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Research Article

Determinants of household food insecurity in Tanzania: A Heckman approach

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ABSTRACT

Household food insecurity is a predominant issue in Tanzania, particularly affecting rural areas where poverty rates are higher. This problem can lead to poor nutritional quality and hinder mental, social, and economic development. The study utilized data from the 2017/18 Tanzania Household Budget Survey to analyse the determinants of food insecurity. Employing the Heckman approach to address the sample selection problem, the study found that household characteristics such as sex of the household head, location, education level, access to credit, household size, marital status, and income significantly reduce the problem of food insecurity among insecure groups. Male-headed, urban location, credit-accessible households and married heads were less food insecure compared to female-headed, rural location and households without access to credit, respectively. In addition, higher household income and education level, as well as smaller household size, positively impacted food expenditure among households. The findings suggest the need for improved credit services, formal education promotion, and targeted food programs, particularly in rural areas, to address household food insecurity effectively in Tanzania.

Key words: Household food insecurity, Determinants, Heckman approach, Tanzania

INTRODUCTION

In 2011/13, 12 percent of the global population, equivalent to 842 million individuals, faced challenges in meeting their nutritional energy requirements, compared to 925 million in 2010/2012. Approximately one in every eight people worldwide experiences chronic hunger, lacking adequate nourishment for an active and healthy lifestyle. During 2011/2013, the prevalence of undernourishment was estimated at 14.3% in developing countries, where the majority of individuals suffering from hunger reside (FAO *et al.,* 2014). Similarly, approximately 1.2 billion people struggle to meet their basic food needs each day, particularly impoverished rural subsistence farmers in developing nations IFAD (2016).

Despite extensive coverage in global media and social networks, alongside increased aid efforts from various institutions and organizations, household food insecurity persists in certain regions of the world, with many communities and societies grappling with daily food shortages and starvation (Makone *et al.,* 2015). Several factors contribute to this ongoing issue. One factor is the escalation in prices of staple foods worldwide, such as wheat, maize, and rice. Notably, wheat prices have surged by 190%, while rice prices have risen by 90% (Dasgupta & Robinson, 2022). Another significant concern is poverty, with the number of individuals living in extreme poverty rising by around 50 million between 2019 and 2020 due to the impact of the COVID-19 pandemic and subsequent global economic downturn. Additionally, climate change resulting from global warming has adversely affected food security across all levels (Christensen, 2021).

In Tanzania, households confront diverse threats to food security, with roughly half of individuals in rural regions experiencing this issue. This leads to approximately 45% of children suffering from stunting, 28% being underweight, and 5% experiencing wasting due to food insecurity (URT, 2017). Additionally, the susceptibility to food insecurity poses a considerable developmental obstacle for Tanzania, presenting various challenges.

Despite various efforts, including initiatives like the Agriculture Sector Development Programme (ASDP), the National Strategy for Growth and Reduction of Poverty (NSGRP), and the Participatory Irrigation Development Programme (PIDP), among others, household food insecurity remains a significant challenge in Tanzania.

In a research context, Assenga and Kayunze (2020) conducted a study on household food security status in the Chimwino district, highlighting the serious concern of food insecurity in Tanzania. However, the study's outcomes may differ based on its location. Safari *et al.* (2022) conducted a study in the Ngorongoro conservation area to establish the factors influencing food security among pastoral communities. Conversely, their research specifically targeted communities residing only on the edges of conservation areas, and the study location was different. With different locations and objectives, numerous empirical studies examined the demographic and socioeconomic factors impacting food security status, the majority have focused on smallholder farmers and disadvantaged rural households (Kayunze *et al.,* 2007; Ngongi & Urassa, 2014; Reincke *et al.,* 2018).

As clarified above, this study utilizes a nationally representative dataset to investigate the determinants of household food insecurity in Tanzania.

RESEARCH METHODS

Theoretical framework

The theoretical framework for modelling household food insecurity determinants is grounded in the household utility model. Drawing inspiration from Singh (1986). The study recognizes households as both consumers and producers of food. Consequently, it conceptualizes household utility within the framework of consumer demand and production theories as follows:

$$Z_i = z(S_i, l_i \mid y_i) \quad (1)$$

Where Z_i is a utility function that is twice differentiable, increasing in its arguments, and strictly quasi-concave; S_i is the vector of the i^{th} household's consumption demand, which includes food S_d and non-food S_{nd}, l_i is the time devoted to leisure and x_i is the vector of household socioeconomic and demographic variables that the study included, in order to recognize that the utility of a household is originated from the combination of decisions made by household members according to their preferences.

