

The role of perceptions in adoption of cricket farming for improved food security and livelihoods

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Abstract

This study assesses the relationship between farmers' positive, negative, and food insecurity perceptions and the likelihood of cricket farming adoption. Using data from a cross-sectional survey of 892 rural households in western Kenya, we employ a logistic regression for analysis. The model controls for several observable covariates, including age, sex, education, access to credit, livelihood source, distance to nearest market, household size, and land under cultivation. The results show that a positive perception of the benefits and ease of implementing insect farming is associated with a higher increased likelihood of adopting of cricket farming, whereas negative perception of its pecuniary and non-pecuniary costs correlated with a lower likelihood of adoption. The findings suggest that households are less likely to adopt cricket farming if they are uncertain about its benefits or perceive it as difficult to implement. Conversely, when farmers view cricket farming as beneficial and easy to implement, they are more likely to engage in the practice. These insights can inform policy interventions aiming at fostering a favorable attitude toward cricket farming by highlighting both its benefits and technical challenges, enabling farmers to make informed decisions.

Key words: perception, insect farming, adoption, Kenya

1. Introduction

Globally, the demand for animal-derived protein is expected to double by 2050 given the unprecedented population growth, increasing consumer income and urbanization among other drivers [1–3]. This rising demand will negatively impact food systems by increasing greenhouse gas emissions, intensifying land use, and disrupting ecosystem balance [4]. Sub-Saharan Africa (SSA) where climate change effects already exacerbate food insecurity will be mostly affected [5–7]. Meeting the growing demand sustainably requires an effective policy framework to drive a fundamental transformation of food systems, improving food security and nutrition [8]. Conventional animal-based protein sources have a high carbon footprint and require intensive resources for production [9]. Therefore, there is a growing urgency to explore alternative animal protein sources [7,10].

Edible insects, such as crickets, have been promoted as a sustainable alternative source of animal protein due to their high nutritional value, resilience to climate change, low resource requirement, and minimal environmental footprint [11–13]. Many people in Africa consume insects collected from the wild [14]. For instance, in Kenya, particularly in western part, majority of people have been consuming insects for generations. Nevertheless, the spread of Westernized diets, loss of biodiversity and rising consumer incomes have negatively affected this culture. Over the past decade, insect farming has resurged with an aim of addressing some of the existing challenges. Significant efforts to develop rearing protocols, production materials, diets, and farming systems have been made particularly for crickets [16, 17]. To improve acceptability, food products have been fortified with cricket flour to foster positive perceptions [18,19]. Efforts in value addition have led to the development and promotion of cricket-based food products such as biscuits, protein energy bars, chips, fritters, waffles, porridge, crackers and pasta [18,20]. Utilizing insects such as crickets as a human food source holds great potential for addressing malnutrition and enhancing livelihoods, especially amongst rural households, who are often vulnerable to multiple shocks, including climate hazards such as droughts and flooding [13,14,21,22].

Despite concerted efforts to promote insects as a food resource, the adoption of insect farming, including cricket farming, for household consumption remains low [23,24]. This is the case in western Kenya where majority of smallholders grapple with malnutrition and food insecurity challenges that are exacerbated by increasing soil infertility, changing weather conditions and limited farming resources [25]. As insect farming is considered a new agricultural technology, existing literature on adoption of agricultural technologies can help explain the low adoption. Personal, cultural, social, economic, and technology-related factors have been reported to drive adoption of agricultural technology [26–28]. However, less attention has been given to psychological factors, limiting our understanding of the relationship between factors such as perception, and adoption of insect farming.

This study examines the relationship between rural households' decisions to adopt cricket farming and their positive, negative, and food insecurity perceptions. Perception refers to farmer's subjective judgment about the technicalities of using a particular technology [29]. Negative perception relates to individuals' unfavorable belief that a particular technology is difficult to use or will not benefit them much [30,31]. Conversely, positive perception or perceived benefit refers to an individual's belief that the outcomes of a given behavior will be positive [32]. Food insecurity perception refers to an emotional or psychological notion that one may not freely access the food

44 one needs to conduct a healthy, active and dignified life due to limited or lack of essential resources
45 [33-36]. While most studies focus on extrinsic factors influencing the adoption of agricultural
46 technologies, the role of intrinsic variables – particularly perceptions, in the context of insect
47 farming remains unexplored. The adoption of new agricultural technologies is generally a complex
48 process [27,37]. Individuals may evaluate a technology based on acquired knowledge, assess its
49 benefits, weigh the associated risks, and develop an attitude for or against its adoption [38,39].
50 Farmers' perception of the pecuniary and non-pecuniary benefits, costs and technicalities
51 associated with a practice have been linked to agricultural technology adoption [40]. Therefore,
52 understanding whether perceived benefits and negative perception influence adoption behaviors
53 in the context of cricket farming is essential.

