

The Influence of Consumption-Based Food Resilience Strategies on Livelihood Outcomes among Farming Households in Makueni County, Kenya

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ABSTRACT

Consumption-based food resilience strategies (CBFRS) are commonly employed by households in semi-arid regions to cope with recurrent food shortages. This paper examines the adoption and influence of CBFRS on livelihood outcomes in Makueni County, Kenya. A sample size of 399 rural households was drawn from three sub-counties (Mbooni, Makueni and Kibwezi West) through multistage sampling, comprising stratified, purposive and simple random sampling techniques. The study adopted a descriptive survey research design to meet the research objective. Data was collected through structured questionnaires, key informant interviews and direct observations and analyzed using descriptive and regression analysis. Results showed that households employed variable consumption-oriented strategies to manage food availability and access during times of stress or scarcity. CBFRS such as meal reduction, food substitution, rationing and preservation were practiced, particularly during droughts. The study findings revealed a moderate adoption of CBFRS ($M = 3.011$) in Makueni County. The regression results revealed a statistically significant negative association between the adoption of consumption-based FRS and overall livelihood outcomes ($b = -0.269$, $p < 0.001$), suggesting that CBFRS are largely coping mechanisms rather than proactive resilience measures. While CBFRS provide temporary relief, they compromise nutrition and long-term well-being. Constraints such as water scarcity, financial limitations, and lack of awareness further hinder effective CBFRS adoption. CBFRS are not productive but coping mechanisms amidst food stress; hence, they can erode food system resilience. The paper recommends targeted interventions to reduce reliance on CBFRS by enhancing institutional and farm-based strategies.

Keywords: Consumption-based strategies, food security, coping mechanisms, livelihood outcomes, Makueni County

INTRODUCTION

Consumption-based FRS focus on how households and communities manage food consumption to enhance their ability to withstand and recover from shocks, such as food insecurity, economic disruptions or environmental stressors (Sengupta & Guchhait, 2023). These strategies may include diversifying food sources, improving food storage techniques, enhancing nutritional intake and reducing food waste to ensure that households can maintain access to sufficient and nutritious food even in the face of disruptions, thereby safeguarding their livelihoods.

Globally, farming households employ various consumption based coping strategies. First, households may make dietary adjustments to consume less preferred or less expensive foods to stretch their food supplies. For instance, In the UK, modest reductions in meat consumption and shifting to plant-based diets are strategies to lower the carbon footprint and adapt to climate change (Steinitz *et al.*, 2024). Promoting domestic consumption of nutrient-rich foods such as bivalve mollusks has been proposed in the UK as a strategy to enhance food security (Willer & Aldridge, 2023). Ghosh-Jerath *et al.* (2021) highlight that consumption-based coping strategies among the Sauria Paharia indigenous community in Bangladesh include utilizing foods from natural vegetation and forests during lean periods, retaining climate-resilient indigenous crop varieties, and accessing indigenous forest foods to enhance dietary diversity and food security. The study also reports increasing consumption of processed foods among the communities

In Africa, households observe meal frequency reduction as a coping strategy. Mustapha (2019) and Mukhtar (2019) found that reducing the number of daily meals or portion sizes, allowing children to eat first, eating less preferred foods and less expensive food, restricted food consumption of female members of households and skipping meals were common practices during food shortages in Nigeria. Mukhtar (2019) also reported skipping meals, harvesting immature crops and consuming seeds reserve were the most frequent coping strategies adopted by households. A report on Syrian refugees indicates that many households rely on stress-based coping strategies, such as borrowing food or reducing meal sizes (Hedstrom, 2022). Households also prioritize vulnerable members ensuring that children or the elderly eat first or receive larger shares during scarce periods.

