming and 5% for Smart Green Chilli Fertigation. These are not survey response rates because the numbers of participants remaining eligible at project completion were not recorded.

Research Design

The study used a cross-sectional quantitative design to examine associations between perceived project benefits and individual-level acceptance across the four initiatives. Beneficiaries completed a structured paper-based questionnaire in person. This design documented participants' perceptions during the evaluation period but did not establish whether the grants caused changes in livelihoods, productivity, poverty, environmental quality, or food security (Creswell & Creswell, 2018).

Participants and Sampling

Each MyIS project initially targeted 100 beneficiaries, giving a combined program target of 400. Some participants did not remain involved through project completion. The survey was completed by 142 participants who were still involved at the end of their respective projects: 57 from Aquaponics, 44 from Kapitani, 36 from Smart-Hive Stingless-Bee Farming, and five from Smart Green Chilli Fertigation. The 142 respondents represent 35.5% of the original program target; the corresponding proportions for the four projects are 57%, 44%, 36%, and 5%. These figures describe coverage relative to the initial targets, not survey response rates, because the numbers of participants still participating and eligible to respond at the end of each project were not recorded. The study therefore captures the views of continuing participants. Those who withdrew earlier may have had different experiences and perceptions, creating a potential source of selection bias that cannot be assessed with the available data.

The four projects were pooled because they belonged to the same program and were assessed using a common questionnaire addressing the same perceived-benefit domains and project acceptance. Pooling allows an exploratory assessment of associations across the surveyed participants, but it does not establish that the measures function identically in each project. Moreover, 137 of the 142 respondents came from Aquaponics, Kapitani, and Smart-Hive; only five came from Smart Green Chilli Fertigation. The project-indicator sensitivity analysis accounts for differences in average acceptance between projects within the observed sample, but it cannot correct for earlier participant withdrawal, test whether the benefit–acceptance associations differ by project, or establish measurement equivalence. Accordingly, the pooled coefficients should be interpreted as associations among the respondents as a group, rather than as estimates that apply equally to each project or to all initially targeted beneficiaries.

Measures

The research team developed the questionnaire to meet Yayasan Inovasi Malaysia's (YIM's) impact-assessment requirements. Items were not adapted from previously validated scales. YIM reviewed the questionnaire for relevance to the program aims and approved its administration. This contextual review did not establish construct validity. Appendix A reproduces the English item wording from the bilingual instrument and reports the complete item-level factor loadings and communalities. The original item wording is retained, including wording that requires refinement in a future validated scale.

The originally specified composites were community productivity (CP; 8 items), economic benefits (EB; 3), employment opportunities (EO; 4), environmental benefits (EN; 6) and project acceptance (PA; 6). The questionnaire also asked whether respondents joined to generate more income; that motivation item was not part of EB. Each composite was the mean of valid item responses when at least half its items were answered. Item labels and wording appear in Appendix A. The original scoring was retained for the primary hypothesis tests. A separate, explicitly exploratory rescoring analysis combined EB01–EB02 and EO01–EO04 into one broad livelihood/opportunity score, omitted the weak EB03 item, retained all eight CP items, used EN01, EN03, EN05 and EN06 for environmental benefits, and used PA03–PA06 for acceptance. EN02 and EN04 mention trust or the decision to participate, and PA01 and PA02 either loaded outside their proposed domain or had a weak maximum loading. PA01 ('This project is easy to use') was excluded from the reduced acceptance score, not reclassified as an environmental item, because its wording concerns usability. The alternate scores used the same half-item completion rule.

Cronbach's alpha and McDonald's omega assessed internal consistency. An exploratory five-factor maximum-likelihood factor analysis with varimax rotation was conducted on the 27 originally scored items for the 132 respondents with complete valid item responses. Items were standardized before extraction. The factor axes were labelled according to the proposed item groups; the labels do not establish construct validity. Communalities were calculated as the sum of squared loadings across the five factors. A cross-loading was flagged when two or more absolute loadings reached .30, and an item was considered weak when its largest absolute loading was below .40. The heterotrait–monotrait ratio (HTMT) was also examined (Henseler et al., 2015). The reduced scoring was selected after inspecting this sample, so its fit and reliability are exploratory descriptions rather than independent validation; no revised five-factor solution is claimed.

