Current Agriculture Practices: Baseline Survey Report

Central Highlands Ecoregion Foodscape (CHEF)

November 2025

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Introduction

The Nature Conservancy (TNC) Central Highlands Ecoregion Foodscapes (CHEF) Use Case targets eleven counties in the central highland region of Kenya that transition from water towers, smallholder transition zone, semiarid production zone, to rangelands. The mission of the Use Case is to improve and sustain the health, diversity, and productivity of the croplands and rangelands to meet the needs of the present and future communities. The interaction of land use systems and agrifood systems in the region is the driver of production decline and depletion of ecosystem services and biodiversity.

The CHEF Use Case embeds a foodscapes-scale approach along the transitions to design, validate, and action that are sensitized to local contexts. The approach fosters bridging traditional knowledge and scalable nature-based interventions to drive and achieve an inclusive and sustainable food systems transformation and to accelerate system-wide change. The Use Case aims to catalyze the implementation of regenerative practices and innovations across the transition zones, representing the diversity of geographic and food production archetypes.

To achieve a transformative landscape, understanding and characterizing the current agriculture and agronomic practices is essential to benchmark baselines and integrate context-specific agriculture practices for evidence-based development of Use Case portfolios. The analysis of the current practices highlights the performance of current agricultural practices and constraints and associated risks, and their impact on food security. This report presents synthesized information on the constraints and risks of agriculture, the context of crop and livestock production diversification, descriptions of current farm agricultural practices and input supply and farmer services, and the food and nutrition security status of farming households.

Methodology

The household survey was conducted under the Excellency in Agronomy initiative of the CGIAR in 2024. The current practices assessment survey was conducted in the three CHEF Use Case target counties, namely Nyandarua, Laikipia, and Meru, with a total of 22 wards. A representative sample of farmers was selected in a two-stage sampling approach. In the first stage, the target counties and villages were purposively identified because of the representation of domains of diverse farming systems in the transition landscape. In each target ward, the sampling frame of all farmers was developed to select 28 sample farmers per ward. In the second stage, a random sampling of the farmers was selected from each sample list of farmers in each ward, with a proportional size of men, women, and youth. The sample size was 622 households across the three counties. The distribution of sampled households by county was Meru 50.3% (n=313), Laikipia 40.5% (n=252), and Nyandarua 9.2% (n=57).

Before the interview of sample households, consent of farmers for their voluntary participation and ethical procedures were obtained. Sampled farmers were interviewed using a structured questionnaire. The structured questionnaire includes questions on awareness, use, and adoption of current agronomic practices; household socio-economic characteristics; plot information; input and output quantities and prices; farmers' perceptions; and constraints and risks. Descriptive analysis was conducted to assess farmers’ perceptions on the state of current agricultural practices, plot-level information, adoption intensity of current agricultural practices, food security status, and constraints and risks of agricultural production and the natural ecosystem. Data analysis began with data cleaning to prepare for analysis. Data collected on household characteristics and plots, units of measurement were standardized to maintain consistency and a standard way of analysis.

Survey Findings

Constraints and Risks of Agricultural Production

Agriculture in the TNC CHEF region is predominantly a rainfed system (85%), supplemented with an irrigated system using various water sources. Farmers in the CHEF region perceived and experienced several production constraints and risks that influence their capacity to respond to and adapt to climatic shocks, and to meet their food security needs. Broadly, the constraints are categorized as degradation of natural resources, disease and pest infestations, lack of agricultural inputs, and inadequate support services. As illustrated in Figure 1, farmers reported that water shortage and/or drought occurrence (69%) and poor soil fertility (52%) are common constraints for many of the study locations. About 38% to 45% of the farmers reported that pests and diseases are common constraints of crop production. Furthermore, systemic constraints, including a lack of inputs (42%), inadequate finance/credit access (36%), shortage of labor (22%), lack of market access (29%), extension services (19%), and shortage of storage facilities (34%) have contributed to the low productivity and production levels of crops in the region. Seasonal shortage of water (72%), long distance to access water sources (46%), insufficient water storage (39%), poor water quality (29%), and high costs of irrigation (15%) are key constraints of smallholder farmers specific to accessing water sources. The common pests that induce crop damage risks are: rodents (48%), stalk borer (42%), aphids, cutworms, and armyworms, and that of disease include rust, blight, wilt, smut, and viral diseases.

Farmers in the CHEF region experienced production risks that influence their agricultural production and limit their capacity to ensure sustainable and resilient agrifood systems and environmental protection. Among the reported risks, drought (78%), pest damage (45%), price fluctuations (40%), disease infestation (32%), and climate change (28%) constituted the largest drivers of production risks. Moreover, farmers also reported specific climate-related risks, including drought (82%), irregular rainfall (71%), increased temperatures (45%), flooding (32%), and extreme weather conditions such as cold spells and hailstorms (34%). Figure 1 displays the relative importance of various risk factors in each county. Drought stress is a more important factor at Nyandarua followed by Meru and Laikipia. Nyandarua and Laikipia experienced more cold stress. Rodent and bird damage is only a risk in Laikipia. Pests and diseases, and price fluctuations are equally important across the three counties. Climate risks are largely uncontrolled, but they can be mitigated through climate-smart technologies and approaches. However, farmers in the region realized that there are barriers affecting their adaptation and mitigation capacity to respond to climate risks and their adoption. They reported that lack of resources, high costs of adaptation measures, knowledge and skill gaps, lack of market access, and policy gaps are critical barriers with varying magnitudes of influence on the different counties and target communities.