In Kenya, Consumption-based coping strategies are diverse and often reflect the socio-economic challenges faced by different communities. A significant coping strategy involves reducing food consumption. This often includes skipping meals or eating less preferred foods to manage limited resources (Amendah *et al.*, 2014). Nkurunziza *et al.* (2024) also highlight that some Kenyans households include reducing meal sizes, skipping meals, and relying on less preferred or cheaper food options. These strategies are often employed when households face food insecurity due to climate-induced disruptions, such as droughts.

In Kenya's arid and semi-arid counties, including Makueni, recurrent droughts have forced households to rely on consumption-based strategies. Despite interventions by NGOs and government relief programs, meal reduction, rationing, and substitution remain common. This study therefore examined how the adoption of CBFRS influences livelihood outcomes among farming households in Makueni County, Kenya.

Theoretical Framework

The study was anchored on the Sustainable Livelihoods Framework (SLF).

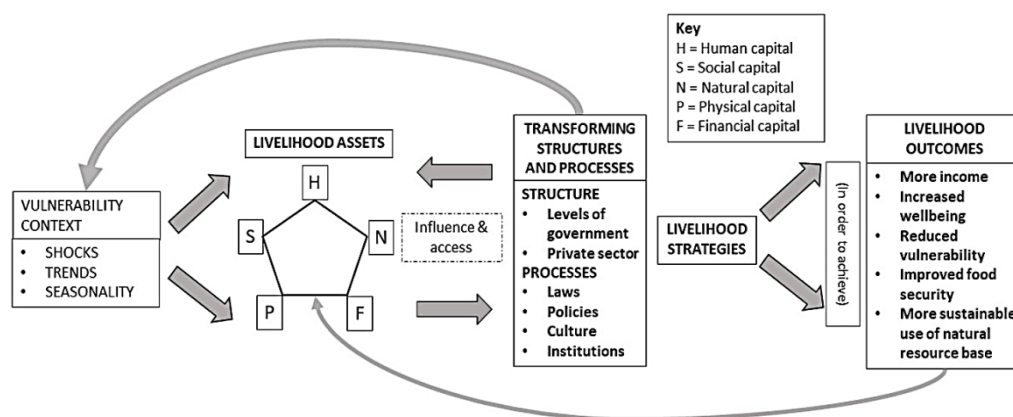


Figure 1: Sustainable Livelihoods Framework (Source: DFID, 2002)

The SLF provides a comprehensive approach to analyzing how households in Makueni County adopt CBFRS in response to climate variability and other challenges. It helps in understanding the relationship between livelihood assets, livelihood strategies like CBFRS and livelihood outcomes such as food security, income stability and resilience to shocks. Ma *et al.* (2024) emphasize the SLF to enhance social, physical, and financial capital, while addressing coping behaviours to improve livelihood resilience.

METHODOLOGY

The study was conducted in Makueni County, Kenya. The county is in the semi-arid climatic area, where temperatures average 15°C to 26°C, with annual rainfall falling to 250mm to 400mm in the lower and 800mm to 900mm in the higher, which affect agricultural productivity. The county is predominantly an agricultural economy. This study adopted a descriptive survey research design. The target population consisted of 127,257 rural farming households, specifically productive households working in agriculture and the agricultural extension officers. The study adopted a multistage sampling technique. First, the six sub counties were clustered according to the three agro-ecological zones: Upper Midland Zone (UM) encompassing the uplands of Mbooni and Kaiti sub counties; Midland Zone (M) consisting of Makueni and Kilome Sub-Counties and

Lowland Zone (LM) encompassing Kibwezi west and Kibwezi east sub counties. Three sub-counties were randomly selected, one in each cluster. Thereafter, a proportionate sample was obtained from the wards. A sample size of 399 respondents who were distributed proportionally across the wards was derived, but 374 formed the response rate since 25 respondents were not available in their households. A structured questionnaire rich in both breadth and depth was used as the primary tool for data collection from household heads. The household survey was supplemented with two qualitative methods: Key informant interviews conducted with agricultural extension officers who possess in-depth knowledge on adoption of FRS and experience working directly with farming communities and Observation Checklist to capture physical evidence of adopted CBBFRS at the household level. Quantitative data was analyzed using SPSS and hypothesis tested Regression and Analysis of Variance (ANOVA). Qualitative data were transcribed and used to support the quantitative data during the interpretation of the findings.