Data-Collection Procedure

The survey was administered in person to participants who remained involved through project completion. A researcher was available to clarify questionnaire items when necessary. Responses were subsequently entered into Google Forms for data management and analysis. Participation in the survey was voluntary, and 142 questionnaires were completed. The number of continuing participants who were eligible but did not respond was not recorded. Data were collected between March 2023 and February 2024, and responses were analyzed only in aggregate.

Data Analysis

Out-of-range item responses were treated as missing. Descriptive statistics, reliability, Pearson correlations, exploratory factor analysis and HTMT were examined before hypothesis testing. The primary simultaneous regression used 139 cases with scores on all five original composites. As an exploratory common-method check, an unrotated principal component analysis included all 27 originally scored items for the 132

respondents with complete item data. Additional sensitivity analyses excluded two environmental items with evaluative wording and estimated a three-predictor model using the explicitly rescored CP, livelihood/opportunity, and environmental scores with the reduced PA outcome. These post hoc checks cannot exclude bias from the shared respondent, questionnaire or measurement occasion.

Ordinary least squares with HC3 robust standard errors was used to describe conditional score associations (Hayes & Cai, 2007). VIFs diagnose linear dependence among composite scores; they do not repair overlapping construct content. Sensitivity analyses examined project indicators and data-quality rules. The income split was retained as a low-priority exploratory comparison using Welch tests and Holm adjustment (Holm, 1979). Analyses were performed in Python 3.12 using pandas, NumPy, SciPy, scikit-learn and stats models.

The primary model was specified as:

$$PA_i = \beta_0 + \beta_1 CP_i + \beta_2 EB_i + \beta_3 EO_i + \beta_4 EN_i + \varepsilon_i$$

where PA denotes project acceptance, CP denotes community productivity, EB denotes economic benefits, EO denotes employment opportunities and EN denotes environmental benefits. A sensitivity model added project indicators, with Aquaponics as the reference category. Two further data-quality sensitivity analyses (a) omitted the later record in each of two exact-response-pattern pairs and (b) required valid responses to all 27 originally scored items. The exploratory rescoring model used CP, a combined livelihood/opportunity score, and a reduced EN score to describe associations with a reduced PA score; it did not separately test H2 and H3. Income-group comparisons used Welch's independent-samples t-tests, with five p-values adjusted using Holm's sequential procedure (Holm, 1979).

4. Findings and Results

Data Screening and Regression Diagnostics

Three questionnaires lacked sufficient valid responses for all five composites, leaving N = 139. VIFs ranged from 1.37 to 2.32; this does not contradict the item-level and HTMT evidence of overlapping constructs. The Breusch–Pagan test was $\chi^2(4) = 3.91$, $p = .418$, and Shapiro–Wilk $W = .967$, $p = .002$. HC3 standard errors were retained. Eleven cases exceeded the 4/N Cook's D screening cutoff (maximum .142). Two exact-response-pattern pairs were retained because duplication could not be established; a reported sensitivity analysis omitted one member of each pair.

Respondent Characteristics

The survey yielded 142 questionnaires from participants who remained involved through project completion, representing 35.5% of the combined initial program target of 400. Respondents were nearly equally distributed by gender: 72 men (50.7%) and 70 women (49.3%). Most were aged 31–50 years (n = 100, 70.4%), and 140 identified as Malay. Educational backgrounds ranged from no formal education to doctoral qualifications. The survey included 57 respondents from Aquaponics (40.1% of the sample), 44 from Kapitani (31.0%), 36 from Smart-Hive Stingless-Bee Farming (25.4%) and five from Smart Green Chilli Fertigation (3.5%).

Table 2: Selected characteristics of respondents (N = 142)

Characteristic	Category	n	%
Gender	Male	72	50.7
	Female	70	49.3
Age	18–30 years	18	12.7
	31–40 years	53	37.3
	41–50 years	47	33.1
	>50 years	24	16.9
Education	No formal education	5	3.5

Characteristic	Category	n	%
	Primary school	3	2.1
	Secondary school	50	35.2
	Certificate/diploma	25	17.6
	Bachelor's degree	46	32.4
	Master's degree	11	7.7
	PhD	2	1.4
Employment status	Full-time	94	66.2
	Part-time	19	13.4
	Unemployed	29	20.4
Monthly income	No income	11	7.7
	<RM1,000	19	13.4
	RM1,001–RM2,000	22	15.5
	RM2,001–RM3,000	36	25.4
	RM3,001–RM4,000	17	12.0
	RM4,001–RM5,000	7	4.9
	>RM5,000	23	16.2
	Preferred not to answer	7	4.9

Measurement Quality and Descriptive Statistics

Table 3 reports the reconstructed construct scores and reliability estimates. Mean scores were favorable across all five measures, ranging from 4.01 to 4.22 on the intended five-point scale. Reliability was strong for community productivity (α = .907), environmental benefits (α = .882) and project acceptance (α = .802), and acceptable for employment opportunities (α = .772). Economic benefits showed marginal reliability (α = .679; ω = .706), so findings involving this three-item measure were interpreted cautiously.

