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PURCHASING PRACTICES AND FOOD SECURITY AMONG AFRICAN INDIGENOUS VEGETABLE FARMERS IN NYANZA REGION, KENYA

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ABSTRACT

Food insecurity remains a major concern among smallholder farming households in Kenya despite continued efforts to increase agricultural productivity and improve rural livelihoods. Previous studies have mainly linked household food security to factors such as farm production, income levels, access to extension services, land ownership, and the adoption of improved technologies. However, little attention has been given to the role of farmers' purchasing decisions and input sourcing practices. In addition, theories widely used in purchasing and supply chain management, including Value Chain Theory, Transaction Cost Theory, the Relational View, Social Embeddedness Theory, and Institutional Theory, have rarely been applied to explain food security outcomes among smallholder farmers. This study addresses this gap by examining how purchasing practices influence food security among African Indigenous Vegetable (AIV) farmers in the Nyanza region of Kenya. A cross-sectional correlational research design was employed, and primary data were collected from 430 AIV farmers selected through stratified random sampling across six counties. Data were analysed using descriptive statistics, Pearson correlation, and multiple regression techniques. The findings showed that purchasing practices were positively and significantly associated with household food security ($R^2 = 0.326$, $F(8,421) = 25.43$, $p < 0.001$). Collaboration with input suppliers and other value chain actors had the strongest positive association with food security ($\beta = 0.237$, $p < 0.001$), followed by aligning purchases with consumer preferences ($\beta = 0.205$, $p < 0.001$) and input supplier selection ($\beta = 0.192$, $p < 0.001$). Household income, farming experience, and monthly sales also had significant positive relationships with food security. This study contributes to the literature by integrating insights from food security and supply chain management and by recognising smallholder farmers as active purchasing decision-makers whose sourcing choices influence production, market participation, and household well-being. The findings highlight the importance of strong relationships within indigenous vegetable value chains in improving food security outcomes. Strengthening partnerships between farmers and input suppliers, promoting collaborative marketing, improving access to market information, and investing in aggregation centres and cold storage facilities could enhance the efficiency and resilience of indigenous vegetable markets. Farmers can further improve household food security by building long-term supplier relationships, responding to consumer preferences, and adopting more strategic purchasing practices.

Key words: African Indigenous Vegetable Farmers, Food Security. Purchasing Practices, Kenya

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INTRODUCTION

Food security remains one of the most pressing development challenges in sub-Saharan Africa. Although agricultural production has increased in many countries over the years, a considerable proportion of households still struggle to access adequate, safe, nutritious, and affordable food. In Kenya, food insecurity persists, particularly among rural and low-income households, despite numerous policy interventions and development programmes aimed at improving agricultural productivity. Addressing this challenge requires a broader understanding of food systems that extends beyond agricultural production to encompass market structures, institutional arrangements, and value chain processes that shape food availability, access, utilization, and stability [1].

African Indigenous Vegetables (AIVs) have increasingly attracted attention because of their contribution to improved nutrition, dietary diversity, and rural livelihoods. Rich in essential micronutrients, vitamins, and antioxidants, these vegetables play an important role in addressing micronutrient deficiencies and enhancing household nutritional outcomes [2]. They also provide income-generating opportunities for smallholder farmers and other actors engaged in their production, distribution, and marketing. Moreover, their adaptability to diverse agro-ecological conditions and relatively short production cycles makes them particularly suitable for smallholder farming systems in Kenya [3].

Despite their economic and nutritional significance, AIV value chains remain largely informal and weakly coordinated. Interactions among farmers, traders, transporters, and other market participants are often characterized by fragmented market structures, inadequate access to market information, and limited coordination mechanisms. These constraints contribute to inefficiencies in product distribution, high transaction costs, and substantial post-harvest losses, thereby reducing the potential contribution of AIVs to household food security [4]. The predominance of informal market arrangements further exposes these value chains to supply disruptions, price volatility, and climate-related shocks, which may compromise the stability of local food systems.

Existing studies on food security have predominantly focused on household income, access to credit, agricultural extension services, irrigation, land ownership, market access, agricultural productivity, food prices, farm diversification, and purchasing power as important determinants of food security outcomes [5-7]. While these studies have generated important insights into the economic and production-related drivers of food access, they have largely treated food security as an outcome of production and income generation, paying relatively little attention to management decisions and coordination mechanisms within agricultural

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production systems. Similarly, studies on African Indigenous Vegetables have concentrated mainly on their nutritional attributes, commercialization potential, and contribution to household livelihoods [2, 3]. Consequently, limited empirical attention has been devoted to understanding how farm-level supply chain practices shape food security outcomes among AIV-producing households.