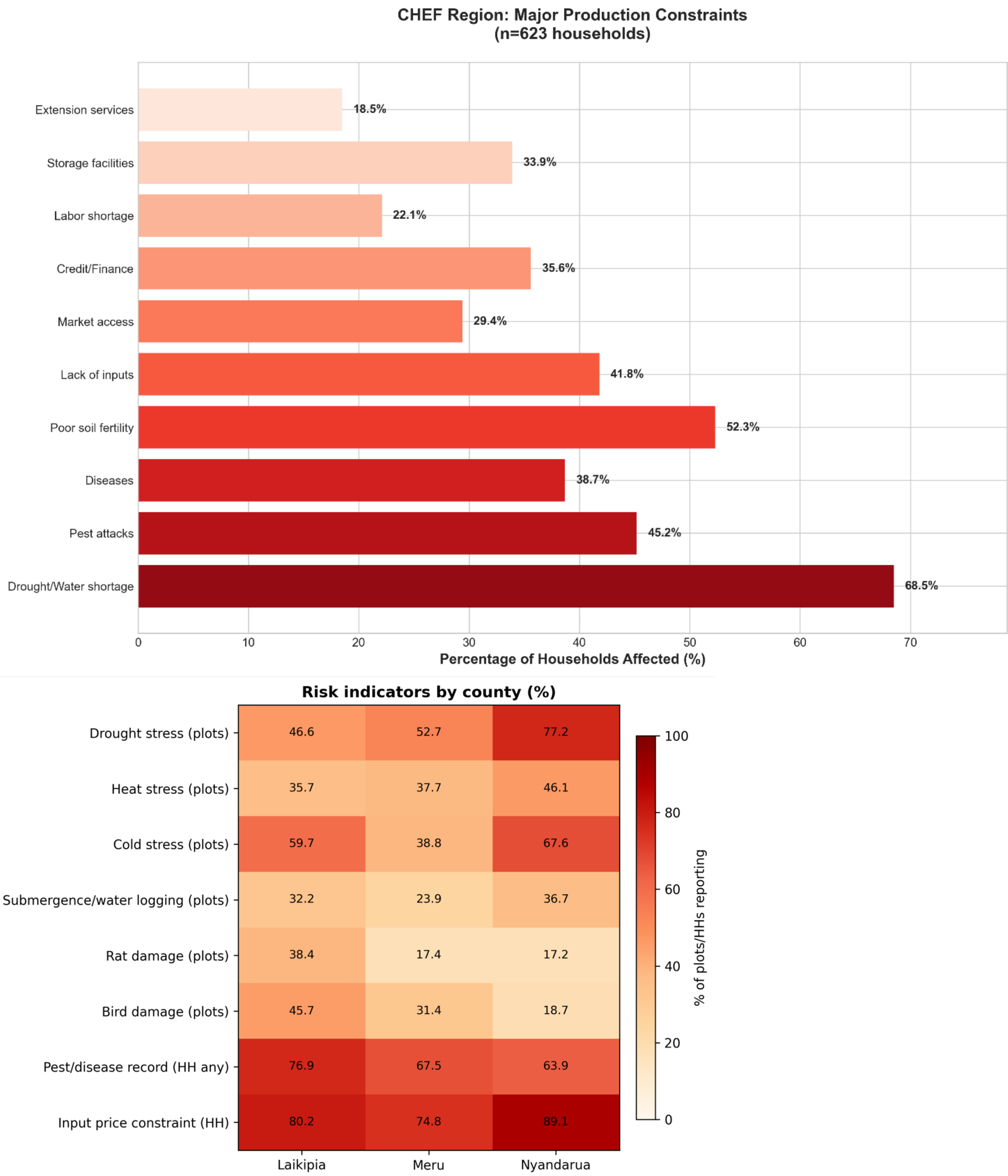

Figure 1. Perceived production constraints (top panel) and risks (lower panel) in the CHEF region reported by the survey respondents

The Context of Agricultural Production and Farm Practices

Farmer plot characteristics

Farmer plot information, such as tenure type, land size, location, crop history, irrigation access, is crucial for designing precision farming strategies, including tailored fertilizer, variety, and water management for higher yields, risk management from pests and weather impacts, and ensuring subsidies and loans reach the right farmers, enhancing supply chain efficiency, tracking soil health, and reducing environmental impacts. Without accurate plot information, farming decisions become guesswork without evidence, leading to wasted resources and lower productivity.

In the TNC CHEF region, farming plot size varies, ranging from <0.5 ha (28.5%), 0.5 to 1.0 ha (34.2%), 1.0 to 2.0 ha (22.8%), 2 to 5 ha (12%), and >5 ha (2.5%). Given that one-third of the plot size is below 0.5 ha and 62% below 1.0 ha, subsistence farming will not sustain the economy of the households unless an agricultural intensification strategy and farm business models are pursued and incentivized towards ensuring viable foodscapes. The majority of the farmers have tenure ownership (68%), and the rest access land through rent (18%), and share cropping (10%). The land ownership information provides insights into codesigning of agricultural practices and land use and land management strategies for the different land ownership groups, particularly for youths who do not have their own land and only access through rent and share cropping. Almost 75% of the plots are located within 3 km walking distance from homesteads. Among the sample plots assessed in the target locations, farmers respond that the soil fertility status of plots is very fertile (18%), moderately fertile (44%), poor (30%), and very poor (8%). Given that most farms are small in size and nearly 40% are infertile, the farmers current practices need to be intensified in such a way that it enhances integrated sustainable farming practices, including nutrient management, green manuring, intercropping, and crop rotations, use of high-yielding varieties, improved water management practices tailored to the specific local conditions, and crops.

Crop and livestock production diversification

In the CHEF region, farmers' income sources are mainly crop produce (45%), followed by livestock products (28%), and a small contribution from off-farm income (15%) and remittance (7%). Farmers' crop production orientation is either market-oriented (44%), mixed (29%), or subsistence-oriented (27%). The current practice of crop diversification reveals that the region is primarily experienced in growing cereals, mainly maize, pulses, potatoes, and vegetables. Such diversified cropping and livestock systems provide households with the resilient capacity to cope with climate risks and enhance a diversified household economy. The largest share goes to maize among the top 10 crops grown by farmers in the CHEF region (Figure 2Many farmers grow staple crops like maize and potatoes, and a proportion of them grow beans and vegetables (tomato, cabbage), which are marketable commodities.

The region is diverse not only in crops, but also 93% of households own livestock of all species, cattle (79%), goats (65%), sheep (46%), equines (24%), and chickens (89%). The evidence across villages revealed that the crop (3 crops on average) and livestock species (2 animals on average) diversity of households does not significantly vary across the study villages. The survey responses shows that the prevailing diversity on the number of crops (Figure 2) and animals of a household have multiple benefits, including 1) providing multiple income sources from the sales of crops and animal products, 2) integrating crop and livestock practices support to reduce input costs, 3) ensuring market flexibility based on price trends, 4) limiting large-scale losses from single pest infestation, 5) providing backup to climate resilience, 6) reducing reliance on one product market, and 7) allowing households to consume diverse foods (grains, vegetables, dairy, meat) and enhancing diet quality.

On the other hand, the summary analysis of constraints by crop commodity (Table 1) shows the significant contribution of both biophysical and systemic constraints that impact crop productivity and production. Given the context of production constraints and local food demands, local crop production priorities ultimately govern the crop diversity achieved. The priority needs to be reflected based on the cost-effectiveness of addressing the constraining factors, crops' significance in local to global trade, and daily diets. In general, diversification strengthens financial stability, reduces risks, and ensures sustainable farming for food and nutrition security. As a concluding remark, it is essential to prioritize the diversity of crop and livestock production to meet community food and nutrition demands and respond to market opportunities and climate shocks.