Table 3: Measurement properties and descriptive statistics

Construct	Items	n	Mean	SD	α	ω
Community productivity	8	141	4.126	0.600	0.907	0.907
Economic benefits	3	140	4.070	0.557	0.679	0.706
Employment opportunities	4	139	4.007	0.601	0.772	0.780
Environmental benefits	6	141	4.224	0.509	0.882	0.881
Project acceptance	6	141	4.204	0.457	0.802	0.806

On the 132 complete item records, the correlation matrix was suitable for exploratory analysis (KMO = .847; Bartlett's $\chi^2(351) = 2353.94$, $p < .001$). In the maximum-likelihood five-factor varimax solution, 13 items had at least two absolute loadings of .30 or greater; two items had no loading of .40 or greater (EB03 and PA02). Appendix A reports every loading, item wording, and communality. The pattern shows substantial overlap between economic benefits and employment opportunities: EB01 and EB02 loaded most strongly on the factor labelled employment, while EO01 and EO02 loaded most strongly on the factor labelled economic benefits. Thus, a three-item EB and three-item EO split cannot be read directly from the strongest loadings. Environmental and acceptance items also overlapped: EN02 and PA01–PA02 loaded most strongly outside their proposed domain. PA01 concerns usability, so its loading does not justify treating it as an environmental benefit. These descriptive factor labels do not establish five well-separated constructs. Economic benefits showed marginal reliability (α = .679; ω = .706), and HTMT between EB and EO was .964. Their separate

coefficients cannot be interpreted as distinct mechanisms with confidence. Table 4 reports correlations and HTMT for the original composites.

Table 4: Pearson correlations and HTMT ratios among study constructs

Construct	CP	EB	EO	EN	PA
1. CP	—	0.572	0.520	0.440	0.416
2. EB	0.453	—	0.964	0.672	0.572
3. EO	0.447	0.699	—	0.471	0.416
4. EN	0.395	0.513	0.379	—	0.825
5. PA	0.356	0.420	0.293	0.691	—

Note. Pearson correlations are shown below the diagonal; HTMT ratios are shown above the diagonal. CP = community productivity; EB = economic benefits; EO = employment opportunities; EN = environmental benefits; PA = project acceptance.

Regression Model and Hypothesis Tests

The primary regression included 139 respondents with scores on all five measures. Together, the four perceived-benefit scores explained 48.8% of the observed variance in project acceptance (R^2 = .488; adjusted R^2 = .472; F(4, 134) = 31.89, p < .001). This represents model fit within the surveyed sample, not predictive performance in other beneficiaries.

After adjustment for the other perceived benefits, environmental benefits were positively associated with acceptance (B = .563, HC3 SE = .081, β = .626, 95% CI [.402, .723], p < .001). Community productivity, economic benefits, and employment opportunities did not have statistically significant unique coefficients (Table 5). Thus, H4 was supported as an association between the measured scores, whereas H1–H3 were not supported as unique associations in this model. Their non-significant coefficients do not imply that these benefits are unimportant. In particular, the weak empirical separation of economic benefits and employment opportunities limits interpretation of their individual coefficients.

The environmental-benefit association remained positive after adjustment for project affiliation (B = .555, HC3 SE = .083, β = .618, p < .001; R^2 = .500, adjusted R^2 = .473). Exploratory within-project correlations between environmental benefits and acceptance were also positive for Aquaponics (r = .787, n = 56), Kapitani (r = .631, n = 44) and Smart-Hive Stingless-Bee Farming (r = .340, n = 36). Their differing magnitudes caution against assuming an identical relationship across projects. The five Smart Green Chilli Fertigation respondents had mean environmental-benefit and acceptance scores of 3.67 and 3.85, respectively; this group was too small for a meaningful within-project association estimate.