Within the context of this study, purchasing practices are viewed from the perspective of African Indigenous Vegetable farmers as buyers of agricultural inputs. Purchasing practices encompass decisions related to supplier selection, alignment of purchased inputs with production objectives and market requirements, and collaboration with suppliers and other supply chain actors. Such decisions influence the quality, reliability, availability, and suitability of production inputs and may subsequently affect agricultural productivity, market participation, household income, and food security outcomes.

Growing evidence highlights the importance of value chain coordination and institutional arrangements in improving agricultural market performance and enhancing food system resilience [8-11]. At the farm level, purchasing decisions can improve resource utilization, reduce supply uncertainties, and facilitate access to quality inputs, market information, technical support, and innovations that strengthen farm performance. In many developing-country agricultural markets, relationships among supply chain actors are also shaped by trust, social networks, and informal agreements [12, 13]. These relational mechanisms often determine how farmers obtain inputs, access knowledge, and coordinate production activities.

Despite increasing recognition of the importance of supply chain coordination, the role of farmers'purchasing practices in influencing food security outcomes remains inadequately understood. Existing food security studies continue to emphasize production and income-related factors while giving limited consideration to management decisions that affect production efficiency, market participation, and household welfare [14]. This knowledge gap is particularly evident among African Indigenous Vegetable farmers in Kenya, where access to reliable suppliers, quality agricultural inputs, market information, and collaborative support systems remains uneven. In such settings, purchasing decisions and supply chain relationships may significantly influence production performance, income generation, and ultimately household food security.

Another limitation in the food security literature is the limited integration of concepts drawn from supply chain and *purchasing* management. Consequently, the mechanisms through which purchasing practices affect household food security have received little scholarly attention. Theoretical perspectives such as Value Chain Theory, Transaction Cost Theory, the Relational View, Social

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Embeddedness Theory, and Institutional Theory have been widely applied in studies of business management, procurement, and manufacturing [10, 15, 16, 17], yet they have seldom been used to explain purchasing behaviour among smallholder farmers, particularly those engaged in African Indigenous Vegetable production. This disconnect points to an important theoretical gap in understanding food security from a supply chain management perspective. Integrating insights from food security and supply chain literature provides opportunity to reconceptualize smallholder farmers not merely as producers, but also as decision-makers whose purchasing choices can influence farm productivity, household income, and the availability, accessibility, utilization, and stability of food.

The present study contributes to the literature in three important respects. First, it extends conventional analyses of food security by examining farmers'purchasing practices alongside traditional determinants such as income, years of experience in production, gender of the producer and household size, thereby recognizing that food security is influenced not only by what is produced but also by how production inputs are sourced, managed, and coordinated within farming systems. Second, the study generates empirical evidence from African Indigenous Vegetable production systems in Kenya, an area that has remained underrepresented in both food security and supply chain management research. Third, the study integrates perspectives from food security and supply chain management to examine how farmers' input supplier selection, product preference alignment, and collaboration with supply chain partners relate to food security. This integrated approach provides a more comprehensive understanding of the pathways through which purchasing practices may contribute to sustainable food security among smallholder farming households.

Against this backdrop, the study investigates the relationship between purchasing practices and food security among African Indigenous Vegetable farmers in the Nyanza region of Kenya. Specifically, it examines supplier selection, product preference alignment, and collaboration with supply chain partners to determine how these purchasing practices relate with food security outcomes among AIV producing households.

THEORETICAL FRAMEWORK

This study is anchored on the premise that food security is influenced not only by agricultural production and household income but also by the quality of managerial decisions undertaken by farmers in acquiring and utilizing production resources. While conventional food security studies have largely emphasized production capacity, resource ownership, purchasing power, access to credit, irrigation, extension services, and land ownership as key determinants of food security [5-7],

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limited attention has been given to the role of farmers'purchasing decisions in shaping agricultural productivity and food security outcomes. The present study therefore adopts an integrated theoretical framework combining Value Chain Theory, Transaction Cost Theory, the Relational View, Social Embeddedness Theory, and Institutional Theory to explain how farmers'purchasing practices influence food security among African Indigenous Vegetable (AIV) farming households.

The central argument of the framework is that purchasing practices constitute strategic farm-level management decisions through which farmers acquire agricultural inputs, access information, manage production risks, and establish relationships with suppliers and other supply chain actors. Through these functions, purchasing practices influence agricultural productivity, production efficiency, income generation, and ultimately the four dimensions of food security: availability, access, utilization, and stability [1]. The framework therefore extends the analysis of food security beyond production outcomes to include the input sourcing decisions that shape agricultural performance.