54 Some studies have examined the determinants of cricket farming adoption among
55 smallholder farmers [11,23,41,42]. However, the findings are insufficient, ambivalent and
56 inconclusive, making it difficult to inform major policy decisions. For instance, Halloran *et al.*
57 [23] investigated factors influencing awareness and interest in adopting cricket farming,
58 identifying key determinants such as proximity to a cricket farm, access to agricultural
59 information, consumption of animal-source foods and fruits, farm size, frequency of visits to
60 extension offices, risk aversion, and prior experience with insect consumption. However, study's
61 small sample size and non-random sampling limit the external validity. Oloo *et al.* [42] analyzed
62 the socio-economic determinants of cricket farming in Lake Victoria region but provided only
63 descriptive statistics, failing to quantify the correlation between socio-economic and cultural
64 factors and the adoption of cricket farming. Similarly, Oyaro [41] examined the determinants of
65 cricket consumption acceptability, highlighting the influence of age, cultural beliefs, perceptions,
66 and attitudes. However, the study lacks clarity in its measurement of perception. Musungu *et al.*
67 [11] explored socio-economic and institutional factors influencing cricket farming adoption,
68 noting that distance to main road, group membership, insect consumption, and the provision of
69 rearing equipment affects cricket farming, albeit after training. Nonetheless, the study focused
70 solely on the market aspect of the cricket value chain and relied on non-random sampling,
71 introducing potential bias.

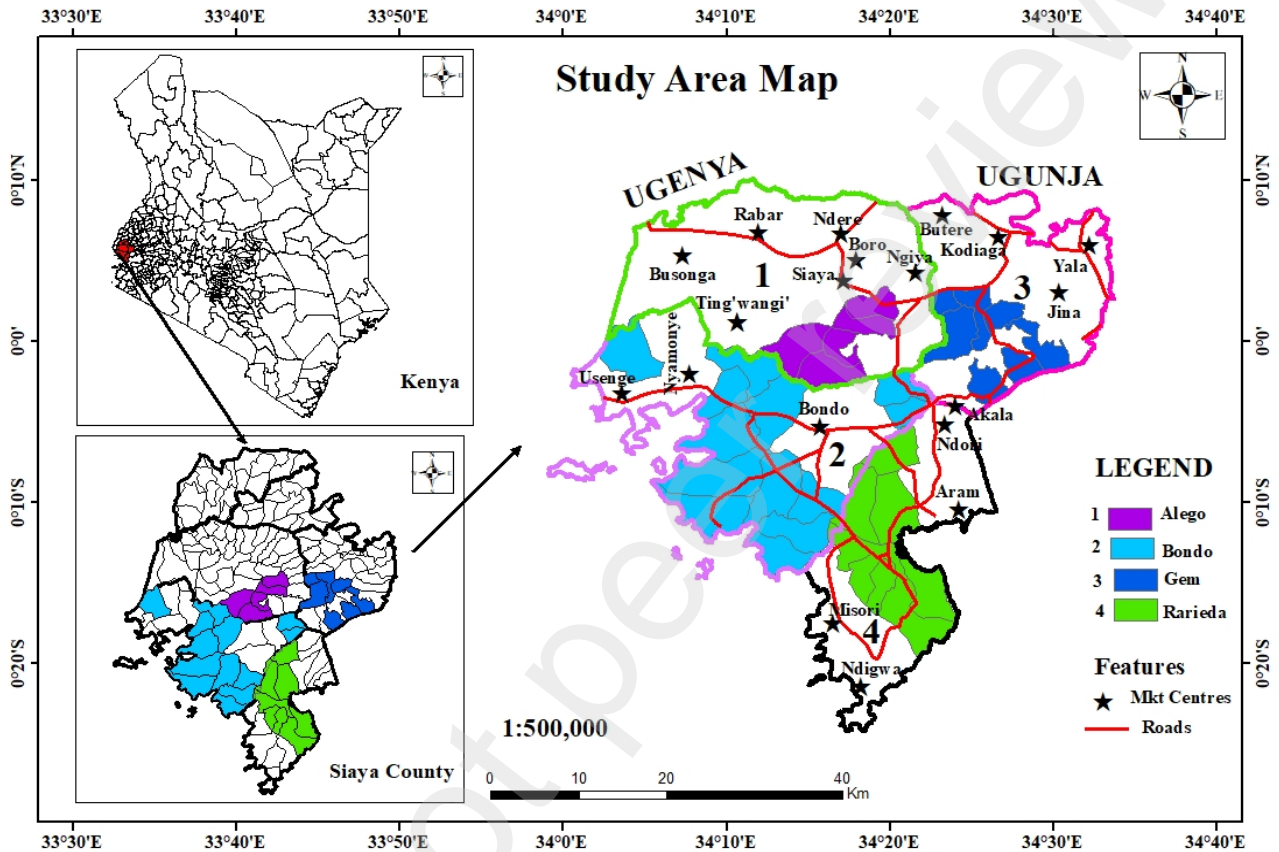
72 Our study contributes to the literature by addressing key limitations of previous research. We
73 employ a larger, randomly selected sample to examine the role of perception in cricket farming, a
74 topic currently lacking in the literature. Additionally, unlike previous research, we incorporate
75 both observed adoption outcomes alongside and self-reported data, providing a more
76 comprehensive understanding on the relationship between adoption determinants and actual
77 adoption behavior. Moreover, our study is conducted in a context where efforts have been made
78 to create awareness about cricket farming, thereby mitigating the technology non-exposure bias
79 prevalent in previous studies [43].