Ethical Considerations

The study, in its development and execution, considered and adhered to all relevant ethical principles. The researcher sought approval from the Chuka University Research Ethics Committee before data Collection. Then, a research permit was sought from the National Commission for Science, Technology and Innovation (NACOSTI). After obtaining all the documents, the Makueni County Director of Agriculture was notified of the intended study. Similarly, appointments were made with the respective Sub-County Officers of Agriculture at Makueni, Mbooni, and Kibwezi West.

After informing and obtaining consent from all relevant offices, field visits were conducted to collect data from the sampled households and key informants. The respondents were assured of the confidentiality of the information provided and that the information given would be used solely for academic purposes. A good rapport was also established with respondents to win their trust. Throughout the study, all sources of information were sufficiently acknowledged. The approved methodologies were followed as per the research design.

RESULTS AND DISCUSSION

Consumption-based food resilience strategies were assessed across three primary dimensions: changes in food consumption, food substitution, and preservation and storage practices. Respondents rated each item on a 5-point Likert scale, where 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often, and 5 = Always. Composite mean scores were computed for each sub-construct to assess the overall adoption of consumption-based strategies.

Table 1: Food Consumption Changes

Items	N	Mean	SD
Reducing the number of meals per day during food shortages	374	2.49	1.045
Reducing food portion served	374	2.73	1.074
Prioritizing feeding the vulnerable (Elderly, children, pregnant women and the sick)	374	2.01	0.995
Cooking just enough per meal	374	3.25	0.952
Sending children to eat elsewhere due to lack of food	374	1.39	0.794
Food Consumption Changes	374	2.373	0.619

The study findings on table 1 indicate a low to moderate level of adoption of food consumption change strategies, with a composite mean of 2.37 (SD = 0.619). The most commonly applied strategy was cooking just enough food per meal (M = 3.25), possibly reflecting an effort to reduce food waste without compromising household nutrition. Strategies such as reducing meal frequency (M = 2.49) and portion sizes (M = 2.73) were adopted

moderately, while more drastic measures, including sending children to eat elsewhere ($M = 1.39$) and prioritizing vulnerable household members ($M = 2.01$), were less common. These findings are consistent with those of Kansanga, et al. (2022) and Mwangi et al. (2022), who reported that households in semi-arid areas often adjust their food quantity and distribution patterns during lean seasons, but tend to avoid socially or culturally sensitive coping strategies unless necessary.

Food Substitution

Table 1 Food Substitution Strategies

Items	N	Mean	SD
Buying less preferred foods	374	2.83	0.850
Consuming more indigenous foods during drought periods.	374	3.52	0.973
Borrowing food from neighbours	374	1.96	1.110
Food Substitution	374	2.767	0.637

Food substitution strategies had low to moderately adoption, with a composite mean of 2.77 ($SD = 0.637$) (Table 2). Consumption of indigenous foods ($M = 3.52$) was the most prevalent practice, reflecting both cultural familiarity and the resilience of such foods during dry spells. Substituting with less preferred or cheaper foods ($M = 2.83$) was also common, especially when staple foods became unaffordable or unavailable. However, borrowing food from neighbours ($M = 1.96$) was reported less frequently, possibly due to social stigma, community-wide shortages or reduced reciprocity during crisis periods.