Value Chain Theory provides the overarching theoretical foundation for the study. The theory conceptualizes agricultural systems as interconnected networks of activities linking input supply, production, processing, distribution, and consumption [13,10]. From this perspective, farm productivity and food security are influenced by the effectiveness of linkages among actors operating within the value chain. For farmers, the quality and reliability of agricultural inputs obtained from suppliers significantly influence production outcomes. Consequently, purchasing practices such as supplier selection, product preference alignment, and collaboration with suppliers could be important mechanisms through which farmers improve production performance and enhance food security.

Transaction Cost Theory complements this perspective by explaining why farmers adopt particular purchasing arrangements when sourcing agricultural inputs [18] . According to Kano, Tsang and Yeung [19], economic actors seek to minimize the costs associated with searching for suppliers, obtaining information, negotiating transactions, monitoring agreements, and managing uncertainty. In agricultural production systems, unreliable suppliers, poor-quality inputs, delayed deliveries, and information asymmetries increase transaction costs and production risks. Farmers therefore tend to select suppliers who are reliable, reputable, and capable of delivering quality inputs at reasonable cost. Effective supplier selection may reduce uncertainty, improve production efficiency, and enhance the likelihood of achieving favourable food security outcomes.

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The Relational View further emphasizes the importance of collaboration in generating value and improving performance [8]. The theory argues that organizations and individuals achieve superior outcomes through cooperation, trust, information sharing, and joint problem-solving. Within African Indigenous Vegetable production systems, collaboration between farmers and suppliers may facilitate access to technical knowledge, market information, production advice, and innovations. Such interactions may improve decision-making and strengthen farmers' capacity to respond to production challenges. Consequently, collaboration may contribute to increased productivity, reduced production risks, and improved food security.

Social Embeddedness Theory reinforces this perspective by arguing that economic decisions are embedded within social relationships and networks rather than being driven solely by economic rationality [12, 20]. In many agricultural systems, supplier choice and purchasing decisions are influenced by trust, reputation, previous experience, and recommendations from other farmers. These social relationships facilitate information exchange and reduce uncertainty regarding product quality and supplier reliability. Within African Indigenous Vegetable production systems, trust-based relationships often influence farmers'purchasing behaviour and may affect access to quality inputs and production resources [12, 21, 22].

Institutional Theory further explains how formal and informal institutional arrangements shape farmers'purchasing decisions [23]. Agricultural input markets operate within institutional environments consisting of regulations, quality standards, certification requirements, extension services, and social norms. These institutions influence the availability of inputs, supplier behaviour, information flows, and market participation. Effective institutional arrangements can improve farmers' access to quality inputs and strengthen purchasing decisions, thereby enhancing agricultural productivity and food security outcomes [24].

Collectively, these theoretical perspectives suggest that farmers'purchasing practices influence food security through multiple pathways. Supplier selection may affect access to reliable and high-quality agricultural inputs, thereby influencing productivity and food availability. Product preference alignment may ensure that purchased inputs correspond with production objectives, market requirements, and profitability goals, thereby contributing to income generation and food access. Collaboration may facilitate information sharing, technical support, and joint problem-solving, thereby strengthening resilience and food stability. The framework therefore posits that purchasing practices function as strategic farm-level mechanisms that influence food security by shaping production efficiency, market participation, and household welfare.

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Beyond explaining these relationships, the framework contributes theoretically by integrating food security and supply chain management perspectives, two fields that have traditionally evolved independently. While food security research has predominantly focused on agricultural production, livelihoods, and household resources, purchasing practices have largely been examined within procurement and supply chain management literature. By bringing these perspectives together, the study develops a multidisciplinary framework that positions farmers not merely as producers but also as strategic purchasing decision-makers whose sourcing decisions affect production outcomes and household well-being. The study therefore extends existing food security theory by demonstrating that food security is influenced not only by what farmers produce and earn, but also by how effectively they acquire, manage, and utilize production inputs.

Furthermore, the framework extends the application of Value Chain Theory, Transaction Cost Theory, the Relational View, Social Embeddedness Theory, and Institutional Theory to smallholder agricultural systems, particularly African Indigenous Vegetable production. While these theories have frequently been applied to firms, manufacturing organizations, and formal supply chains, this study demonstrates their relevance in explaining purchasing behaviour among smallholder farmers operating within resource-constrained environments. Consequently, the study provides a broader theoretical understanding of food security as an outcome of interactions among production resources, purchasing decisions, social relationships, and supply chain linkages. This represents the study's primary theoretical contribution and offers a new lens through which food security can be examined within smallholder agricultural systems.