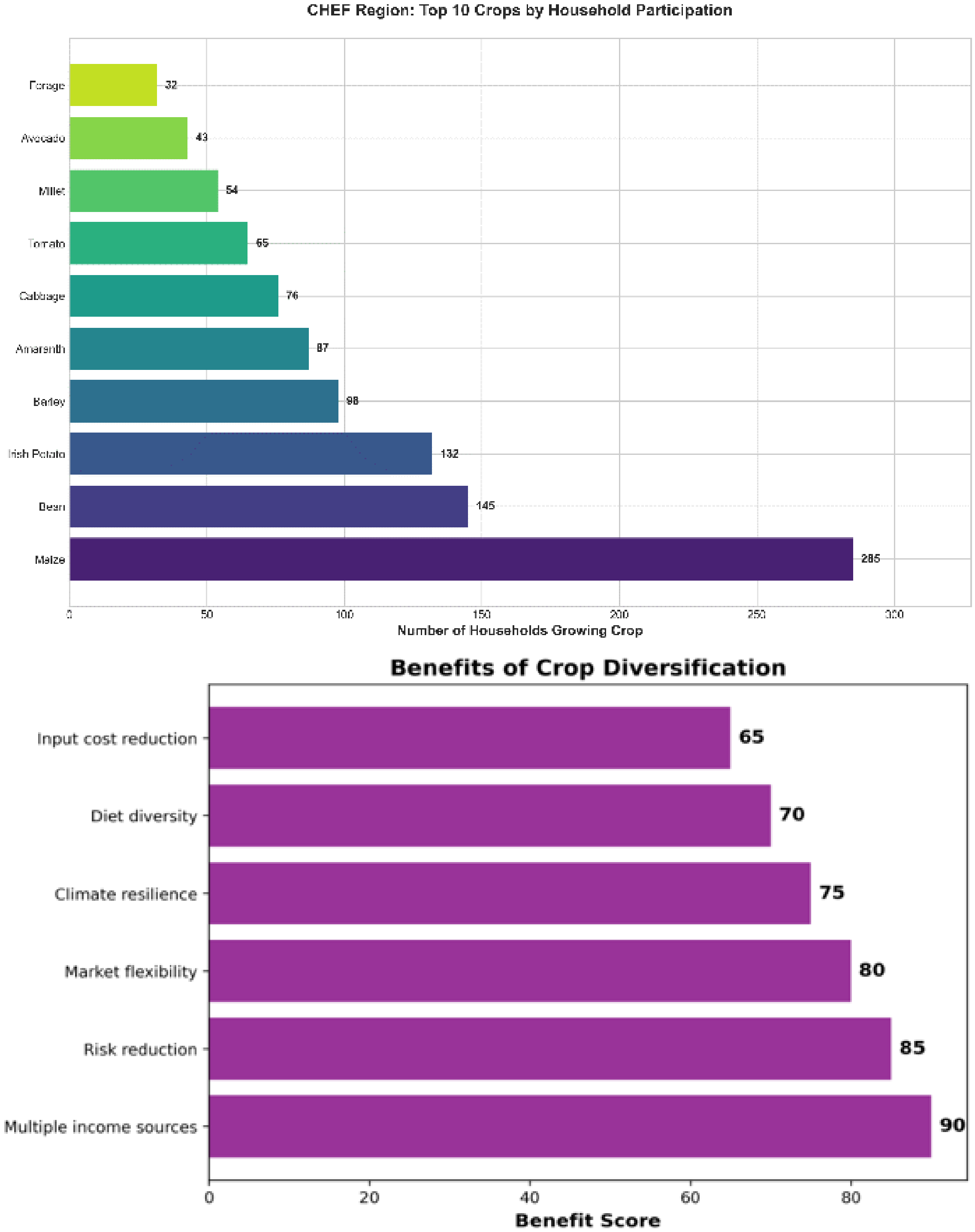

Figure 2. Diversity of crops (top panel) and benefits of crop diversification (lower panel) as perceived from survey respondents

Table 1. Summary of perceived responses of participants on key constraints by crop commodity

Commodity	Biophysical constraints (share of plots)	Systemic constraint(s)
Maize	Water shortage/drought 69%, poor soil fertility 52%, pests & diseases 41%	High fertilizer price, limited storage
Beans (pulse mix)	Disease rust/blight 46%, pests 39%	Limited quality seed, weeding, labour shortage
Potato	Late blight 61%, poor drainage 37%	High certified-seed cost, storage
Forages	Soil fertility declined 45%, and erosion 34%	Sparse extension advice
Banana	Panama & Sigatoka 44%, drought 38%	Bulky harvest, poor road
Vegetables (cabbage, tomato)	Pest pressure 53%, water stress 42%	Expensive pesticides, cold-chain loss
Tea / Coffee	Soil acidity 57%, erratic rainfall 30%	Price fluctuation, labour shortage
Wheat	Drought 48%, rust 33%	Inadequate harvest mechanization
Peas	Frost 36%, powdery mildew 28%	Certified-seed scarcity
Onion / minor horticulture	Waterlogging 31%, thrips 29%	Transport cost

Agricultural practices

Planting and harvesting calendar: The planting and harvesting calendar varies by crop, climate, and region. The extended planting calendar of the major crops for both rainfed and irrigated production systems starts early in February and extends up to August (Figure 3). The majority occur between February to April/May and July/August that resulting in an extended harvesting season, May to December. Despite the variation in the number of households, the planting and harvesting calendars are more or less similar among the study counties (Figure 4). The wider planting and harvesting calendar provide farmers with an opportunity for staggered planting to manage labor and resources, and spreads weather and pest risks over the months, ensuring continuous produce availability for market supply. A balanced cropping calendar of the diversified crop types should provide a good harvest and optimize yield and resource use, while an excessively long window may increase costs and risks. Adjustments should match local climate conditions and market demands.

According to farmer responses, the crop harvest conditions depict 33% good harvest, 35% normal harvest, and 31% bad harvest, attributed to several factors such as in-season weather conditions, pests and diseases, and access to labor and machinery for harvesting. This implies that one-third of the harvests did not meet the food demands of households due to several risks.