80 **2.0 Materials and methods**

81 *2.1 Description of the study area*

82 The study was conducted in western Kenya and covered four sub-counties in Siaya county
83 including Alego, Rarieda, Gem, and Bondo. Farming is the main source of livelihood for most
84 households in the region. A culture of consuming insects through wild collection is common in
85 the region [44–46]. The average farm size per smallholder farmer is 1.1 hectares and maize is the
86 main staple crop in the area. About 80% of households in Siaya county are food insecure and 25%

87 have experienced stunting [25]. A paradigm shift is needed to improve the food insecurity situation
 88 in the region. This study is part of such efforts aimed at promoting cricket farming and processing
 89 as a food diversification strategy to improve food security and livelihoods among smallholder
 90 farmers.
 91



92 **2.2 Sample frame and data collection**

93 Data were collected through a household survey between November and December 2023.
 94 The sampling frame comprised of 892 farmers who were part of the 1056 farmers that were
 95 previously randomized and later exposed to a cricket farming intervention through training.
 96 Additional details about the intervention study design can be found in Alemu *et al.* [47]. A team
 97 of trained enumerators conducted computer assisted personal interviews with the household heads,
 98 using a closed ended, semi-structured questionnaire that was programmed in research electronic
 99 data capture (REDCap) [48]. Interviews were conducted in the local language. Prior to the survey,
 100 the questionnaire was pretested and revised accordingly. Data on food insecurity perception,
 101 positive and negative perception about insect farming and other socio-economic and demographic
 102 factors were collected.

103 **2.3 Measurement of variables**

104 The purpose of the study is to examine the relationship between adoption of cricket farming
 105 and farmers' perception. To determine whether farmers successfully adopt cricket farming, they
 106 are asked if they are still farming crickets post-intervention. The adoption variable takes a value
 107 of one if the farmer is farming crickets and zero otherwise. Additionally, adoption intensity is

108 measured by capturing the number of adult crickets produced by each farmer during data
109 collection. The main explanatory variables of interest include food insecurity perception, positive
110 and, negative perceptions about insect farming. To measure insect farming perceptions, farmers
111 responded to 10 statements, each rated on a 5-point Likert-scale (ranging from 1 = strongly
112 disagree to 5 = strongly agree), indicating the extent to which they agreed with each statement.
113 The 10 statements (see Table A1) covered aspects such as market availability, yield, access to
114 capital, production cost, income potential, benefits, adaptability, space requirements, and difficulty
115 of insect farming. To construct the perception variables, we performed principal component factor
116 (PCF) analysis and extracted the factor scores (see also Mihiretu *et al.* [49] and Somanje *et al.*
117 [50]).

118 To assess the suitability of the insect farming perception statements for factor analysis, we
119 applied Bartlett's test of sphericity and Kaiser-Meyer-Olkin (KMO) measure of sampling
120 adequacy, as applied by Okello *et al.* [51] and Lagerkvist *et al.*[52]. The KMO value fell within
121 the recommended threshold (0.6 to 1) and Bartlett's test of sphericity was significant, indicating
122 that all the items within each factor had significant relationships (Table A4), justifying further
123 analysis. Since perception is a latent variable, we employed principal component factor (PCF)
124 analysis to examine correlations among the constructs. The PCF retained two factors
125 corresponding to positive and negative perception, with high loading (>0.5) for both factors and
126 eigen values of 3.09 and 1.42 for positive and negative perceptions, respectively (Table A2-A3;
127 Fig A1). Components contributing to a positive perception included: "an insect farm will have
128 high yield", "the initial amount of start-up capital for insect farming is low", "insect farming will
129 provide me with a personal benefit, "insect farming is adaptable to the climatic conditions of my
130 farm", and "insect farming requires little space". Conversely, components contributing to a
131 negative perception included "insect farming requires high production cost", "insect farming does
132 not provide a sustainable income", "insect farming is difficult and requires much training and
133 knowledge", and "there is insufficient access to and availability of insect farming tools".