Given the foregoing definition of S_i, it can be specified as:

$$S_i = (S_d, S_{nd}) \quad (2)$$

As some households are both consumers and producers of food S_d can be further considered as a vector of home-produced food h_{pd} and market-purchased food m_{pd}. Again, within this context S_d can be stated as follows:

$$S_d = (h_{pd}, m_{pd}) \quad (3)$$

Substituting Equation 2 and 3 into Equation 1 gives the utility function defined as:

$$Z_i = z[(S_d, S_{nd}, l_i \mid x_i)] \quad (4)$$

$$Z_i = z[[(h_{pd}, h_{pd}), S_{nd}], l_i \mid x_i] \quad (5)$$

The optimization of Equation 5 requires that households' production and consumption decisions be made separately on the assumption that they are all essential to the market for those households that produce food that they also consume and are subsequently subject to certain restrictions of production, income, and time factors. In this scenario, production decisions are taken first, and the income is then shared between the consumption of goods and leisure spending (Feleke *et al.,* 2016). According to Feleke *et al.* (2016), it is important to make this assumption because food security or food consumption often depends on production variables, but not vice versa.

Optimization of Equation 5 requires production, income, and time constraints.

Production constraint

$$d(Q_h, L, F^o, C^o) = 0 \quad (6)$$

Equation 6 is a typical household production for food Q_{hp} produced at home and assumed to be twice differentiable increasing in outputs, decreasing in inputs, and strictly convex; F^o is the farm size, C^o is the fixed capital stock; L is total labour used on the farm.

Income/budget constraint

$$P_h (Q_h - h_{pd}) - P_m m_{pd} - P_{nd} S_{nd} - w (L - e_d) + K = 0 \quad (7)$$

From Equation 7 P_h is the price per unit of the marketed surplus of food that is produced, $Q_h - h_{pd}$ is the marketed surplus of food produced, l_f is the sum household labour supply on the farm, P_m is the price per unit of food items purchased from the market, P_{nd} is the price per unit of non-food stuff; S_{nd} is the demand for non-food items such as education and housing, etc., w is the wage for hired labour, K is the non-farm income adjusted to ensure that Equation 7 equal to zero.

Time constraint

$$T = e_d + e \quad (8)$$

Where T is household's time endowment received in each time period, which is allocated between time for leisure e and time spent working on the farm e_d.

Substituting the right-hand side of Equation 8 into 7 gives:

$$P_h (Q_h - h_{pd}) - P_m m_{pd} - P_{nd} S_{nd} - w (L - T + e) + K = 0 \quad (9)$$

Rearranging Equation 9 to explicitly account for household income and expenditure gives:

$$\frac{P_h Q_h + wT + K + wL}{HH\_Income} = \frac{P_h h_{pd} + P_m m_{pd} + P_{nd} S_{nd} + we}{HH\_Expenditure} \quad (10)$$

Equation 10 shows that the left-hand side equals household income (HH income). The household income includes the value of farm produce $P_h Q_h$, value of HH's time endowment wT, the value of labour used wL and non-food income K. Likewise, the right-hand side is equivalent to household expenditure (HH expenditure). The household expenditure includes the value of home produce food consumed $P_h\, h_{pd}$, value of market purchase food consumed $P_m\, m_{pd}$; value of non-food expenditure $P_n\, S_{nd}$ and purchase of leisure *we*. The optimization of Equation 5 gives rise to the income and expenditure Equation. within the separability assumption, which is necessary to have first order conditions. It is equally possible through the optimization of Equation 12 to yield production and consumption equations separately. This is discussed below