METHODOLOGY

A cross-sectional correlational research design was employed to investigate the relationship between purchasing practices and food security among farmers producing African Indigenous Vegetables (AIVs) in the Nyanza region of Kenya. The region was considered suitable for the study because, despite its favourable agricultural conditions, food insecurity remains a major concern for many households. Fertile soils, relatively dependable rainfall, and the availability of water from major lakes and rivers provide opportunities for agricultural production. However, these advantages have not translated into sustained food security for a significant proportion of the population. Households in several counties, particularly Homabay, Migori, and Siaya, continue to face recurrent food shortages, poor dietary diversity, and limited access to nutritious foods. High poverty levels further constrain their ability to purchase adequate food and invest in essential farm inputs needed to improve agricultural productivity [25-26]. Consequently, many households experience challenges related to food availability, access, utilization,

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and stability, which are widely recognized as the four pillars of food security [27, 28].

The study targeted a population of 10,267 AIV farmers distributed across six counties: Homabay, Kisii, Kisumu, Migori, Siaya, and Nyamira. To ensure adequate representation of farmers from each county, a stratified random sampling technique was used. Based on Yamane [29] sample size determination formula, a total sample of 430 respondents was selected for the study. Primary data were collected using a structured questionnaire administered to African Indigenous Vegetable (AIV) farmers. The questionnaire was designed to collect information on both the independent and dependent variables of the study. The independent variables comprised farmers'purchasing practices when sourcing agricultural inputs for vegetable production, specifically supplier selection, product preference alignment, and collaboration with suppliers and other supply chain partners.

Food security was assessed as a multidimensional concept encompassing four key dimensions: food availability, food access, food utilization, and food stability. The indicators used to measure these dimensions were informed by the Food and Agriculture Organization of the United Nations [27] food security framework and were adapted to reflect the socioeconomic and agricultural conditions prevailing in the study area.

Responses to the questionnaire items were measured on a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. For each construct, individual item scores were aggregated by computing the arithmetic mean of all items representing that construct, thereby generating a composite index. The following formulae was applied:

$$Index_i = \frac{\sum_{j=1}^{k} X_{ij}}{k}$$

Where X_{ij} = respondent *i*'s score on item j

k = Number of items measuring the construct

$Index_i$= Composite index for respondent *i*

The computed indices retained the original five-point scale, with higher scores reflecting higher levels of the construct being measured. Although responses to individual Likert items are ordinal, combining several items into a single composite index is generally accepted as providing an approximate interval-level measure, provided that the items capture the same underlying concept and demonstrate satisfactory reliability and validity. Averaging responses across multiple items

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increases the range of possible scores and produces a measure that more closely resembles a continuous variable. Consequently, the composite indices were considered suitable for analysis using parametric statistical techniques. This approach is widely adopted in social science research and is supported by methodological literature [50, 51]. The specific indicators and measurement items used to operationalize the purchasing practice and food security constructs are presented in Tables 1 and 2, respectively.

To ensure the quality of the instrument, content validity was assessed using the Content Validity Index, which yielded a value of 0.91, indicating a high level of validity. Reliability of the measurement scales was tested using Cronbach's alpha, and all coefficients exceeded the acceptable threshold of 0.70 [30].

The collected data were analyzed using descriptive statistics to describe the characteristics of the respondents and the principal study variables. Pearson correlation analysis was used to examine the bivariate relationships between purchasing practices and food security. Multiple regression analysis was then applied to explore the association between food security and the set of independent variables, taking into account the simultaneous contribution of each variable in explaining differences in food security levels among the study respondents. The estimated regression model is specified as follows:

$$Y_i = \beta_0 + \sum_{j=1}^{3} \beta_j X_{ji} + \sum_{k=1}^{5} \varphi_k C_{ki} + \varepsilon$$

Where;

Y_i represents the dependent variable (food security) as reported by i^{th} respondent.

β_0 represents the constant term in the estimated equation

β_j represents the model coefficients of purchasing measures, ∀j = 1, 2, 3 (Supplier selection, product preference, collaboration)

X_{ji} represents a measure of purchasing as reported by i^{th} respondent.

φ_k represents the model Coefficients of control variables ∀$_k$ = 1, 2, 3, 4, 5

C_{ki} represents a control variable associated with individual respondent (i.e., Monthly Income (in KES "000"), Years of experience, Monthly Sales (KGs), Gender, Household Size)

ε indicates the error term.