134 The food insecurity perception is measured as guided by the Rasch model procedure framed
135 to define the eight-item food insecurity experience scale (FIES) [35]. Household heads are asked
136 to respond to an 8-item questionnaire outlining their experiences for the 12 months recall period.
137 This depicts their inability to access healthy food due to lack of money or other resources. Each
138 question is a yes or no taking a binary variable equal to 1 if the household had a food insecurity
139 experience or 0 otherwise. We then do a summation across all the eight items for every household.
140 In addition to the perceptions variables, socioeconomic and demographic factors are included as
141 control variables in our econometric analysis (section 2.5). These factors included household
142 head's age (in years), gender (female = 1, male = 0), years of formal education completed, whether
143 the household received credit, whether the household received off-farm income, distance to nearest
144 market (km), household size, and cultivable land (ha).

145 2.5 Econometric estimation

146 Our econometric analysis is based on the random utility theory, which assumes that economic
147 agents, such as smallholder farmers, will adopt a given technology if the satisfaction derived from
148 adoption exceeds that of non-adoption [40]. We argue that estimating the relationship between
149 farmers' perception and their adoption decisions regarding cricket farming may be constrained by
150 endogeneity and reverse causality, given the complex relationships that may exist between
151 perception, control factors and adoption variables. To address these challenges, we focused on the

152 correlation between explanatory variables and cricket farming adoption among farmers. Since the
 153 response variable is binary, we employed a logit regression model to analyze the correlation,
 154 estimating the corresponding marginal effects to facilitate results interpretation. To enhance
 155 precision, we systematically incorporate additional control variables into the model. Furthermore,
 156 to verify the robustness of results, we also applied a linear probability model (LPM). The estimated
 157 model is as follows:

$$158 \quad Y_i = \beta_0 + \beta_1 neperc_i + \beta_2 poperc_i + \beta_3 rp_i + \beta_4 X_{ki} + \beta_5 village + \varepsilon_i \quad (1)$$

159 Where Y_i is the dependent variable equal to 1 for adopting household i (i.e. household who at the
 160 time of survey was rearing crickets) and $Y_i = 0$ for a non-adopter (i.e. household not rearing crickets
 161 at the time of survey); $neperc_i$ is the negative perception score for the i^{th} household; $poperc_i$ is
 162 the positive perception score for the i^{th} household; rp_i is risk perception dummy and X_{ki} is a set of
 163 socio-economic and demographic variables. $\beta_1 - \beta_5$ represent the coefficients being estimated.
 164 Village represents village-level dummies that capture geographical and biophysical characteristics,
 165 which may also influence cricket farming adoption decisions. We first performed stepwise
 166 inclusion of important variables, and later added other variables, including the village-level
 167 dummies. We also clustered standard errors at the village level, as farmers residing in same village
 168 are likely to share unobserved effects.

169 Furthermore, to examine the relationship between perception and adoption intensity, we fit a
 170 standard ordinary least square (OLS) regression model, using the total amount of crickets
 171 harvested by the households as the dependent variable.

$$172 \quad Y_i = \beta_0 + \beta_1 neperc_i + \beta_2 poperc_i + \beta_3 rp_i + \beta_4 X_{ki} + \beta_5 village + \varepsilon_i \quad (2)$$

173 Where Y_i is the amount of crickets (continuous) harvested by household i . The rest of variables
 174 included in the model are as outlined in equation (2).