The demand for inputs and output produced, especially for households that produced their food at home, can be derived by maximizing the first-order condition of the left-hand side of Equation 12 with respect to Labour (L) and output produced (Q) as:

$$L^* = e^* (P_h, w, F^o, C^o) \quad (11)$$

$$G^* = Q_h^* (P_h, w, F^o, C^o) \quad (12)$$

Where L^* is the optimum labour used and G^* is the optimum output. Substituting Equation 11 and 12 into left hand side of Equation 10 gives optimum/full income R^* under the assumption of maximized profit π^* as:

$$R^* = P_h G^* + wT + K - wL^* \quad (13)$$

$$R^* = wT + \pi^* (P_{np}, w, A^o, C^o) + K \quad (14)$$

Where $\pi^* (P_{hp}, w, F^o, C^o) = P_h G^* - wL$

Household's demand for food S_d can be solving the first order conditions of the Right-hand side of Equation10, However recall in Equation 3 that S_d is a vector of h_{pd} and m_{pd} which in turn, depend on their respective prices. This relationship can be specified as

$$S_d = s_d (P_h, P_m, P_{nd}, w, R^*) \quad (15)$$

Household demand for food also depends on the preference of its members. These preferences are represented by household demographic characteristics in Equation 15, Thus, in line with Equation 14 we can further specify R^* in Equation15 as:

$$S_d = s_d (P_h, P_m, P_n, w, R^* (P_h, w, F^o, C^o, K) \mid x) \quad (16)$$

Where; $food(d) = h, m$

Equation 16 suggests that food consumption s_d depends on both food and non-food prices, wages and household income. Thus, if household demand for food could be referred to as measure of household food security, then s_d is a reduced form of the utility function in Equation 1. It allows the evaluation of the effects of household level characteristics as well as economic factors such as income. The relationship can be represented by:

$$s_d = fs_i = (calories_{intake}, consumption_{score}, DDI, food\_expenditure.etc) \quad (17)$$

Where fs_i is taken as a vector of various indictors of household food insecurity, which could be food expenditure/food spending, dietary diversity index and consumption score (Lokosang *et al.,* 2016).

Model specification

This study is focused solely on socioeconomic and demographic factors such as household size, age of household head, education level of household head, marital status of household head, access to credit, household location, household income, and sex of household head.

Therefore, the empirical specification of the reduced form of Equation 15 without the prices of food and non-food is stated as follows:

$$fs_i = X'\gamma_i + \alpha_i \quad (19)$$

Where hfs_i represents food insecurity, X is a vector of socioeconomic and demographic determinants, γ_i represents coefficients and α_i is the error term of the regression.

Description of variables

Variables	Description
Dependent Variable	
Household food insecurity (foodexp)	This is a continuous dependent variable, the proxy used for, is household food expenditure per adult equivalent per month.
Independent variables	
Age of the household head (hhhage)	This is a continuous variable (years)
Size of household (hhsize)	This is a continuous variable (number of household members)
Household head's education level (hhhed)	This is a continuous variable, years of schooling
Sex of the household head (hhhsex)	This is a categorical variable, 1 for male and 0 female
Monthly household expenditures	This is a continuous variable, the variable proxy household income.
Credit service (credit)	A categorical variable, 1 for access, 0 otherwise
Location (Rural/Urban)	This is a categorical variable (0) rural and (1) urban
Marital status of the household head (hhhmarst)	This is a categorical variable, 1 for married/living together, 0 for not married

Data collection

The study utilized data from the 2017-2018 Household Budget Survey (HBS) conducted by the Tanzania National Bureau of Statistics, with support from the Ministry of Finance and Planning. Funding came from the government of Tanzania and partners like the World Bank, UNICEF, and UN Women. The survey covered the entire United Republic of Tanzania and employed a two-stage cluster sample design, resulting in a 99 percent response rate from 9465 households. The dataset includes information from agriculture, households, livestock, and communities. However, this analysis solely focuses on the household dataset to capture economic, social, and demographic characteristics and outcomes simultaneously.

Determinants of household food insecurity

Heckman sample selection model

In this study the household food expenditure per adult equivalent per day was used as a proxy for food insecurity. In Tanzania the government has set the minimum acceptable weighted average food requirement per person per day at 2200 kcal, establishing the food poverty line as the minimum monetary value households need to spend on food items to meet this requirement. Households spending below the average of TZS 1,205 per adult equivalent per day are classified as having low food security status, otherwise are considered food secure, according to NBS (2020).