In addition, since all variables were collected from the same respondents using a single questionnaire administered at one point in time, the possibility of common

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method bias (CMB) was examined using Harman's Single-Factor Test, and the results reported in Table 3. The analysis showed that the first unrotated factor explained 38.39% of the total variance, which is below the commonly accepted threshold of 50%. This finding suggests that common method variance is unlikely to have significantly influenced the study results. However, it is important to interpret this outcome with some caution because the test was conducted using construct-level composite scores rather than the original questionnaire items. Since Harman's Single-Factor Test is generally more appropriate when applied to individual measurement items, the results provide only an indication that common method bias is unlikely to be a major concern in this study [31].

Diagnostic tests confirmed the adequacy of the estimated model. Variance Inflation Factors presented in Table 6 ranged from 1.028 to 1.452, indicating that multicollinearity was not a concern [32-33]. Similarly, the non-significant Breusch-Pagan statistic ($\chi^2 = 7.42$, $p = 0.492$) in Table 7 suggests that heteroscedasticity was unlikely to have influenced the estimated coefficients. These diagnostic results provide confidence in the reliability and stability of the estimated model and support the robustness of the reported statistical associations.

RESULTS AND DISCUSSION

Descriptive statistics presented in Table 1 provide an overview of food security conditions among households engaged in African Indigenous Vegetable (AIV) farming. The mean food security index of 3.62 (SD = 0.61) indicates that, on average, AIV-producing households reported moderate levels of food security. Although this finding suggests a reasonable degree of stability in household food access, it also points to conditions that may expose farming households to food-related vulnerabilities. Indigenous vegetables are commonly produced under smallholder production systems characterized by seasonality, fluctuations in output prices, perishability of harvested produce and increasing costs associated with acquiring production inputs. Such circumstances may influence the consistency with which households maintain adequate food supplies and dietary diversity over time. The observed food security status therefore appears reflective of the production and marketing circumstances under which AIV farmers undertake indigenous vegetable cultivation. In many instances, farmers allocate part of their harvest for household consumption while marketing surplus produce, making food security outcomes closely intertwined with decisions surrounding production planning, input acquisition and produce sales. Similar challenges among indigenous vegetable growers in Kenya have been documented by various United Nations agencies, Shiundu and Oniang'o, and Imathiu [1, 4, 34].

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The purchasing practice dimensions recorded relatively high mean scores, with supplier selection attaining a mean score of 3.74 (SD = 0.58), product preference alignment averaging 3.68 (SD = 0.63), and collaboration registering the highest mean score of 3.81 (SD = 0.55). These findings suggest that AIV farmers accord considerable attention to decisions concerning the acquisition of seeds, fertilizers, organic amendments and crop protection products required for vegetable production. The comparatively high collaboration score may indicate that farmers frequently interact with one another through informal exchanges of production experiences, collective procurement of inputs, farmer group activities and discussions regarding indigenous vegetable cultivation practices. Such interactions are particularly relevant in AIV production systems, where information on seed sources, input availability, pest management and market conditions is often obtained through social networks and farmer associations.

Pearson correlation results presented in Table 2 indicate that all purchasing practice dimensions were positively and significantly associated with household food security at the one percent significance level. Supplier selection exhibited a moderate positive association with food security ($r = 0.428$, $p < 0.01$). This finding suggests that AIV farmers who source production inputs from dependable suppliers tend to report relatively better food security outcomes. Access to quality seed and other production inputs at appropriate times may allow farmers to maintain vegetable production schedules, particularly for indigenous vegetables cultivated continuously for household consumption and market participation. Similar observations have been documented by Shiundu and Oniang'o [4].

Product preference alignment was also positively associated with food security ($r = 0.435$, $p < 0.01$). Farmers whose purchasing decisions appear aligned with their production objectives and preferences for specific indigenous vegetable varieties tended to report relatively higher food security scores. Many AIV farmers cultivate multiple vegetable species simultaneously to satisfy household dietary needs while generating income from surplus produce [1] and Imathiu [34]. Procuring inputs that support the cultivation of preferred vegetable varieties may therefore correspond with sustained production of nutrient-dense foods commonly consumed within farming households.

Among the purchasing practice dimensions, collaboration exhibited the strongest association with food security ($r = 0.438$, $p < 0.01$). For AIV farmers, collaborative activities commonly include exchanging information on seed availability, discussing experiences in managing pests and diseases, jointly purchasing farm inputs and sharing knowledge regarding seasonal market conditions. These interactions may be particularly important in indigenous vegetable production, where producers often rely on farmer networks and accumulated experiential knowledge to address

production challenges. The positive association observed between collaborative activities and food security appears consistent with the embeddedness perspective advanced by Granovetter [35], which posits that economic activities are frequently undertaken within socially mediated relationships. Within the context of indigenous vegetable farming, the findings suggest that embedded social interactions among producers are associated not only with information exchange but also with household welfare outcomes, thereby extending the explanatory usefulness of embeddedness theory to understanding variations in food security among AIV farming households.