The pooled result was similar after omitting one response from each identical-pattern pair (n = 137, R^2 = .486; environmental benefits: B = .562, p < .001) and after requiring valid responses to all 27 analyzed items (n = 132, R^2 = .515; environmental benefits: B = .605, p < .001). Because two environmental-benefit items explicitly referred to trusting the project or considering participation the right decision, we repeated the regression without them. The resulting four-item environmental score remained associated with acceptance (B = .526, HC3 SE = .080, 95% CI [.368, .684], p < .001; n = 139, R^2 = .481).

In an exploratory common-method check using 132 questionnaires with complete item responses, the first component of an unrotated principal component analysis explained 34.3% of the variance across the 27 originally scored items. The absence of a single dominant component does not rule out common-method bias. The item-exclusion and exploratory rescoring sensitivity results address wording and construct overlap, but cannot remove bias from a shared respondent, questionnaire or occasion. Nor can the cross-sectional design establish whether environmental perceptions preceded acceptance or acceptance shaped reported benefits.

Table 5: HC3 multiple regression predicting agribusiness project acceptance

H	Predictor	*B*	HC3 SE	*β*	*t*	p	95% CI	VIF	Decision
H1	Community productivity	0.067	0.064	0.087	1.05	.298	[-0.059, 0.192]	1.372	Not supported
H2	Economic benefits	0.076	0.106	0.092	0.71	.476	[-0.134, 0.286]	2.316	Not supported
H3	Employment opportunities	-0.037	0.085	-0.048	-0.43	.667	[-0.204, 0.131]	2.041	Not supported
H4	Environmental benefits	0.563	0.081	0.626	6.92	<.001	[0.402, 0.723]	1.420	Supported

Note. N = 139. B = unstandardized coefficient; β = standardized coefficient; SE_HC3 = HC3 robust standard error; CI = confidence interval. Model statistics: R^2 = .488, adjusted R^2 = .472, F(4, 134) = 31.89, p < .001.

Exploratory Rescoring Sensitivity Analysis

Because the EB and EO items did not separate cleanly, we calculated a six-item livelihood/opportunity score using EB01–EB02 and EO01–EO04 and removed EB03. The reduced environmental score retained EN01, EN03, EN05 and EN06; the reduced acceptance score retained PA03–PA06. CP retained all eight items. Internal consistency was α = .838 (ω = .843) for livelihood/opportunity, α = .831 (ω = .835) for reduced environmental benefits, and α = .801 (ω = .814) for reduced acceptance. The reduced environmental–acceptance HTMT was .776, compared with .825 for the original scores; HTMT between the combined livelihood and reduced acceptance scores was .509. These statistics describe the same respondents whose factor loadings prompted the item choices. They do not establish discriminant validity or a replicable measurement model.

Among 140 respondents with complete reduced composite scores, the three-predictor model had R^2 = .418 (adjusted R^2 = .406; conventional F(3, 136) = 32.61, p < .001). Reduced environmental benefits were positively associated with reduced acceptance (B = .515, HC3 SE = .094, β = .540, 95% CI [.329, .701], p < .001; Table 5A). The combined livelihood/opportunity coefficient was B = .119 (p = .151), and the CP coefficient was B = .065 (p = .432). Adding project indicators gave R^2 = .428 and an environmental coefficient of B = .511 (HC3 SE = .094, p < .001). The change from R^2 = .488 in the primary model cannot be interpreted as a fit comparison because the outcome score, predictors, and case set differ. H2 and H3 are not separately testable in this sensitivity model.

Table 5A: Exploratory HC3 Regression Using Reduced Scores

Predictor	B	HC3 SE	β	p	95% CI
Community productivity (8 items)	.065	.083	.077	.432	[-.098, .229]
Livelihood/opportunity (6 items)	.119	.083	.130	.151	[-.044, .282]
Reduced environmental benefits (4 items)	.515	.094	.540	< .001	[.329, .701]

Note. n = 140; environmental and acceptance scores contain four items each. The item map and completion rule are specified under Measures. Coefficients are conditional associations among reduced scores; the same-sample item choices make this an exploratory analysis. The original hypothesis tests appear in Table 5.

Supplementary Exploratory Income Comparison

The original income question used several ordered categories. Of 135 usable responses, 88 fell at or below RM3,000 and 47 above it; construct-specific comparisons used 132–134 cases. None of the five Welch contrasts remained significant after Holm adjustment (adjusted p = .847–1.000; |g| ≤ .255). Table 6 is a supplementary description, not a test of moderation or economic project impact. The RM3,000 cut loses category information, and personal income does not capture household position or benefits received. The imprecise contrasts should not be interpreted as evidence that income groups evaluated the projects equally.