The main goal of this research is to examine the determinants of household's food insecurity. The study operates under the assumption that the response variable, which indicates household food insecurity, adheres to a linear model and is chosen randomly from a population:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \mu_i, \mu_i \sim N(0, \sigma^2) \quad (20)$$

In these situations, the error term is assumed to have a zero mean and no correlation with the explanatory variables, resulting in an unbiased and consistent Ordinary Least Squares (OLS) estimate (Wooldridge, 2010). In this study, the researcher aimed to specifically examine the insecure group rather than the entire sample dataset, thereby incorporating the observed values from the censored group. A non-random sample may arise when data is truncated either below or above a specific threshold of the response variable (Wooldridge, 2010). It is also possible that self-selection bias could arise due to the truncation process, which might only contain the poor households group. These scenarios could result in inconsistent and biased OLS estimates, rendering the estimations ineffective. Therefore, this study used the Heckman two-stage approach to correct the sample selection bias (Hashmi *et al.,* 2019). Heckman (1976) introduced a two-stage approach, which has been extensively employed to rectify bias problems from the sample selection process. This approach yields consistent, unbiased, and rendering efficient estimates for all parameters (Heckman, 1976). The initial assumption of this approach is the presence of unobserved latent variables. Hence, the study deployed the probit model.

Probit model specification

The Probit model was used for the whole sample to estimate the likelihood of a household being food insecure. The probit model developed an index ($Z_i = 1$) of factors determining the probability of household being insecure. Hence, from estimated model, the lambda λ_i which is known as Inverse Mills Ratio (IMR) would be developed. Mathematically expression of the Inverse Mills Ratio (IRM):

$$\lambda_i = \frac{\phi(Z_i)}{1-\Phi(-Z_i)} = \frac{\phi(Z_i)}{\Phi(Z_i)} \quad (21)$$

But,

$$\Pr(Z_i = 1) = \Phi(X_i \omega) \quad (22)$$

Where ∅ and Φ are the PDF and CDF for the standard normal random variable, ω is a vector of regression parameter of variable X. According to Greene (2000), the IMR term corrects the problem of selection bias. If the term (λ) is insignificant, there is no selection bias problem (Heckman, 1976). Millis ratio estimate is included in the second stage of OLS regression with other explanatory variables to correct the bias arising from the selected sample.

Now from the Equation 3:

$$P(secured = 1|X) = \Phi(\beta_o + \beta_1(hhsize) + \beta_2(offfarm\_activity) + \beta_3(rural) + \beta_4(male) + \beta_5(accescredit) + \beta_6(hhed) + \beta_7(hhmrst) + \beta_8(hhhage) \quad (23)$$

The second stage (Model 2)

The study employed OLS Model to predict household food insecurity determinants. This Model was chosen since the response variable was continuous variable (Wooldridge, 2010). The household food expenditure per adult equivalent per day is used as a proxy for household food insecurity (response variable), while treating household head age, household size, household head education level, sex of household head, average total monthly income and credit service, location, and household head marital status as regressors. The Model was specified as follows:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} +. +\beta_p X_{Pi} + \mu_i \quad (24)$$

Where $\beta_1, \beta_2, \ldots, \beta_n$ represent vectors of random variables, and μ_i represents an error term. Hence; the outcome model with the variables, stated as follows:

$$foodexp = \gamma_o + \gamma_1(hhsize) + \gamma_2(ham\_exp) + \gamma_3(rural) + \gamma_4(male) + \gamma_5(accescredit) + \gamma_6(hhed) + \gamma_7(hhmrst) + \gamma_8(hhage) + \gamma_9 IMR + \mu_i \quad (25)$$

RESULTS AND DISCUSSION

Descriptive statistics for continuous variables

Table 1 summarizes the descriptive statistics of both the independent and dependent variables used in the model estimation.

As shown in the Table 1, the average household size was five members, with a range from 1 to 12 members. The age of the household head ranged from 21 to 88 years, with an average age of 47 years. Additionally, the average monthly income of the household was TZS 386,838.90, with a range from TZS 54,810 to 2,337,448. The average years of schooling of the household was 6 years, ranging from 0 to 21 years. Household per capita food expenditures ranged from TZS 4,959.174 per month to TZS 783,987.40, with an average of TZS 55,598.30.