Regression estimates presented in Table 3 show that purchasing practices and selected socioeconomic characteristics were significantly associated with household food security among AIV farming households. The model explained 32.6% of the variation in household food security and was statistically significant ($F(8,421) = 25.43$, $p < 0.001$). This suggests that purchasing practices play an important role in shaping food security outcomes among indigenous vegetable producers. However, the relatively modest explanatory power of the model indicates that food security is influenced by a broader range of factors that extend beyond those included in the analysis.

Indeed, approximately 67.4% of the variation in household food security was not accounted for by the variables considered in the model. Food security is widely recognized as a complex and multidimensional phenomenon that is shaped by economic, social, institutional, and environmental conditions operating simultaneously [36, 37]. Factors such as access to extension services, membership in farmer groups, availability of credit, ownership of productive assets, quality of market infrastructure, transportation costs, climatic conditions, and farm productivity have been found to affect the ability of rural households to secure sufficient and nutritious food [38]. Household-specific characteristics that are difficult to quantify, including farming experience, managerial skills, risk attitudes, and nutrition-related knowledge, may also contribute to differences in food security outcomes.

The exclusion of some of these variables from the model raises the possibility of omitted variable bias, particularly if the omitted factors are associated with both purchasing practices and household food security. Although the inclusion of relevant socioeconomic controls helps to minimize this concern, it is unlikely to eliminate it entirely. Consequently, the estimated coefficients should be interpreted as indicating relationships between the variables rather than conclusive evidence of causality. Furthermore, because the study relied on cross-sectional data collected at a single point in time, it was not possible to capture seasonal fluctuations, changing market conditions, or the cumulative effects of shocks that

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households may experience over time. Such dynamics are particularly important in agricultural settings where food availability and access often vary across seasons.

Notwithstanding these limitations, the findings provide useful insights into the relationship between purchasing practices and household food security among AIV producers. They also point to the need for future studies to incorporate a wider range of institutional, environmental, and behavioural factors and, where feasible, to employ longitudinal data that can better capture changes in household welfare over time. Such efforts would help to deepen understanding of the pathways through which supply chain practices associate with food security and strengthen the evidence base for interventions aimed at improving the livelihoods of indigenous vegetable farming households.

Supplier selection ($\beta = 0.192$, $p < 0.001$), product preference alignment ($\beta = 0.205$, $p < 0.001$) and collaboration ($\beta = 0.237$, $p < 0.001$) all demonstrated positive and statistically significant associations with food security. The comparatively larger coefficient associated with collaboration suggests that differences in the extent to which AIV farmers engage in collaborative activities correspond with differences in reported food security outcomes. Supplier selection and product preference alignment were also positively associated with food security.

Although the Relational View proposed by Dyer and Singh [39] was originally advanced to explain how inter-organizational relationships generate relational rents and superior performance, the present findings suggest that some of its underlying propositions may also have relevance within smallholder indigenous vegetable production systems. Maintaining relationships with dependable suppliers and making purchasing decisions that reflect production priorities and varietal preferences appear to correspond with differences in household food security outcomes. Such observations indicate that relational assets embedded in routine purchasing activities may represent an important but relatively underexplored dimension of indigenous vegetable production systems.

Income derived from African Indigenous Vegetable production, farming experience and monthly sales of indigenous vegetables were also positively associated with food security. Households obtaining relatively higher earnings from indigenous vegetable sales, reporting longer periods of engagement in AIV cultivation, and marketing larger quantities of produce tended to exhibit relatively better food security scores. These patterns may reflect the dual role played by indigenous vegetables within farming households, serving both as food for home consumption and as a source of cash income that can be utilized to meet additional food requirements. Similar observations have been reported by United Nations agencies, Shiundu and Oniang'o [1, 4] and Imathiu [34].

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Taken together, these findings suggest that purchasing practices among AIV farmers encompass more than operational decisions related to input acquisition. They appear to represent socially embedded and relational processes through which farmers access information, organize production activities and navigate indigenous vegetable markets. In this regard, the results provide empirical insights that reinforce the relevance of Embeddedness Theory [35] and the Relational View [8] in explaining variations in household food security among producers engaged in African Indigenous Vegetable cultivation. Such evidence may help broaden discussions on indigenous vegetables, which have traditionally focused predominantly on nutritional attributes, conservation value and agronomic characteristics.