A wide variety of indigenous and locally available foods are consumed during lean periods. The most common were: Githeri (20.6%), Cassava (9.1%), sweet potatoes (7.5%), mango fruits (7.5%), Maize (7.2%) and Ugali (5.9%). Sorghum, millet, pumpkins, pawpaw, and wild fruits were less commonly cited. This diversity reflects flexible dietary substitution as a resilience strategy, especially towards drought-tolerant and indigenous foods, confirming findings by Mwangi, et al. (2019) and Mijena et al. (2024). These foods are often more readily available during stressful periods and can help meet micronutrient needs.

Preservation and Storage Practices

Table 3: Preservation and Storage Practices

Item	N	Mean	SD
Preserving food for use during times of scarcity.	374	4.15	1.003
I dry my cereals and vegetables before storage	374	4.44	0.839
I use pesticides in preservation of cereals	374	4.36	0.958
Preservation and Storage Practices	374	4.32	0.808

Information on table 3 reveals that preservation and storage practices were the most highly adopted consumption-based strategies, with a composite mean of 4.32 ($SD = 0.808$). Households reported strong engagement in drying food ($M = 4.44$) and using pesticides to prevent post-harvest losses ($M = 4.36$), as well as in general food preservation efforts during times of plenty ($M = 4.15$). These results suggest that households actively try to extend food availability beyond the harvest period by adapting PSP. Food preservation and storage is vital in drought-prone areas like Makueni, where low yields and crop failure are significant risks to crop production.

Effective preservation minimizes seasonal hunger, stabilizes consumption patterns, and reduces dependence on food aid or market purchases during lean seasons. Post-harvest food preservation techniques, particularly drying, the use of pesticides, and storing surplus produce, especially serials like maize, are common traditional practices adopted in rural areas in Kenya (Gitau, 2024; Koskei, 2022). It ensures farmers get adequate food availability up to the next planting season.

The aggregate Consumption-Based Food Resilience Strategies (CBFRS) composite construct was derived by averaging across all 11 items in three sub-domains: Food Consumption Changes (5 items), Food Substitution Practices (3 items), and Preservation and Storage Techniques (3 items).

Table 4: Summary of CBFRS

	N	Mean	SD
Consumption-Based Food Resilience Strategies	374	3.0112	0.37939

This average reflects a moderate level of adoption of CBFRS, $M = 3.011$, $SD = 0.379$. The results suggest that households employed variable consumption-oriented strategies to manage food availability and access during times of stress or scarcity. Strategies such as reducing meal size, adjusting frequency, substituting preferred foods with less desirable alternatives, and engaging in preservation methods like sun-drying or fermenting provide both immediate, short-term, and long-term coping mechanisms during food insecurity.

Figure 1 presents the primary constraints limiting household adoption of CBFRS, based on survey responses from farming communities across Makueni County.