Descriptive statistics for categorical variables

Table 2 provides descriptive insights into various demographic and socioeconomic factors: Marital Status of the household head: The majority (72.13%) of household heads were married and living together, while only 27.87% were not married. Credit Service: A significant proportion (98.27%) of households did not have access to credit services, with only 1.73% having access. Location: Approximately 29.46% of households were in urban areas, while the majority (70.54%) were in rural areas. This indicates that the majority of respondents reside in rural areas. Sex of Household Head: Descriptive statistics show that 27.3% of household heads

Table 1: Descriptive statistics for continuous variables

Variable	Units	Obs	Mean	Std. Dev	Min	Max
Household size	Numbers	9,463	4.853535	2.910977	1	12
Age of head	Years	9,463	47.01543	15.53629	21	88
Household income	Tsh (Monthly)	9,463	386,838.90	378,737.80	54,810	2,337,448
Education of head	Years	9,463	6.014477	4.346942	0	21
Per capita food exp	Tsh (Monthly)	9,463	55598.3	37772.40	4959.40	783987.40

Source: Author's computation

Table 2: Descriptive statistics for categorical variables

Variable	Frequency	Percent (%)
Marital status of the household head		
Married	6821	72.13
Not married/separated	2635	27.87
Credit service		
Access	164	1.73
Not access	9297	98.27
Location of the household		
Rural	6675	70.54
Urban	2788	29.46
Sex of the household head		
Male	6882	72.7
Female	2581	27.3
Off-farm activity		
Participate	3763	39.77
Not participate	5700	60.23

Source: Author's computation

were female, while 72.7% were male. The majority of families in Tanzania were headed by males. Off-Farm Activity: About 37.7% of households participated in off-farm activities, while the majority (60.23%) did not engage in such activities.

Testing for multicollinearity

The correlation matrix reveals that all variables exhibit correlations with each other. But, the Variance Inflation Factors (VIFs) were found to be sufficiently low, ranging between 1.02 and 1.28. These low VIF values suggest that the inclusion of the individual determinants in the model is statistically valid.

Testing for heteroscedasticity

The study used the Breusch-Pagan test and revealed that the error term's variance is constant ($\chi^2(1) = 5359.57$, $p - value = 0.343$). Therefore, the model provides unbiased and consistent results for further analysis and interpretation.

Determinants of household food insecurity: Heckman two stage with first stage probit model and second stage ols regression model

The selectivity bias has been examined using Heckman's two-step method. Initially, the response variable was modeled as a binary variable, with a value of 1 indicating food insecurity in a household and 0 otherwise. In the second phase, the model estimates the factors that affect household food insecurity (household's food expenditure per adult equivalent per day for the selected group. Furthermore, the value of lambda (reverse mills ratio) was used to correct for any selection bias that may have existed.

Table 3 Probit Model analysis results; household head age, household head education (years of schooling), rural location, male head of the household, married/living together head, access to credit (dummy of credit service) and participation in off-farm activity were positively and statistically significant related with household food insecurity at 5% significance level, while the household size was negatively associated with household food insecurity, and it may increase the severity of food insecurity.

In the second stage of the Heckman approach, the OLS estimator was used to estimate the linear model. The coefficient of the Inverse Mills Ratio was significant, indicating that the selection model is necessary to correct the sampling bias.

The OLS estimates exposed that the entire model (F-test) was statistically significant with P=0.000, which was less than 0.05, and the coefficient of determination (R-squared) was 33.60%. This implies that the model explained 33.60% variance of per capita household food expenditures was explained by model predictors.

Results from regression analysis based on the individual effects by T-test are as follows; The estimated coefficient of access to credit (a dummy for credit service) was significantly and positively related to per capita food expenditures at the 5% significance level. The implication of the result means that, on average, the household members in the household where the head has access to credit services spend 1.235 more per day compared to households where the head has no access to credit services among the food insecure group. This study is similar to those done by Awotide *et al.* (2016) and Feyisa (2018) on agricultural technological adoption and food security, who found that subsistence agriculture yields were higher in households with access to credit services than in those without.