Table 6: Exploratory Welch Tests by Reported Personal-Income Group

Variable	≤RM3,000 n/M/SD	>RM3,000 n/M/SD	Δ	*t*	*df*	p	Holm p	95% CI	g
Community productivity	87/4.16/0.51	47/4.01/0.75	-0.149	-1.21	69.26	.231	.922	[-0.394, 0.096]	-0.244
Economic benefits	86/4.07/0.53	47/4.05/0.62	-0.013	-0.12	83.38	.906	1.000	[-0.226, 0.200]	-0.022
Employment opportunities	85/4.01/0.60	47/3.99/0.63	-0.018	-0.16	91.71	.871	1.000	[-0.242, 0.205]	-0.030
Environmental benefits	87/4.27/0.50	47/4.13/0.54	-0.133	-1.39	88.12	.169	.847	[-0.323, 0.058]	-0.255
Project acceptance	87/4.24/0.45	47/4.15/0.49	-0.086	-1.00	87.62	.320	.960	[-0.257, 0.085]	-0.185

Note. Δ is the mean of the >RM3,000 group minus the mean of the ≤RM3,000 group; g = Hedges' g; CI = confidence interval. Holm-adjusted p-values account for five comparisons.

All five difference intervals included zero; the observed group differences were small and imprecise.

Discussion

The principal finding is an association between environmental-benefit and acceptance scores reported by the same people at the same time. One plausible but untested account is that perceived responsible resource use represents a collective return within a social exchange and signals trustworthy implementation and legitimacy (Cropanzano & Mitchell, 2005; Moffat & Zhang, 2014). Trust appeared in the wording of an environmental-benefit item but was not measured as a separate mediator. Alternatively, beneficiaries who already accept a project may rate its environmental features more favorably, or a generally favorable response tendency may elevate both scores. The coefficient cannot distinguish between these explanations.

The environmental association persisted after adjustment for project affiliation, the data-quality checks, exclusion of two environmental items with evaluative wording, and a broader exploratory rescoring of livelihood, environmental and acceptance items. The unrotated first component explained 34.3% of item variance, but this diagnostic does not quantify or exclude common-method bias. Shared respondents, response format, measurement occasion, and favorable wording may still contribute to the association. No independent environmental outcome, longitudinal ordering or marker variable was available for a more decisive assessment. The primary standardized coefficient (β = .626) is therefore a conditional association among questionnaire scores, not an estimate of an environmental mechanism or intervention effect.

Productivity, economic benefits and employment had positive bivariate correlations with acceptance under the original scoring (r = .356, .420 and .293, respectively). Their non-significant conditional coefficients do not show that these benefits are less important to beneficiaries than environmental outcomes. HTMT = .964 for economic benefits and employment; 13 cross-loading items; two weak items; and marginal reliability for the original economic score constrain separation of these domains (Appendix A). VIF values below common cutoffs address linear dependence among composite scores, not discriminant validity. The exploratory combined livelihood/opportunity score had adequate internal consistency but was not uniquely associated with reduced acceptance after adjustment (Table 5A); this does not establish that livelihood considerations are unimportant. Rescoring in the same sample can capitalize on chance, and no causal or construct-validity claim follows from the alternate model.

The supplementary income split showed no adjusted differences, but it is weakly aligned with the main question and has limited power and information. It should not be used to claim distributional equity or equivalent project effects. Practitioners may find it useful to ask beneficiaries how they perceive resource use and environmental practices alongside livelihood returns. The survey does not show that emphasizing environmental messages would increase acceptance. Evaluation should pair perceptions with independently recorded outputs, costs, jobs, income, water or input use, and repeated acceptance measures to test whether the proposed account has practical validity.

Scope of Program and SDG Claims
The projects were framed around livelihoods and sustainable agribusiness, themes relevant to SDG 1 and SDG 2. This survey measured neither poverty transitions nor food security, yields or verified environmental change. Its contribution is about perceived benefits and acceptance among respondents; program impact requires baseline and follow-up outcomes, credible comparisons, and project-specific indicators. No inference about poverty reduction or Zero Hunger follows from the reported associations.