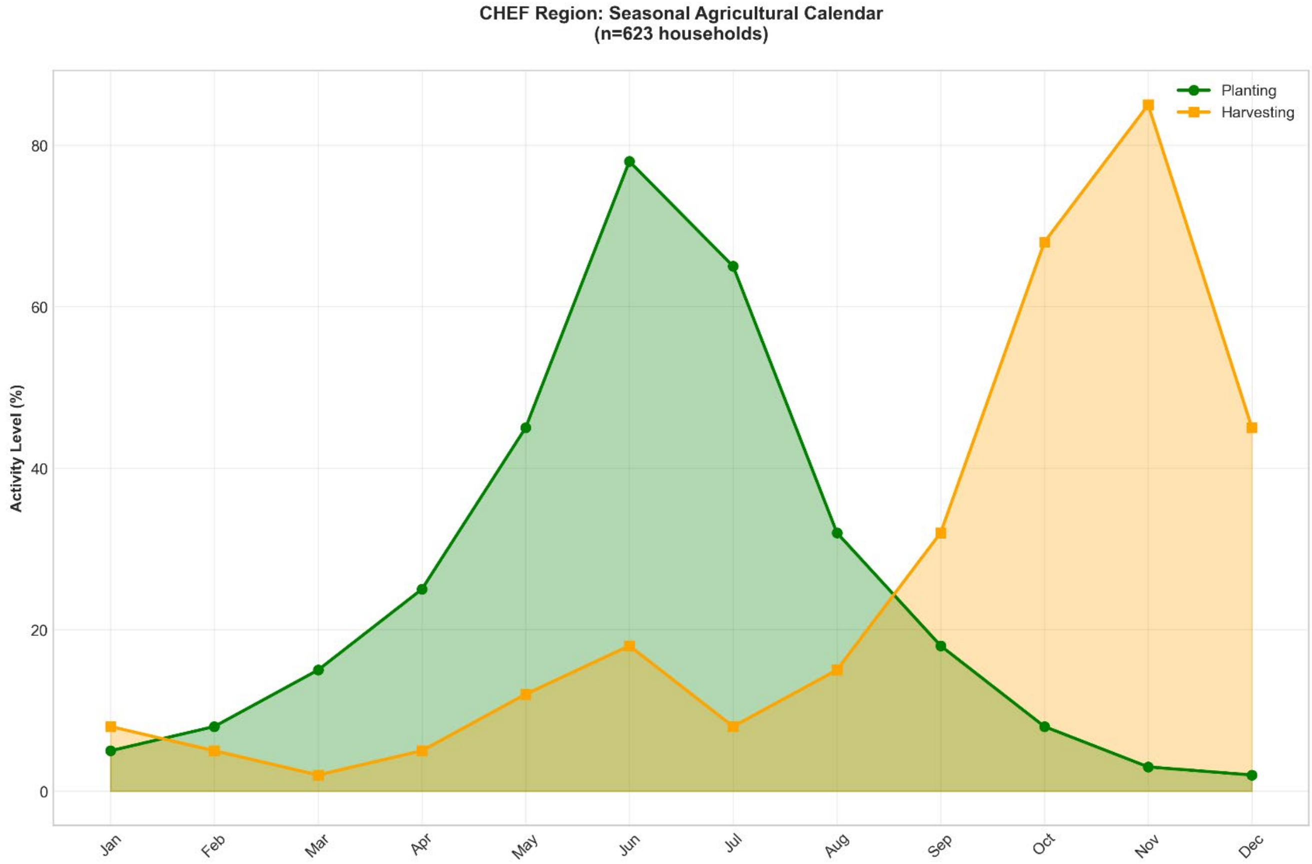

Figure 3. A range of planting and harvesting calendars for diverse crops in the three counties.

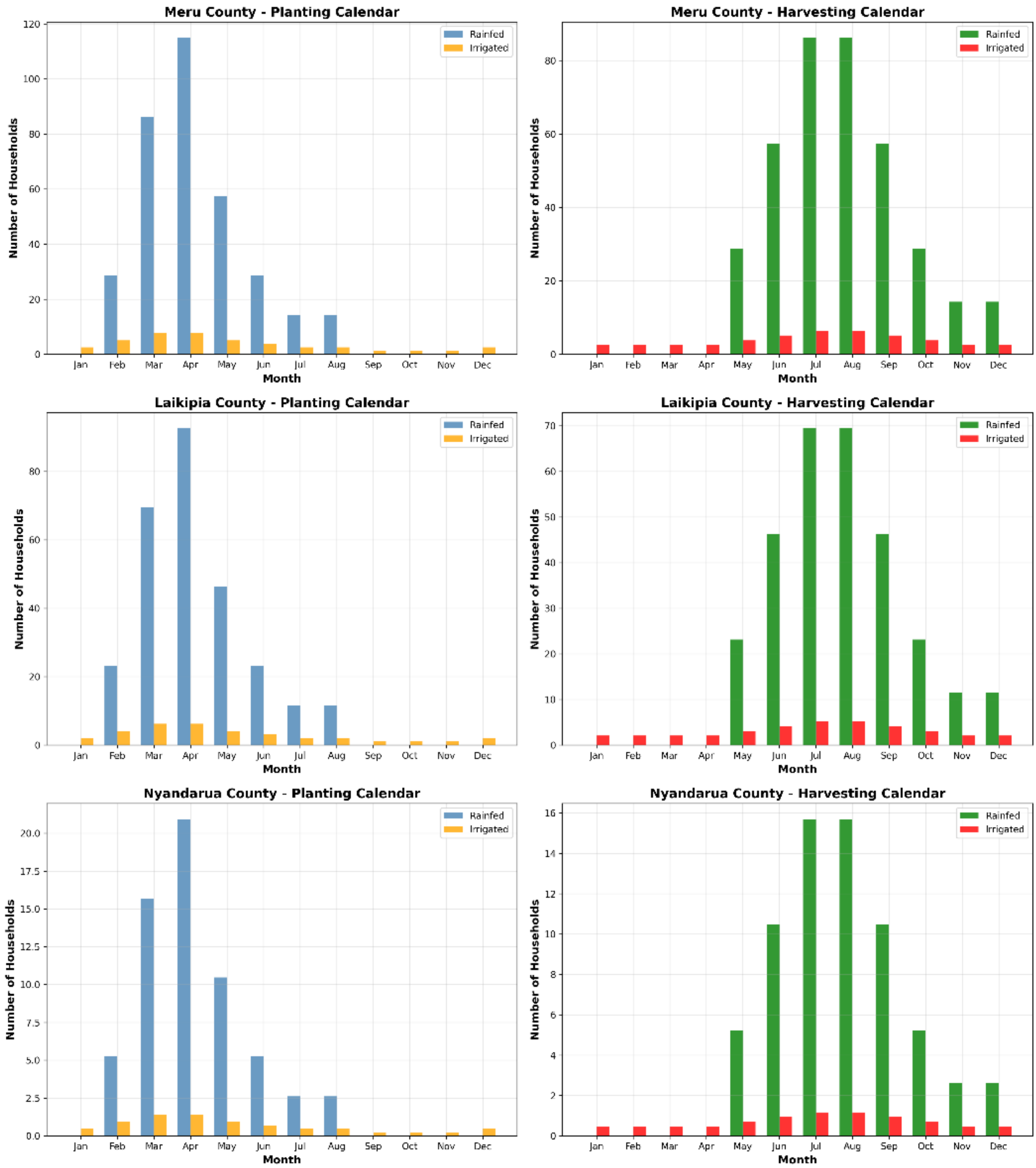

Figure 4. A range of planting and harvesting calendars specific to survey counties.