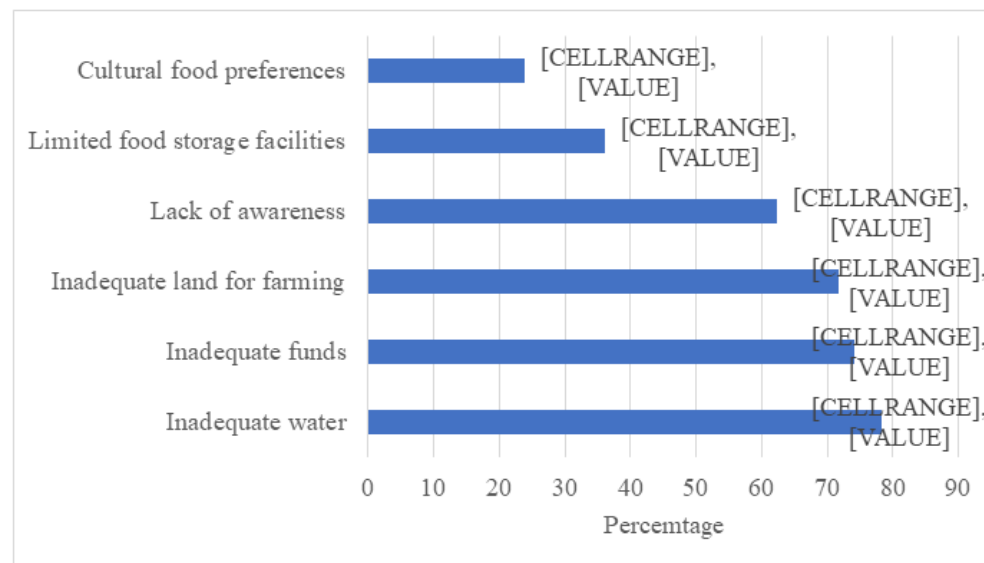


Figure 1: Main Constraints to Adopting Consumption-Based Food Resilience Strategies

The study findings showed that the most commonly cited barrier by over three quarter (78.3%) of the respondents was inadequate water access, which is consistent with the county's semi-arid climate and frequent droughts. Water scarcity undermines the growth of other diverse foods that are heavily reliant on rainfall, such as maize, arrowroot, and beans. The second constraint, inadequate funds (74.1%*). Limited income restricts their ability to purchase substitute foods during shortages, invest in storage infrastructure, or diversify diets. The constraint is severe during lean seasons when food prices rise due to a general low supply of food. Inadequate land for farming (71.7%) was also a significant problem. Households with small landholdings are less able to grow supplementary crops, cultivate tubers or legumes for fallback diets, or establish small gardens for subsistence use. With general low production in arid and semi-arid conditions in Makueni, households with small parcels may produce inadequate food to sustain them until the next planting season.

A lack of awareness (62.3%) reflects informational and educational barriers that limit the adoption of some CBFRS. This problem often applies to food preservation techniques, as other coping mechanisms are common behaviours amidst food shortages. Farmers reported that limited availability of food storage facilities (36.1%) restricts a household's ability to store excess food for lean periods. Without adequate cooling, drying, or sealed environments, perishable crops such as tubers, legumes, or fruits spoil rapidly. Perishability could be higher, especially in Makueni County, due to high temperatures that undermine resilience. Thus, agricultural extension can help encourage farmers to store surplus food instead of selling it, thereby cushioning them from shortages and avoiding inflationary demand pressure during lean seasons.

Lastly, cultural food preferences (23.8%) represent a social dimension of constraint. Based on the feedback from the current study, the common foods grown in Makueni include traditional foods such as githeri (a mixture of maize and beans), cassava, sweet potatoes, mangoes, maize, ugali, rice, and sorghum. This might constrain farmers to farm similar food types, despite their lesser suitability to the geological conditions. Collectively, these constraints encompass ecological, economic, and social norms that shape food resilience in Makueni County. Such barriers can be mitigated through financial support and Government support, including water infrastructure development and extension services, to enhance awareness of food preservation and storage techniques.

Table5 Regression of CBFRS on Livelihood Outcomes

R	R Square	Adjusted R Square	Std. Error of the Estimate
.186	0.035	0.032	0.538
Notes. a Predictors: (Constant), Consumption-Based Food Resilience Strategies			

The results on table 5 show that the coefficient of determination, R Square (R^2) value of 0.035, implying that approximately 3.5% of the variance in livelihood outcomes can be attributed to the adoption of consumption-based FRS. This low proportion suggests that consumption-based FRS is not a major determinant of livelihood outcomes. The model accounts for only 3.5% of the variance in livelihood outcomes, indicating the likely presence of other unmeasured or omitted variables, such as farm-based factors, market access, climate variability, household income levels, or institutional support mechanisms, that may have a more substantial influence on livelihood outcomes. All these factors can account for the remaining 93.5% of the variation in livelihood outcomes.

To assess whether the adoption of consumption-based (FRS) significantly influences livelihood outcomes, an analysis of variance (ANOVA) was performed following a simple linear regression. The results are presented in Table 26.