Implications for Evaluation
Future evaluations can test whether perceived environmental practice is linked to acceptance after measuring resource use and implementation quality independently. They should also assess whether trust, reciprocity and legitimacy mediate any longitudinal relationship, rather than assuming these mechanisms from the present coefficient. Project-balanced recruitment, nonresponse information, and item-level checks of measurement comparability are required before meaningful project contrasts. A larger fertigation sample is especially necessary.

5. Conclusion and Recommendations

Among 139 surveyed beneficiaries with complete original composites, perceived environmental benefits had the only statistically significant conditional association with project acceptance in the four-score regression. A reduced-score exploratory model also showed a positive environmental association among 140 cases, but the reduced scales require validation in a new sample. The results are associations among contemporaneous self-reports, not evidence that environmental practice causes acceptance or that the program achieved economic, food-security or environmental impacts. The non-significant socioeconomic coefficients do not establish that these benefits are unimportant.

The study contributes a bounded account of acceptance across four Malaysian agribusiness social innovation settings and exposes a measurement challenge in distinguishing economic benefits from employment opportunities. Unequal coverage of the initial project targets, particularly the five respondents from Smart Green Chilli Fertigation, restricts project-specific inference. Complete item-level reporting, scale validation in an independent sample, and longitudinal evidence with independently measured outcomes are needed before stronger theoretical or program claims can be made.

Limitations and Future Research
The cross-sectional design cannot establish direction. Acceptance may shape reported benefits, benefits may shape acceptance, both may develop together, or a third factor may influence both. The proposed exchange and legitimacy mechanism remains untested.

All central scores came from one paper questionnaire administered at one time. An unrotated first-component check and the exclusion of two overlapping environmental items did not eliminate the observed association, but neither check can establish that common-method bias was absent. Shared response tendencies, item wording, and survey context may still contribute to the environmental-benefit–acceptance relationship. Independent sources and separated measurement occasions would strengthen future work.

The 142 respondents represented 35.5% of the initial combined target of 400, with project-specific target coverage of 57%, 44%, 36% and 5%. Because the numbers remaining eligible at project completion were not recorded, survey response rates cannot be calculated. The views of those who withdrew earlier and of continuing participants who did not respond are unknown. Project indicators cannot remove this selection concern or establish common measurement meaning and slopes across interventions. Five fertigation respondents preclude a stable project-specific association estimate.

The researcher-developed instrument had 13 items with at least two absolute factor loadings of .30 or greater and two items with no loading of .40 or greater in the complete-case five-factor analysis (Appendix A). The original EB–EO HTMT ratio of .964 and the economic score's $\alpha = .679$ and $\omega = .706$ limit the interpretation of their separate coefficients. The exploratory combined livelihood/opportunity score and reduced environmental and acceptance scores yielded a similar directional environmental association, but this same-

sample exercise does not validate either the revised items or their factor structure. All structural coefficients remain exploratory pending theory-led refinement and independent validation. The supplementary income split discarded ordinal information, and personal income did not measure household status or program-related earnings. The achieved sample and four intervention types limit transportability beyond surveyed beneficiaries.

The item-level results in Appendix A and exploratory rescoring in Table 5A can guide a theory-led reassessment of livelihood, environmental and acceptance items. The suggested omissions and combined livelihood score require independent confirmation; factor loadings alone are insufficient grounds for moving a usability item into an environmental construct. Project-specific descriptive results are available for the three larger groups, but larger and more balanced samples are required for project comparisons and measurement-invariance testing. Longitudinal data and independently recorded environmental and livelihood outcomes would permit stronger tests of direction and program effects.

Declaration of Competing Interest: The authors declare no competing interests.

Funding: This research received financial and institutional support from Yayasan Inovasi Malaysia and Universiti Teknologi MARA under Consultation Grant Reference 20230117003. YIM specified the impact-assessment requirements and reviewed and approved the purpose-built questionnaire.

Acknowledgement: The authors acknowledge the institutional support provided by Yayasan Inovasi Malaysia (YIM) and Universiti Teknologi MARA (UiTM), as well as the time and cooperation of beneficiaries from the four MyIS Community 2021–2022 agribusiness projects.

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Appendix A Item-Level Factor Loadings and Communalities

Table A1 reports the survey items.