175 To examine potential heterogeneity among farmers, we conducted a heterogeneity analysis by
 176 interacting perception variables with other variables, such as whether farmers generated off-farm
 177 income and whether they borrowed money from others (Eqn 3). The interaction terms are then
 178 estimated using the linear probability model.

$$179 \quad Y_i = \beta_0 + \beta_1 neperc_i + \beta_2 poperc_i + \beta_3 rp_i + \beta_4 nec_i * cred_i + \\
 180 \quad \beta_5 poc_i * cred_i + \beta_6 nec_i * ofar_i + \beta_7 poc_i * ofar_i + \beta_8 ofar_i + \beta_9 cred_i + \\
 181 \quad \beta_{10} village + \beta_n V_{ki} + \varepsilon_i \quad (3)$$

182 Where Y_i is the same outcome measure as in (1), $nec_i * cred$ is the interaction between negative
 183 perception score and credit access, $poc_i * cred$ is the interaction between positive perception score
 184 and credit access, $nec_i * ofar$ is interaction between negative perception score and off-farm
 185 income, $poc_i * ofar$ is interaction between positive perception score and off-farm income, V_{ki} are
 186 interactions between food insecurity perception and on-farm income and credit access, $\beta_1 - \beta_n$ are
 187 the coefficients for correlation between the variables.

188 2.5. Robustness Checks

189 The results remained robust across different models and variable specifications (see Table 2).
190 Both the linear probability and ordinary least squares models confirm the importance of perception
191 variables in the adoption of cricket farming, although risk perception is insignificant in the final
192 model. The results also remained robust after controlling for household characteristics, and
193 geographic (village-level) information, and clustering standard errors at the village level. This is
194 crucial, as topographic variations are expected to influence the distribution and accessibility of
195 agricultural technologies

196 **3.0 Results**

197 *3.1 Descriptive Findings*

198 Table 1 presents summary statistics for the variables used in the analysis. At the time of the
199 survey, 38% of the farmers had adopted cricket farming while 62% remained non-adopters.
200 Positive perception scores are significantly higher (p -value < 0.1) among adopters compared to
201 non-adopters. On the other hand, negative perception scores are considerably lower among
202 adopters than non-adopters (p -value < 0.01 for negative perception). The mean food insecurity
203 perception is about 6 and approximately 53% are anxious about accessing food due to lack of
204 resources. More than 60% of the surveyed households are headed by women, likely due to
205 selection criteria that require households with primary caregivers for inclusion in the survey. There
206 is no significant statistical difference between adopters and non-adopters in terms of sex,
207 household size, education, asset ownership, cultivable land or age ($p > 0.05$). The mean household
208 size is six members, and the average age is 42 years, respectively. A significantly lower
209 proportion of adopters engage in off-farm activities compared to non-adopters (p -value < 0.05).
210 Additionally, a significantly higher proportion of adopters (63%) had borrowed money compared
211 to non-adopters (54%). While the results presented in Table 1 are meaningful and align with
212 expectations, it is important to note that the sample size for adopters is much smaller than that of
213 non-adopters, which may affect the mean difference tests shown in the last column of that tab

214

215 **Table 1: Summary statistics for variables**

Description of variables	Population Mean (SD)	Non-adopter Mean (SD)	Adopter Mean (SD)	Mean difference	<i>p</i> -value
Positive perception about insect farming (scores)	0.26(0.79)	0.22(0.81)	0.32(0.75)	-0.097	0.07*
Negative perception about insect farming (scores)	-0.03(0.76)	0.03(0.74)	-0.12(0.76)	0.158	0.00***
Food insecurity perception (1-8)	6.60(2.44)	6.57(2.41)	6.58(2.50)	-0.011	0.94
Household head is female (1=yes, 0=otherwise)	0.62(0.49)	0.64(0.48)	0.60(0.49)	0.039	0.25
Household size	2.44(0.37)	2.44(0.38)	2.44(0.36)	0.002	0.93
Household head education (above secondary =1, 0 otherwise)	0.31(0.46)	0.32(0.47)	0.28(0.45)	0.035	0.28
Asset ownership (number of non-agricultural assets owned)	4.97(1.42)	4.95(1.48)	5.06(1.32)	-0.105	0.27
Cultivable Land (ha)	1.37(1.58)	1.35(1.56)	1.39(1.62)	-0.044	0.69
Age of household head in years	42.99(13.67)	43.28(13.69)	42.5(13.65)	0.781	0.41
Distance to nearest market from homestead (km)	3.93(0.62)	3.95(0.62)	3.89(0.62)	0.068	0.11
Household has borrowed	0.57(0.50)	0.54(0.50)	0.63(0.48)	-0.089	0.01***
Household received off-farm income	0.17(0.38)	0.19(0.40)	0.14(0.35)	0.056	0.03**
Number of observations	892	558	334		

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217 **Notes:** The t-test provides mean differences and significant levels between the adopters and non-adopters. *, **and *** indicate significance at 10%, 5% and 1%
218 level, respectively. SD is standard deviation

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3.2 Empirical results and discussion