Table 6: ANOVA for CBFRS on Livelihood Outcomes

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Regression	3.874	1	3.874	13.39	.000
Residual	107.63	372	0.289		
Total	111.504	373			
Notes. a Dependent Variable: Livelihood Outcomes b Predictors: (Constant), Consumption-Based Food Resilience Strategies					

The results on table 25 indicate that the regression model is statistically significant at a 5% significance level, $F(1, 372) = 13.39$, $p = 0.05$. ANOVA evaluates the overall significance of the model by comparing the variance explained by the regression against the unexplained variance within the data. The ratio of the variances is the F-statistic. Given the significance of the F-statistic, the results suggest that the variation in livelihood outcomes

attributable to the adoption of consumption-based FRS is unlikely to have occurred by random chance. Although the R Square value reported earlier (0.035) indicates that only 3.5% of the total variance in livelihood outcomes is explained by the model, this small proportion is statistically significant. The influence of consumption-based resilience strategies on livelihood outcomes is statistically substantial.

To further assess the nature and strength of the relationship between consumption-based FRS and livelihood outcomes, the coefficients of the simple linear regression model were examined. These coefficients provide insight into both the direction and magnitude of the predictive relationship. Table 7 presents the regression coefficients, along with their associated statistical significance values.

Table 2: Coefficients of Regression of CBFRS on Livelihood Outcomes

	Unstandardized Coefficients		Standardized Coefficients	T	p-value
	B	Std. Error	Beta		
(Constant)	4.31	0.223		19.347	0.000
Consumption-Based Food Resilience Strategies	-0.269	0.073	-0.186	-3.659	0.000

Note: a Dependent Variable: Livelihood Outcomes

Based on the simple linear regression, Equation 1 was derived, predicting livelihood outcomes (Y) based on consumption-based FRS (X).

$$Y = 4.31 - 0.269X \quad (1)$$

Where Y is the predicted value of the livelihood outcomes, 4.31 is the intercept (constant) term, which represents the expected value of livelihood outcomes when no consumption-based FRS are adopted. X is the level of adoption of consumption-based food resilience strategies. The regression coefficient of Y on X is - 0.269. The negative sign of the slope coefficient suggests an inverse relationship: as adoption increases, livelihood outcomes tend to decrease. Specifically, Equation 1 indicates that for every unit increase in the adoption of consumption-based FRS, livelihood outcomes are expected to decline by 0.269 units, assuming all other factors remain constant. The effect is established to be statistically significant at a 1% significance level, $t = -3.659$, $p < .001$.

The regression results revealed a statistically significant negative association between the adoption of consumption-based FRS and overall livelihood outcomes. Consumption-based FRS includes practices adopted by households to mitigate food scarcity through adjustments in consumption behaviour. These strategies include reducing the number of meals per day during food shortages, cutting food portions, prioritizing feeding vulnerable household members (e.g., the elderly, children, and the sick), cooking only enough for each meal, and sending children to eat elsewhere when food is unavailable. These measures seek to alleviate food stress. The established negative impact of these strategies on livelihood outcomes can be understood through several pathways.

These practices prioritize conserving existing food supplies rather than boosting production or supply. As a result, they undermine long-term food security by failing to generate production gains. Households adopting these strategies often have low incomes, limiting investments in expanded planting, inputs, or yield-improving activities. This creates a reversed causality: low food security prompts the adoption of consumption-based FRS, which in turn perpetuates limited food availability and production improvements. Such behaviors signal habitual food deficits, leading to insufficient intake throughout the year and reduced dietary diversity, as households focus on staples and restrict access to micronutrient-rich foods. Consequently, these strategies are associated with undernourishment and no enhancements in food variety (Gebrehiwot et al., 2021; Dryland et al., 2021).