Note. CP = community productivity; EB = economic benefits; EO = employment opportunities; EN = environmental benefits; PA = project acceptance. n = 132 complete cases. Five-factor maximum-likelihood exploratory factor analysis of standardized items with varimax rotation; factor columns are descriptively matched to the proposed groups, and signs are oriented to positive mean loadings within each group. h^2 is the sum of squared loadings across the five factors. The largest absolute loading in each row is bold. Cross = at least two absolute loadings ≥ .30; Weak = no absolute loading ≥.40; Other factor = the strongest loading is outside the proposed group. All primary and secondary loadings are shown, including negative values. Values outside the valid 1–5 response range were treated as missing. The original questionnaire includes an additional income-generation motivation item that was not in the three-item EB score.

Table A1: Factor Loadings and Communalities

Item	English questionnaire wording	CP	EB	EO	EN	PA	h^2	Flag
CP01	My current skill/knowledge helps me to improve the quality of my task/work.	**0.838**	-0.095	0.221	0.052	0.028	0.764	—
CP02	My current skill/knowledge helps me improve my productivity.	**0.892**	0.118	0.097	0.093	0.048	0.829	—
CP03	My current skill/knowledge helps me to accomplish more task/work than would otherwise be possible.	**0.749**	0.062	0.126	0.127	0.096	0.606	—
CP04	My current skill/knowledge helps me perform my task/work better.	**0.808**	0.027	0.169	0.135	0.182	0.733	—
CP05	My current skill/knowledge helps me reduce my stress.	**0.514**	0.353	0.119	0.219	0.015	0.451	Cross
CP06	My current skill/knowledge helps me overcome any challenges.	**0.553**	0.388	-0.096	0.182	0.230	0.551	Cross
CP07	My current skill/knowledge helps me get many benefits (income, time flexibility, and family).	**0.582**	0.465	0.196	0.119	0.093	0.616	Cross
CP08	I'm happy with my current skill/knowledge that can efficiently enhance my task/work productivity.	**0.660**	0.308	-0.154	0.127	0.148	0.592	Cross
EB01	I believe that my income can be increased by joining this project/business.	0.243	0.378	**0.445**	0.154	0.138	0.442	Cross, Other factor
EB02	The project/business contributes to the economic development of the community.	0.182	0.221	**0.574**	0.318	0.233	0.567	Cross, Other factor
EB03	I am happy with my current level of income.	0.148	**0.359**	0.282	0.273	-0.053	0.308	Weak
EO01	I will hire a few people to assist me in running the project/business smoothly.	0.176	**0.719**	0.230	0.048	-0.028	0.603	Other factor
EO02	I am involved in this project/business to help people who are unemployed.	0.111	**0.577**	0.534	0.023	-0.026	0.632	Cross, Other factor
EO03	I am happy that this project/business creates jobs for people in the community.	0.150	0.161	**0.820**	0.251	0.154	0.806	—
EO04	This project/business can potentially be expanded.	0.198	0.033	**0.741**	0.140	0.205	0.651	—
EN01	I believe that this project is environmentally friendly.	0.237	-0.129	0.196	**0.496**	0.462	0.570	Cross
EN02	I trust this project because of its environmental image.	0.158	-0.149	0.273	0.321	**0.448**	0.426	Cross, Other factor
EN03	The quality of this project is reliable with respect to environmental considerations.	0.118	0.022	0.152	**0.451**	0.399	0.400	Cross
EN04	It is a right decision to be part of the project because of its environmental functionality.	0.147	-0.007	0.265	**0.748**	0.242	0.710	—
EN05	I am happy with the involvement of this project in the conservation of my living environment.	0.074	0.107	0.150	**0.877**	0.138	0.828	—
EN06	I am happy with this project's involvement in environmental monitoring and care.	0.163	0.081	0.089	**0.868**	0.196	0.834	—
PA01	This project is easy to use.	0.101	-0.100	-0.067	**0.426**	0.380	0.350	Cross, Other factor
PA02	I find this project useful in my daily life.	0.125	-0.020	0.142	**0.374**	0.300	0.266	Cross, Weak, Other factor
PA03	I think this project is a wise idea.	0.114	-0.022	0.193	0.255	**0.617**	0.496	—
PA04	I think this project is affordable.	0.128	0.234	0.092	0.353	**0.484**	0.439	Cross
PA05	Looking at project benefits, I am happy to use it.	0.167	0.062	0.182	0.279	**0.778**	0.748	—
PA06	If I have access to this project, I am happy to use it.	0.099	0.012	0.155	0.282	**0.634**	0.516	—