222 Table 2 shows the results of the regression analysis assessing the relationship between farmers'
223 perceptions and the adoption of cricket farming. The findings revealed that a positive perception
224 of insect farming correlates with a higher likelihood of adopting cricket farming and greater use
225 intensity, while a negative perception reduces the likelihood of adoption. Specifically, a unit
226 increase in the positive perception score correlates with an approximately 0.1 increase in the
227 probability of adopting cricket farming. Conversely, a unit increase in the negative perception
228 score correlates with an approximately 0.1 decrease in the probability. These results align with
229 prior expectations and supports previous studies linking positive perception or perceived benefits
230 to improved adoption decisions and negative perceptions to a reduction in adoption of new
231 technologies [40,53–56]. This suggests that when farmers are less certain about the benefits of
232 cricket farming or perceive it as burdensome to practice, they are less likely to adopt it. Conversely,
233 when they believe that it is beneficial and easy to implement, adoption is more likely. This
234 resonates with the findings of other researchers who argue that positive perception shapes attitude
235 toward adopting new technologies, ultimately influencing their actual use [57–59]. Food
236 insecurity perception negatively correlates with adoption decisions, albeit the relationship is
237 insignificant.

238 Other results indicate that credit access has a significant positive relationship with the
239 adoption of cricket farming, increasing the likelihood of adoption by approximately eight
240 percentage points. This suggests that credit access plays crucial role in enabling farmers to adopt
241 cricket farming, thereby improving their productivity, livelihoods. In general, access to credit
242 allows farm households to acquire essential farm inputs and expand agricultural production. Since
243 cricket farming is a relatively new venture, many households remain uncertain about the required
244 inputs and resources, perceiving it as a risky venture. As a result, farmers with access to additional
245 funding may be more likely to adopt the practice. This results confirm those of Udimal *et al.* [60]
246 and Simtowe & Zeller [61], who found that credit access facilitates the adoption of risky
247 agricultural technologies. Similarly, credit access is essential for climate-smart agricultural
248 technologies, as it mitigates risk aversion and alleviates liquidity constraints among rural
249 households [62,63].

250 Furthermore, off-farm income is negatively correlated with cricket farming adoption, contrary
251 to expectations. Participation in off-farm activities correlates with an 11 percentage points decline
252 in the likelihood of adoption. While off-farm income can serve as a livelihood diversification
253 strategy, allowing farmers to invest in their farms to enhance productivity [64], some smallholder
254 farmers perceive cricket farming as a labor-intensive and time demanding venture. Therefore a
255 shift toward off-farm income sources contributes to its lower adoption rates [65,66]

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Table 2: Effect of Perception on Adoption of cricket farming

Variable	Logit (Marginal effects)	LPM	OLS
	Farmer rearing crickets or not	Farmer rearing crickets or not	Number of crickets harvested
Positive perception about insect farming	0.067 (0.028)**	0.063 (0.029)**	0.158 (0.129)
Negative perception about insect farming	-0.058 (0.028)**	-0.050 (0.028)*	-0.139 (0.109)
Household food insecurity perception	-0.001 (0.010)	-0.001 (0.010)	-0.018 (0.028)
Household head is female	-0.048 (0.033)	-0.048 (0.034)	-0.103 (0.166)
Household size (natural log)	-0.018 (0.037)	-0.019 (0.039)	-0.125 (0.258)
Household head education	-0.071 (0.039)*	-0.069 (0.039)*	-0.199 (0.205)
Asset ownership	0.012 (0.015)	0.011 (0.014)	-0.024 (0.070)
Cultivable land (natural log)	0.001 (0.021)	-0.000 (0.015)	0.041 (0.065)
Age of household head in years	-0.001 (0.001)	-0.001 (0.001)	-0.005 (0.006)
Distance from the market (natural log)	-0.012 (0.035)	-0.012 (0.036)	-0.124 (0.112)
Household received credit	0.089 (0.031)**	0.081 (0.032)**	0.192 (0.196)
Household received off-farm income	-0.115 (0.053)**	-0.099 (0.053)*	0.053 (0.286)
Village indicators	Yes	Yes	Yes
Constant	0.852 (1.079)	0.605 (0.194)**	4.304 (0.898)**
R squared	0.270	0.263	0.531
Number of observation	836	878	310

Note: Estimates from logit, linear probability models (LPM), and ordinary least squares regression (OLS). Village indicators include geographical and biophysical characteristics. The columns show estimates for variables used in the model and village fixed effects. Standard errors are clustered at village level and given in parentheses. Asterisks: *, ** and *** indicate statistical significance at 10%, 5% and 1%, respectively.