Empirical studies reinforce these negative effects. Gebrehiwot et al. (2021) used panel data from rural Ethiopia to show, via an endogenous switching treatment effects approach, that consumption adjustments increase undernourishment. Dryland et al. (2021) emphasized that coping strategies must be adaptive to existing insecurity levels. In Eswatini, Mabuza and Mamba (2022) found that mildly food-insecure low-income households relied on reducing meal sizes, begging, asset sales, and skipping meals. Shakeel and Shazli (2021) observed in India's Banda district that the frequency and intensity of these strategies rise with food insecurity severity. Kemboi et al. (2024) reported similar patterns among female-headed households in Liberia, where food insecurity led to skipping meals, borrowing, asset sales, and cutting health expenses. These findings indicate a negative correlation between consumption-based FRS and food security, portraying them as erosive to resilience through nutritional deprivation and reduced intake variety.

Beyond nutrition, consumption-based FRS are non-productive and linked to constrained income flows and reduced purchasing power. They do not generate income or leverage assets productively, making households less likely to report income improvements. Vulnerable groups, often reliant on seasonal farming incomes, face instability, exacerbated by high food prices or poor harvests (Mabuza & Mamba, 2022). In contrast, formal wage earners achieve consumption smoothing via stable earnings. Consumption-based coping reveals income volatility rather than resolving it, leading to low satisfaction with income stability. Additionally, these strategies hinder surplus generation, especially in subsistence farming on small plots, limiting market-oriented production and income from food sales. This reinforces a negative link to economic advancement, reducing the ability to afford food.

Asset accumulation is further eroded by consumption-based FRS. Amid insecurity, households prioritize survival over investments, often selling assets like livestock or land to buy food, diminishing productive resources. Frequent rationing diverts income from asset-building expenditures, such as acquiring farm equipment. Danso-Abbeam et al. (2023) found in Northern Ghana that asset-rich households used fewer coping strategies, suggesting a reverse causality: consumption-based FRS correlate with low asset accumulation tendencies. These practices also hinder income diversification, as economic stress discourages new ventures; instead, assets are monetized for immediate needs, compromising long-term acquisition. Savings suffer too, with financial drains from repeated coping leaving no surplus for reserves, weakening buffers against shocks and limiting productive investments.

Consumption-based FRS also impair household well-being in health, education and social dimensions. Health access declines as food-insecure households, with unstable incomes, struggle with unexpected medical costs; intensified coping reduces affordability for care. Education is jeopardized by nutritional deficits causing fatigue, illness, and poor concentration, leading to absenteeism and dropouts. Financial trade-offs delay school fees or materials, while coping involving children (e.g., dropping out, begging) links to stunting, wasting, and disrupted development (Chaudhuri et al., 2021). Social participation in welfare groups like cooperatives and self-help groups is limited. Budgetary pressures divert resources from contributions or loan repayments, raising default risks and potential asset liquidation (Demont, 2022). Exclusion occurs due to perceived untrustworthiness or poverty, as seen in Tanzania (Matunga & Kontinen, 2023). Mutisya et al. (2023) noted in Kenya that high interest rates, vetting, and property confiscation deter participation. Missing these groups means forgoing affordable credit, training, and safety nets, which enhance livelihoods (Atieno, 2023; Franco, 2020).

CONCLUSION

The study concluded that Consumption-based strategies are vital short-term responses to food crises in Makueni County, but they undermine long-term livelihood outcomes exacerbating food insecurity, nutritional deficits, income instability, asset erosion and well-being constraints. While they provide immediate survival benefits, they are insufficient to ensure resilience.

RECOMMENDATIONS

The study recommends: Enhancement of food storage infrastructure to reduce post-harvest losses and reliance on meal reduction, Promotion of nutrition education to minimize adverse health impacts of food substitution, Scaling up institutional support like cash transfers and food aid during drought periods and Encouragement of

adoption of farm-based strategies which are proactive, production-enhancing and asset-building interventions to reduce overreliance on CBFRS. Further studies are suggested on integrating broader geographic coverage and diverse demographics to enhance generalizability.

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