Improved farm management practices: Farmers perceived responses shows that the use of improved farm practices, constituting agronomic, soil management, and inputs, has played a pivotal role in minimizing yield gaps and improving farm resource use efficiency. Figure 5 shows various inputs and agricultural practices adopted by farmers. Farmers in the CHEF region use improved seeds (22%), pesticides (26%), inorganic (22%) and organic (19%) fertilizers, irrigation practices (8.2%), and their combination (22%). However, one-third of the farming households have no use of any of these improved practices, which are critical for boosting productivity. Maize shared the largest amount of inorganic fertilizer, followed by beans and potatoes (Figure 6), which implies that farmers used to apply a large share of inputs to food grains like maize. On the contrary, wheat has the lowest share of inorganic fertilizer. Despite the fact that nearly 45% of farmers use inorganic fertilizers, 70% of them use the broadcasting method of application, which leads to inefficient use of inputs, and the remaining 30% use either row, banding, or foliar applications. More than 80% of the farmers apply fertilizer for maize, followed by beans (32%) and potatoes (27%). Nearly 10 to 13% of farmers use fertilizer for irrigated crops (cabbage, bananas) and forage crops.

Among other agronomic practices, crop rotations (56%), contour farming (42%), terracing (35%), cover crops (30%), and agroforestry (18%) have been adapted into the agricultural productions. In restoring problematic soils with acidic and organic depletion conditions, improved fallowing (28%), lime application (15%), and organic amendments (68%) received significant attention by farmers in the region. Farmers used to control pests and diseases using traditional methods (49%), pesticides (26%), resistant varieties (17%), and biological controls (8%). They often use the control methods as a preventive measure, during early detection of pests and diseases, responding during outbreaks, and during the post-harvesting period. The effective and sustained use of these farm practices would be impactful if the supply of inputs such as seeds of improved variety, fertilizer, and pesticides needs to be facilitated, strengthened, and regulated. Other interventions, like soil testing, which are currently implemented by 10% of farmers, will foster site-specific and soil-test-based farm management technology advisories and adaptive and localized improved technology services. In general, the current level of adoption for soil management practices is relatively better (65% adoption), while it is low for inputs (35% adoption). This shows the need for managing adoption barriers.

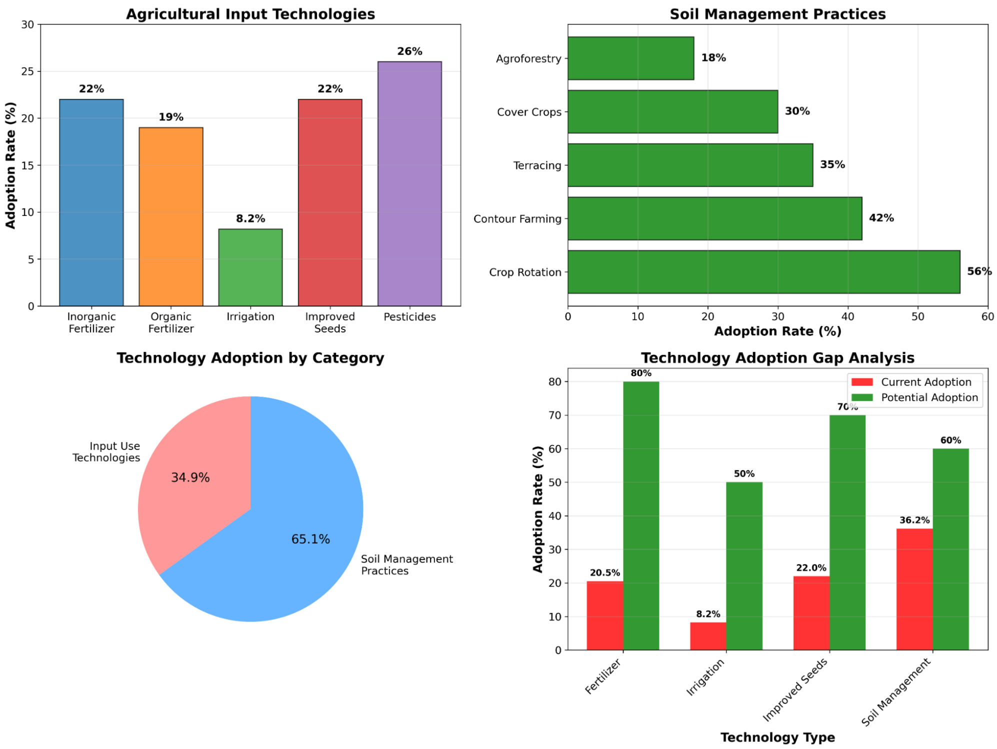

Figure 5. Examples of agricultural practices adapted by farmers in the sample villages

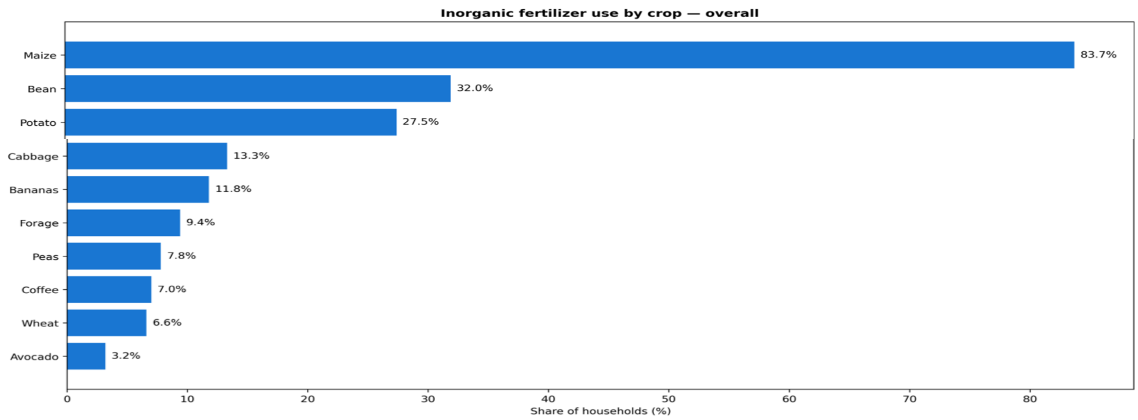

Figure 6. Fertilizer use by crop type

Storage practices: Post-harvest loss occurs due to pests and rodents (35%), mold (28%), poor handling (18%), and poor prices of produce market (22%). The majority of farmers store produce for less than 6 months, and one quarter of them store it for more than 6 months. Regarding the storage methods, 46% of farmers use traditional granaries, 23% use improved bags, 12.7% use warehouses, and 9% use metal silos. Nearly 45% of the farmers use improved storage methods that encourage promoting post-harvest technologies at scale. This indirectly shows the significance of post-harvest losses by smallholder farmers and the level of awareness of farmers to adopt improved storage practices.