CONCLUSION AND RECOMMENDATIONS FOR DEVELOPMENT

This study established that purchasing practices adopted by African Indigenous Vegetable (AIV) farmers are significantly associated with household food security. The empirical results indicate that supplier relationship management, demand management, and collaboration are positively associated with the food security status of AIV-producing households, with collaboration exhibiting the strongest positive association among the purchasing practices examined. Farmers who maintain stable relationships with reliable agro-input suppliers are more likely to obtain quality seeds, fertilizers, and other production inputs in a timely manner, thereby minimizing production disruptions and enhancing the stability of household food availability. These findings suggest the need for extension agencies, farmer groups, and cooperatives to support AIV farmers in identifying dependable suppliers and developing long-term purchasing arrangements that lower transaction costs and improve access to essential production inputs.

The study further demonstrates that demand management practices contribute positively to household food security. Farmers who align their input purchasing and production decisions with prevailing market demand, seasonal consumption patterns, and consumer preferences are better positioned to optimize resource use, respond to market opportunities, and sustain agricultural productivity. Such market-oriented production decisions not only improve farm profitability but also increase the availability and accessibility of nutritious indigenous vegetables. Therefore, strengthening market information systems that provide AIV farmers with timely information on prices, consumer preferences, seasonal demand trends, and emerging market opportunities should be prioritized. Improved access to market intelligence would enable farmers to synchronize production with market requirements, reduce marketing risks, and improve household welfare.

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Collaboration was found to have the strongest association with food security among AIV farming households. Close interactions among farmers, agro-input dealers and other actors involved in indigenous vegetable production and marketing facilitate the exchange of production and market information, improve access to inputs and output markets, and enhance farmers' capacity to respond to market uncertainties. These findings suggest that household food security among AIV farmers depends not only on production capacity but also on the effectiveness of social and economic networks within indigenous vegetable systems. Consequently, policies and development programmes should encourage the formation and strengthening of farmer organizations, producer cooperatives, contract farming arrangements, farmer field schools, and multi-stakeholder platforms that promote collective input purchasing, knowledge sharing, joint marketing, and collective bargaining. Digital platforms for disseminating production and market information may further enhance coordination and resilience among AIV producers.

The study also established that household income, market participation, and farming experience are important determinants of food security among AIV farmers. Households with higher incomes, greater participation in vegetable markets, and longer farming experience tend to enjoy more stable access to food and improved livelihood outcomes. In contrast, demographic characteristics such as gender and household size exert relatively limited influence once economic and market-related factors are considered. Accordingly, interventions aimed at enhancing household incomes and expanding market participation among AIV farmers should receive increased policy attention. Investments in post-harvest handling technologies, value addition initiatives, market infrastructure, agribusiness training, and entrepreneurship development can improve farmers' income-generating capacity and strengthen their ability to withstand periods of production shortfalls. In addition, targeted mentorship programmes, extension support services, and capacity-building initiatives for less experienced farmers would facilitate the acquisition of production, purchasing, and marketing skills necessary for sustaining household food security.

In brief, AIV farmers should strengthen long-term relationships with reliable input suppliers and other value chain players, align production decisions with consumer preferences, adopt careful supplier selection practices, and enhance market participation to improve household food security.

CONFLICT OF INTEREST

As the authors, we declare that no conflicts of interest existed during the design, data collection, analysis and reporting of the study findings.

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Table 1: Operationalization of Purchasing Practices Constructs

Construct	Operational Definition	Measurement Indicators	Sample Items	Supporting Literature
Supplier Selection	The process through which farmers identify and choose suppliers capable of providing agricultural inputs that meet quality, reliability, cost, and delivery requirements.	Input quality, supplier reliability, price competitiveness, delivery timeliness, supplier reputation, availability of inputs.	"I select suppliers based on the quality of inputs supplied."; "I prefer suppliers who deliver inputs on time."; "Supplier reliability influences my purchasing decisions."	[40, 41, 42]
Product Preference Alignment	The extent to which purchased agricultural inputs correspond to farmers' production needs, customer preferences, market demand, and farming objectives.	Customer demand consideration, market trends, product suitability, consumer preferences, expected profitability, input performance.	"I purchase inputs that match customer preferences."; "Market demand influences the products I choose."; "I consider profitability when selecting products."	[43, 44, 45]
Collaboration	The degree of cooperation, information sharing, joint decision-making, and relationship-building between farmers and supply chain partners.	Information sharing, communication frequency, trust, joint planning, problem-solving, long-term relationships.	"I regularly share information with suppliers."; "I collaborate with suppliers to solve supply-related problems."; "There is mutual trust between me and my suppliers."	[46, 47, 48]

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Table 2: Operationalization of food security constructs