The estimated coefficient of household size was negative and statistically significant at the 5% significance level; this indicates that, on average, when the household size increases by one unit, 4.352 units will drop in the household food expenditures per day among the food insecure group. This is consistent with one ended by Bhattacharjee and Sassi (2021)

Table 3: Heckman selection model

Variable	Food insecurity status (Probit Model)		Food insecurity (OLS Model)	
	Coefficient	Std. error	Coefficient	Std. error
Household size	- 0.199***	0.00687	-4.352***	7.146
Age of household head	0.00447***	0.00101	1.370***	0.324
Education of household head	0.0441***	0.00314	1.439***	1.721
Location of household (rural)	0.450***	0.0329	-2.001***	1.540
Sex of the household head (male)	0.0340***	0.0425	1.439*	1.420
Household head income	-	-	0.00147***	0.0002
Marital status	0.127***	0.0434	3.149*	1.506
Access of credit	0.650***	0.109	1.235***	2.177
Off farm activity	0.210***	0.0359	-	-
lambda (mills)	-	-	84.041*	46.694
cons-	0.0456	0.0734	-31.80.5	33.29.6
N	Unselected Obs. 9463		Selected Obs. 2001	
R^2			0.336	

Standard errors in parentheses: *p<0.05, **p<0.01, ***p<0.001
Source: Author's computation

who revealed that having a large household increased the likelihood of being food insecure amidst the food insecure households. But the study was not supported by Worku (2023), who found that family size is positively and significantly related to household food security. Their study outlined that a household with large members has more food to share, therefore there is less chance for the household member to be hungry.

The coefficient of the rural location of the household was negative and significant at a 5% significance level. This implies that, on average, a household located in a rural location, the individual members of that household spend 2.001 units less compared to the household located in an urban location. Therefore, this implies that the people living in rural areas are more insecure than the urban ones. The results are similar to those done by Mwanga *et al.* (2019) and Rashid *et al.* (2024) who found that there is a positive and significant relationship between the household location and food security. Those who live in urban areas are at least more secure than those who live in rural areas.

The regression analysis results showed that the education level of the household head (years of schooling) was positive and statistically significant (P=0.000) and related to food security among insecure households. This indicates that, on average, when the years of schooling increase by one year, 1.439 units would rise in the household food expenditures per day among the food insecure groups. This result agrees with Assefa and Abide (2023) and Worku (2023), their results found that households whose heads are educated have a higher likelihood of being secured amongst the insecure households.

The estimated coefficient of not married/divorced (a dummy for the marital status of the household head) was negative and significantly related to the household food expenditures at the 5% significance level. This implies that, on average, household members in the household head who not married/divorced spend 3.149 units less per day compared to a household head who is married/living together. Comparable findings were reported by Saruni and Mutayoba (2018) and Mwanga *et al.* (2019) and similar results by stating that the married head or living together positively and significantly contributes to food security.

The estimated coefficient of male (a dummy for sex) was positive and significantly correlated with the household calorie intake at the 5% level of significance. The implication of the result means that, on average, household members in the male head spend 1.439 units more on food per day compared to female-headed household among food insecure households. This study is similar to those conducted by Rashid *et al.* (2024) in Tanzania, who discovered that the sex of the household head (male) has a positive and significant effect on household food expenditure and food security. But this finding is not similar to one done by (Assefa & Abide, 2023) in Ethiopia who revealed that there is no relationship between the sex of the household and household food security.

The estimated coefficient of the age of the household head was positive and statistically significant at the 5% significance level; this shows that, on average, when the age increases by one unit (year), 1.370 units would rise in household food expenditures per day among food insecure households. The findings agree with those of Saruni and Mutayoba (2018) and Mahmood *et al.* (2023) who found a positive significant relationship between age of head of the household and food security status.

Therefore, the estimated coefficient of total household income was positive and significantly related to the household food expenditures at the 5% level of significance. This implies that when the income (TShs) increases by one unit, 0.00147 units would rise in the household food expenditures among food insecure households. The results are similar to those done by Bata *et al.* (2018) and Mahmood *et al.* (2023) who found a significant positive correlation between household income generation and food security.

CONCLUSIONS AND RECOMMENDATIONS

Examining the variables impacting household food insecurity in Tanzania was the goal of this study. Results showed that most heads of households are not formally educated, and there is a significant problem with large family numbers, which may lead to higher costs for non-food goods.

It is suggested that formal education should encourage a greater concern for the food security of households, both for the heads of the households and their offspring. In addition, empowering household members to participate in business ventures could be achieved through providing training in entrepreneurship and financial management, which includes obtaining and handling loans. Furthermore, to address concerns about family size management, family planning programs should be prioritized for implementation.

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