Analysis of Input Supply and Farmer Services

Demand analysis for agricultural inputs and farmer services is crucial for efficient and sustainable agricultural development. It involves understanding the needs and preferences of farmers and the factors influencing their demand for inputs like seeds, fertilizers, and machinery, as well as services like extension, credit, insurance, and marketing. This involves identifying the specific inputs and services that farmers require based on their farming practices, crops grown, and environmental conditions. Demand analysis can also help to pinpoint areas where there are shortages or inefficiencies in input supply and service provision, allowing for targeted interventions. Effective demand analysis for inputs and services ensures that resources are allocated efficiently and as per local farmers' needs, leading to increased productivity, improved livelihoods, and food security.

Agricultural input supply services: In the TNC CHEF region, input supply and access are critical limitations for the smallholder farmers. It is only 43%, 28.5%, 22%, and 0.2% of the farmers who access fertilizer, pesticides, improved seeds, and organic inputs, respectively. These figures show that input access or affordability becomes a constraint for farmers to increase their farm productivity. The low input supply is likely attributed to the shift in the extension services from a supply-driven approach to demand-driven services, where farmers are expected to demonstrate their interest and reach service providers on their own.

Training and extension services: Farmers rated their extension service access, where 29% access regularly, 38% occasionally, 23% have limited access, and 11% have no access. The sources of the information service are dominantly through extension agents (47%) followed by other farmers (32%), radio and TV (18%), non-government service providers (12%), and mobile phones (8%). The quality of the extension services is dominantly rated as good and fair. Farmers received training in crop production, livestock production, marketing, and cooperatives topics.

Credit services: Farmers access credit from informal creditors (34%), microfinance (29%), and banks (15%), except for 22% of them with no access. Credits are used for input purchase (58%), livestock rearing (32%), purchase of equipment (18%), and emergency cases (43%). However, farmers reported constraints to access credits, as a result of high interest rates (67%), no assets for collateral (54%), lengthy and complex procedures (38%), and a long distance to access the services (32%). Farmers also participate in saving through cooperatives (34%), informal groups (28%), and banks (22%), but the majority save at home (47%).

Marketing and value addition: Farmers in the region have access to primary market channels such as farm gate (46%), local market (32%), cooperatives (12%), processors (6%), and exporters (2%), implying that 90% of their product marketing remains within the local market chains in the wards and villages (Figure 7). About 10.5% of the farmers are producing for commercial purposes, and 25% for regular market sales, 30% are producing for occasional market sales, while 36% are subsistence farmers. Distance to market, poor access road infrastructure, low prices, lack of transport services, and absence of storage services affected the marketing of agricultural products in the region.

Smallholder farmers are also involved not only in production but also in marketing, processing, integration, and input supply along the value chain. Farmers are engaged in various activities, including grain cleaning (68%), drying (65%), milling (35%), packaging (30%), processing (13%), branding (3%), and direct sales (21%). However, there are barriers to ensuring an effective value chain and value additions, including limited processing capacity (65%), poor storage infrastructure (60%), high transport costs (45%), lack of market information (38%), and inadequate quality standards (29%).

Figure 7. Market and value chain practices adapted by farmers in the sample villages

Transportation services: The different service centers in the CHEF region are away from residents' homes, ranging from 7 km to 25 km. Market centers are less than 10 km proximity, whereas input suppliers, extension offices, health centers, and banks are at distances beyond 10 km. Regardless of the distances, only 20% of farmers access all-weather roads, and the rest of the farmers access either seasonal roads or footpaths. Because of poor access road conditions, the transport modes of 78% of farmers are either walking or using donkeys or horses, and only 10% use vehicles or motorcycles. Hence, the transportation cost has a high impact (22%), moderate impact (43%), and low impact (35%) in affecting households' incomes at a magnitude of >20%, 10 to 20% and <10% of the incomes, respectively.

Gender engagement and labor supply: Women and youth engagement in agriculture is very context-driven and varies among the types of engagement. Women's participation is relatively high for training (60%) and access to credit (43%), while their participation is low in decision making (35%), marketing (28%), and land ownership (18%). However, some barriers constrain women's participation in accessing resources, benefit sharing, and participation in different agricultural activities. The majority of women agreed that limited land access (78%), time constraint (82%), credit access barrier (65%), lack of market access (53%), and poor technology uptake (45%) are the main constraints limiting their participation and their access to services. On the other hand, men have engaged in farming activities, including land preparation (73%), planting (45%), weeding (30%), harvesting (50%), and marketing (65%). Similarly, assessment of youth engagement involves off-farm work (39%, farming (26%), education (22%), and migration (13.4%). Since the majority of the productive labor force, i.e., youth, are engaged in off-farm activities and have left their localities for migration, the primary sources of labor are family (59%) and others are hired (28%), and exchanges (13%). This implies that the labor shortage is a common challenge during the peak production seasons, attributed to seasonal peak labor shortage, high costs of labor, youth migration, and some with health problems.

Local institutions: Participation in local community institutions such as producer cooperatives, savings, marketing, and other service-driven self-help groups fosters better access to services and encourages collective actions. In the CHEF region, farmers' participation in local institutions benefits them in terms of input access (68%), market access (53%), credit access (42%), training (40%), and social support (31%) (Figure 8). However, leadership capacity (28.5%), financial management (23%), members' commitment (34%), and market limitations (15%) are reported as key challenges of group participation.