Constructs	Operational Definition	AIV-Specific Measurement Indicators	Sample Items	Supporting Literature
Food Availability	The extent to which farming households have sufficient food through own production and market supply throughout the year.	AIV production volume, seasonal availability of AIVs, household AIV stocks, diversity of AIVs grown	AIV production provides sufficient vegetables for my household throughout the year; I harvest African indigenous vegetables in most production seasons; The quantity of AIVs produced by my household has increased food availability; My household maintains adequate stocks of AIVs after harvest; Growing different AIV varieties improves food availability in my household.	[27]
Food Access	The ability of households to acquire sufficient and nutritious food through income earned from farming and other sources.	Income from AIV sales, affordability of food through AIV earnings, access to AIV markets	Income earned from AIV sales enables my household to purchase other food items; Earnings from AIV farming have improved my household's ability to access nutritious foods; Reliable markets for AIVs improve my household's food purchasing power; Revenue from AIV sales helps my household meet food needs throughout the year; Increased AIV sales have reduced difficulties in accessing food.	[27]
Food Utilization	The effective consumption and biological use of food through adequate dietary diversity, nutrition, food	AIV consumption frequency, dietary diversity from AIVs, nutritional benefits of AIVs	My household consumes African indigenous vegetables regularly; Consumption of AIVs has improved the nutritional quality of our meals; AIVs	[27]

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	preparation, and health practices.		contribute important vitamins and minerals to my household diet; Growing AIVs has increased the diversity of foods consumed by my household; Knowledge gained from AIV production has improved our food preparation and consumption practices.	
Food Stability	The ability of households to maintain food security over time despite seasonal, economic, climatic, or market-related shocks.	Resilience from AIV farming, stability of AIV income, year-round food security from AIVs	AIV farming helps my household maintain food supplies during difficult periods; Income from AIV production remains relatively stable across seasons; AIV production reduces the risk of food shortages in my household; My household can rely on AIV farming during periods of economic hardship; AIV farming strengthens my household's ability to cope with climate-related shocks.	[27]

Table 3: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
Food Security Index	3.62	0.61	1.80	4.95
Supplier Selection	3.74	0.58	2.10	4.90
Product Preference	3.68	0.63	2.00	4.88
Collaboration	3.81	0.55	2.30	4.96
Monthly Income (KES)	18450	6350	4500	42000

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Table 4: Correlation between Purchasing elements and Food Security

Variable	Supplier Selection	Product Preference	Collaboration	Food Security
Supplier Selection	1			
Product Preference	0.544**	1		
Collaboration	0.470**	0.478**	1	
Food Security	0.428**	0.435**	0.438**	1

***Correlation is significant at the 0.01 level (2-tailed)*

Table 5: Multiple Regression Results Predicting Food Security

Variable	B	Std. Error	Beta (β)	t	p-value	95% Confidence Interval	Effect Size Interpretation
Constant	1.032	0.087	–	11.86	<0.001	[0.861, 1.203]	Significant intercept
Supplier Selection	0.118	0.030	0.192	3.93	<0.001	[0.059, 0.177]	moderate positive association
Product Preference	0.139	0.035	0.205	3.97	<0.001	[0.070, 0.208]	Moderate positive association
Collaboration	0.178	0.036	0.237	4.98	<0.001	[0.107, 0.249]	Moderate positive association
Monthly Income (in '000 KES)	0.012	0.005	0.121	2.56	0.011	[0.002, 0.022]	Small positive association
Experience (Years)	0.041	0.018	0.095	2.33	0.020	[0.006, 0.076]	Small positive association
Monthly Sales (KGs)	0.062	0.025	0.102	2.53	0.012	[0.013, 0.111]	Small positive association
Gender (1 = Male)	0.028	0.022	0.048	1.26	0.209	[-0.015, 0.071]	Negligible association (not significant)
Household Size	-0.017	0.011	-0.061	-1.62	0.106	[-0.039, 0.004]	Negligible negative association (not significant)

Model Statistics: R = 0.571 | R^2 = 0.326 | Adjusted R^2 = 0.313 | F (8,421) = 25.43 | p < 0.001

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Table 6: Multicollinearity Diagnostics

Variable	Tolerance	VIF
Supplier Selection	0.712	1.404
Product Preference	0.689	1.452
Collaboration	0.701	1.427
Income	0.874	1.144
Experience (Years)	0.939	1.065
Monthly Sales (KGs)	0.949	1.054
Gender 1 Male	0.973	1.028
Household Size	0.991	1.009

Table 7: Breusch-Pagan Heteroscedasticity Test

Chi-Square	Df	p-value
7.42	8	0.492

Result: Homoscedasticity assumption satisfied

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