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261 3.2.1 Heterogeneity results

262 In this section, we examine heterogeneity in adoption based on key covariates (Table 3). The
263 results suggest an interaction effect between credit access and a positive perception of insect
264 farming. Specifically, these two variables interact negatively, meaning that farmers with a positive
265 perception of insect farming are less likely to have access to credit, which could negatively affect
266 adoption. Since the interaction term cannot be interpreted independently from the main effect, the
267 overall (summed) effect of the interaction term and the main effect coefficient on positive
268 perception remains positive. In other words, among farmers without a credit access, a unit increase
269 in the positive perception score is associated with a 0.04 increase in the probability of adopting
270 cricket farming. This finding contrasts with previous research suggesting that a positive perception
271 enhances credit access, hence adoption [67]. In general, insect farming relies on locally-sourced,
272 inexpensive rearing materials [16,24,68]. More importantly, farmers remain uncertain about the
273 actual cost of production relative to its benefits [69]. As a result, they may not have a significant
274 need for credit to support insect farming. This suggests that positive perception remains a key
275 driver of adoption, independent of credit access. On the other hand, our results indicate little or no
276 interaction effects among the other variables, suggesting heterogeneity is limited to only a few
277 variables.

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Table 3: Heterogeneity results (Linear probability model)

	1	2	3	4
Adoption				
Positive perception about insect farming	0.097 (0.030)***	0.088 (0.031)***	0.104 (0.083)	0.066 (0.088)
Negative perception about insect farming	-0.061 (0.038)	-0.072 (0.039)*	0.031 (0.079)	-0.004 (0.072)
Food insecurity perception	0.001 (0.014)	0.000 (0.014)	0.004 (0.024)	0.005 (0.024)
Household head is female	-0.047 (0.034)	-0.047 (0.034)	-0.048 (0.034)	-0.050 (0.100)
Log (household size)	-0.021 (0.037)	-0.019 (0.038)	-0.019 (0.038)	-0.015 (0.037)
Household head education	-0.071 (0.038)*	-0.074 (0.039)*	-0.076 (0.038)**	-0.077 (0.038)**
Asset ownership	0.012 (0.015)	0.012 (0.015)	0.013 (0.015)	0.013 (0.015)
Log (cultivable land)	0.001 (0.021)	0.003 (0.021)	0.002 (0.021)	0.001 (0.022)
Age of household head in years	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.003)	-0.000 (0.003)
Log (distance from the market)	-0.015 (0.034)	-0.018 (0.033)	-0.018 (0.034)	-0.016 (0.034)
Household received credit	0.119 (0.091)	0.126 (0.093)	0.129 (0.093)	0.129 (0.096)
Household received off-farm income	-0.116 (0.055)**	-0.178 (0.071)**	-0.168 (0.080)**	-0.141 (0.080)*
Positive perception* credit Access	-0.051 (0.039)	-0.052 (0.040)	-0.058 (0.042)	-0.065 (0.040)
Negative Perception* credit Access	0.005 (0.051)	0.000 (0.050)	-0.010 (0.052)	-0.011 (0.051)
Food insecurity perception * credit Access	-0.002 (0.013)	-0.003 (0.013)	-0.003 (0.013)	-0.002 (0.013)
Positive perception* off-farm		0.060 (0.078)	0.062 (0.078)	0.065 (0.077)
Negative Perception*off-farm		0.096 (0.059)	0.089 (0.057)	0.091 (0.057)
Food insecurity perception * off-farm		0.009 (0.010)	0.008 (0.012)	0.004 (0.012)
Positive perception* age			-0.000 (0.001)	0.000 (0.001)
Negative Perception* age			-0.002 (0.001)	-0.002 (0.001)
Food insecurity perception * age			-0.000	-0.000

Positive perception* female			(0.000)	(0.000)
				0.063
				(0.043)
Negative Perception*female				0.060
				(0.056)
Food insecurity perception* female				-0.002
				(0.014)
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Village Indicators	Yes	Yes	Yes	Yes
Constant	0.700	0.704	0.742	0.748
	(0.199)***	(0.195)***	(0.200)***	(0.198)***
R squared	0.266	0.270	0.272	0.274
Number of observations	836	836	836	836

297 Note: Standard errors clustered at the village level in parentheses. The columns show estimates for interaction effects of perception
 298 Indicators in different covariate inclusion. Asterisks: *, **and*** indicate statistical significance at 10%, 5% and 1%, respectively
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320 **4.0 Conclusion and Recommendation**