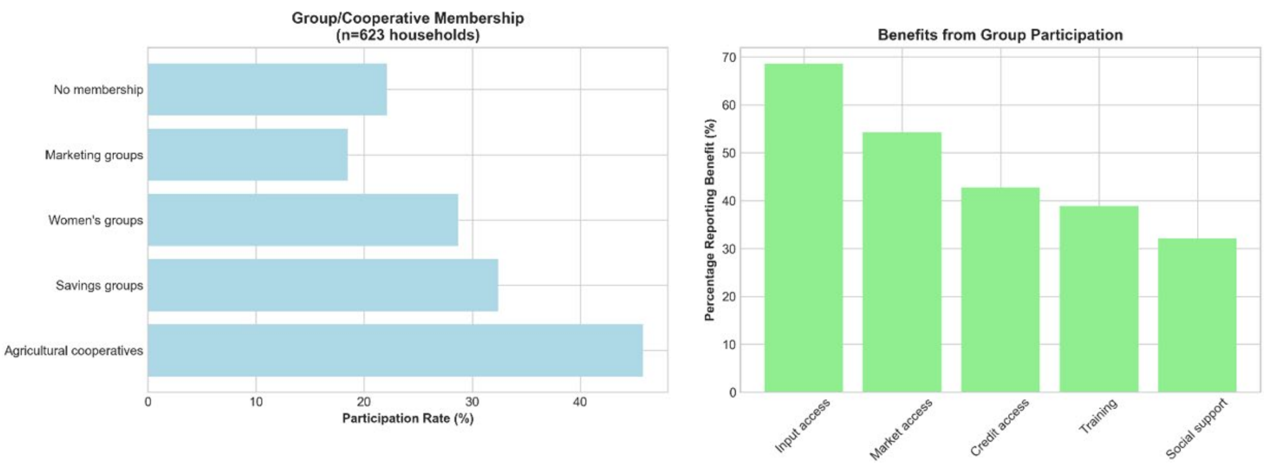

Figure 8. Famers' level of participation in group services and local institutions

Food and Nutrition Insecurity and Coping Strategies

Relevant information was gathered to assess the food and nutrition status of households in the CHEF region. This information supports understanding and analyzing the prevalence of households in their food shortage experience, as well as diet quality and nutritional adequacy status. Nearly 78% of surveyed farmer households experienced food shortage for the past 12 months. About 35%, 27%, 22%, and 14% of affected households reported a shortage of food for a period of 1-2 months, 3-4 months, 5-6 months, and >7 months, respectively. According to the survey respondents in the target region, high seasonal food shortages occurred between January and June, and afterwards they decreased until November. As shown in Figure 9, the households' Food Insecurity Experience Scale (FIES) resulted in 22%, 35%, 27%, and 13% of households being food secured, mildly secured, moderately secured, and severely secured, respectively. Counties vary by their food insecurity status, where FIES demonstrated that 63%, 38%, and 36% of households experience food insecurity in Laikipia, Nyandarua, and Meru counties, respectively. Overall, these findings indicate that food insecurity (moderate to severely secured) is a critical problem for at least 40% of households in the CHEF region. As a result, a significant number of farmers have experienced some coping strategies to respond to food insecurity facing them over the year, using strategies such as reducing daily meals (78%), borrowing food (45%), eating wild foods (32%), selling assets (18%), and seasonal migration (13%).

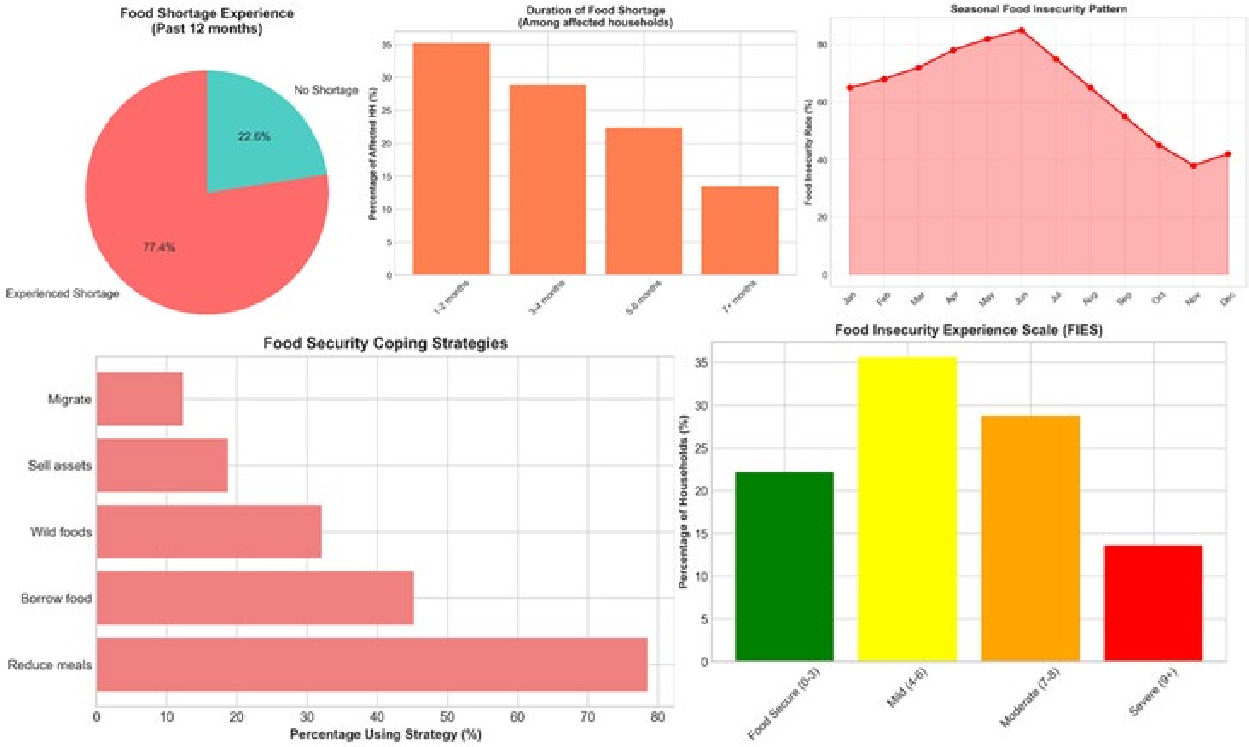

Figure 9. Food security context of farmers and the food insecurity experience scale in the CHEF region

Concerning the nutritional quality, household daily consumption patterns also reveal that the majority of households consume little and below half of a daily meal, much below the required. The consumption rate of households for different food groups shows that the highest consumption is in the order of cereals, followed by oils and legumes. The consumption rate of households for vegetables, fruits, meat, fish, and dairy is at its lowest rate. Households reported their nutrition status, where 26% and 46% of farmers are facing severe and moderate malnutrition, respectively, whereas only 29% of households perceived that their daily diets have adequate nutrition. Consequently, a Dietary Diversity Score (DDS) data, a metric used to assess the variety of food groups consumed by households and used to understand dietary quality and nutritional adequacy, insights 43%, 37%, and 17% of households face poor diversity (<=3 food groups), moderate diversity (4-5 food groups), and good diversity (>= 6 food groups), respectively. Both the food insecurity and dietary diversity scores showed that nearly 40% of households are facing both moderately to severely food insecure and poor consumption of dietary diversity (Figure 10).