321 The aim of the study was to assess the relationship between farmers' perceptions and the
322 likelihood of cricket farming adoption in western Kenya. We provided empirical evidence on how
323 different perception factors influence adoption. We employed an interdisciplinary approach,
324 integrating psychology and economics, to explore the link between farmers' cognitive perceptions
325 and adoption decisions of cricket farming in a rural setting. Our findings demonstrate that results
326 remain consistent and robust across different estimation strategies. We observed that a positive
327 perception significantly increases the likelihood of adopting cricket farming, while negative
328 perceptions significantly reduce it. Additionally, adoption is influenced by credit access and off-
329 farm income. These findings have important policy implications for promoting cricket farming
330 adoption. First, greater emphasis should be placed on continuous training and technical support to
331 enhance smallholder farmers' knowledge and experience, thereby encouraging adoption. Second,
332 farmers should be provided with incentives, in form of rearing resources or starter kits to nudge
333 them for enhanced adoption. While cricket farming relies on inexpensive, home-based resources,
334 many smallholder farmers perceive it as a resource-intensive, likely due to limited farming
335 experience – highlighting the need for financial support through credit access and off-farm income.
336 Third, our results suggest that agricultural policies aimed at promoting cricket farming should
337 address the benefits and challenges, ensuring that farmers have the necessary information to make
338 well-informed adoption decisions.

339 **5.0 Ethical Considerations**

340 The study adhered to the research ethics guidelines approved by Ethical Review Committee (ERC)
341 of Jaramogi Oginga Odinga University of Science and Technology (JOOUST).

342 **6.0 Acknowledgements**

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344 KU).

345 **7.0 Declaration of Conflict of Interests**

346 The authors declare no conflict of interest

347 **8.0 Data Availability**

348 Data will be made available on request.

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363 **Appendices**

364 **Table A1: Principal-Component Factor Loadings**

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Perception statements	Factor1	Factor2	Uniqueness
There is no market for selling insects	-0.177	0.444	0.771
An insect farm will have high yields	0.707	0.071	0.496
The initial amount of start-up capital for insect farming is low	0.535	0.163	0.687
The production costs related to insect farming are high	0.200	0.630	0.564
Insect farming does not provide a sustainable income	-0.064	0.715	0.485
Insect farming will provide me with a personal benefit	0.769	0.052	0.406
Insect farming is difficult and requires much training and knowledge	0.435	0.529	0.530
Insect farming is adaptable to the climatic conditions of my farm	0.686	0.145	0.509
Insect farming requires little space	0.748	0.043	0.439
There is insufficient access to and availability of insect farming tools	0.247	0.574	0.609

Table A2: Retained Factors

Factor	Variance	Difference	Proportion	Cumulative
Factor1	2.732	0.961	0.273	0.273
Factor2	1.771	.	0.177	0.450

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367 **Table A3: Factor Rotation Matrix**

	Factor1	Factor2
Factor1	0.887	0.461
Factor2	-0.461	0.887

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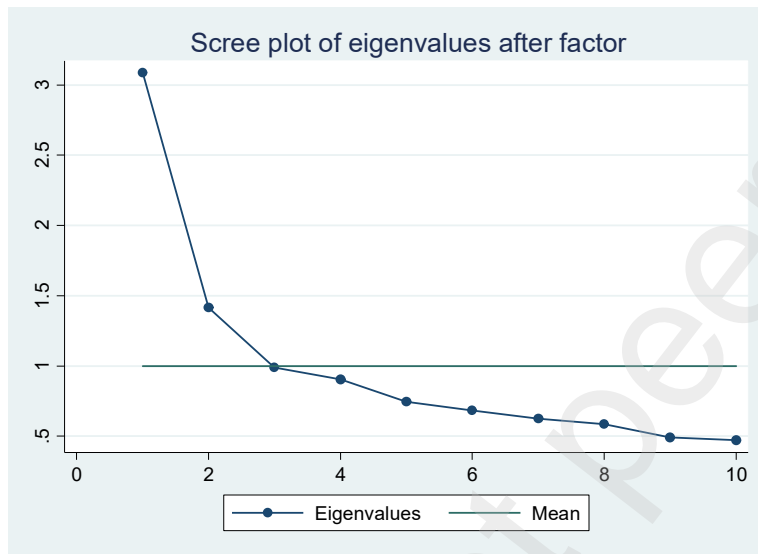
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375 **Table A4: Bartlett test of Sphericity and Kaiser-Meyer-Olkin (KMO)**
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Tests	Results
Bartlett test of Sphericity	P-Value: 0.000
Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO)	0.810

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381 *Figure A1: Eigenvalues for the Component Factors*

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