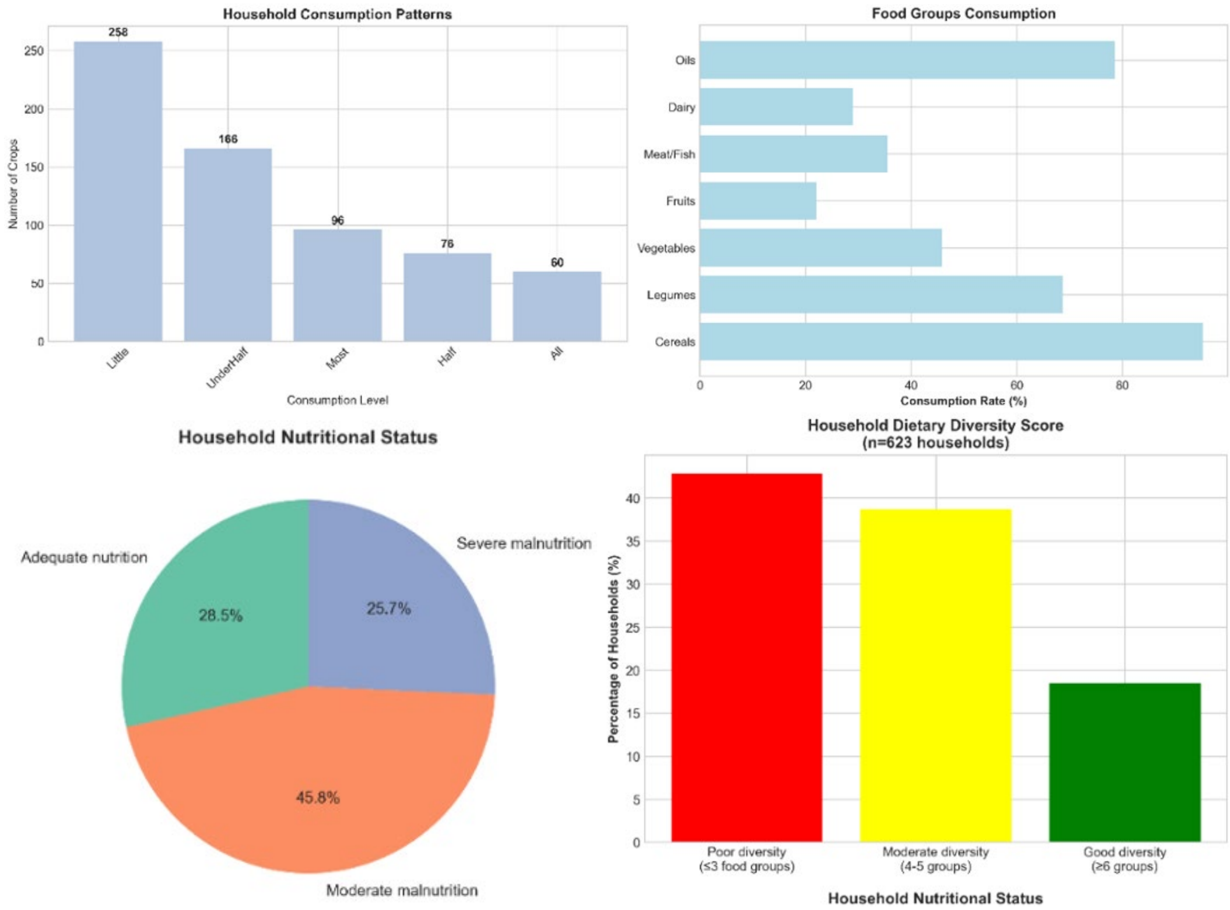

Figure 10. Consumption profile of farming households and the level of household dietary diversity score.

Agricultural Practices and Level of Impact on Food and Nutrition Security

The household survey in the CHEF region reveals important constraints, risks, and barriers to crop and livestock production under fragmented parcels (65% of households hold less than 1.0 ha) and poor to medium soil conditions. The region is environmentally endowed with diverse crop and livestock production potentials and an extended cropping calendar staggered throughout the year. This diverse farm and household context drives heterogeneous farming practices, triggers tailored input supply systems, market, and extension service provisions. Such an interactive situation results in different categories of households in terms of attaining food and nutrition security. The survey results demonstrate that households' adoption of farming practices is growing over the years, although food security has shown a declining trend. This is likely due to the attribution of constraints related to soil degradation, increasing droughts, pests and diseases, and inadequate access to services and inputs. The biophysical constraints have imposed a high impact on food insecurity and household nutrition insecurity, followed by systemic constraints (Table 2). Similarly, risk factors pose a greater impact on food and nutrition security (Table 3), where drought, pests, diseases, and price fluctuation affected the food production and the availability of nutritious crops and animal source foods.

Table 2. Trends of the influence of agricultural constraints on FIES and DDS levels

Constraint	Occurrence	Food insecure (%)	Poor DDS (%)	Impacts of constraining factors
Water shortage/drought	69%	51	48	Strongest driver of both indices
Poor soil fertility	52%	46	41	Often occurs with water shortage
Pests & diseases	43%	44	38	Impact ↑ when input access is low
Lack of input supply	40%	49	42	Distance >10 km compounds FIES
Credit constraint	34%	45	39	Female HHs are more exposed
Labour shortage	29%	40	36	Driven by youth out-migration
Market access gap	27%	41	35	Farm-gate sales dominate (46%)
Sparse extension services	22%	38	32	Only 29% get regular visits
Storage facility deficit	21%	37	31	Post-harvest loss ↑ and lean-season hunger

Table 3. Trends of risks against FIES and DDS levels

Risk factor	HH prevalence	Δ Food secure (%)	Δ Good DDS (%)	Interpretation
Recurrent drought	78%	-13	-11	Climatic risk dominates
Pest damage	45%	-6	-9	Decline in legume, vegetable loss
Price fluctuation	40%	-8	-6	Hurts cash-crop areas
Disease outbreak (crop/livestock)	32%	-7	-8	Reduces animal-source foods
Climate change perception	28%	-5	-4	Captures multi-stress exposure

On the other hand, the synthesis of the positive contributions of the adoption of sustainable farm practices to food security and nutrition indicated that access and use of inputs and irrigation have a strong impact on changing the food and nutrition security of households (Table 4). However, leveraging the complete package of practices and innovation services provides the highest impact. Consequently, as depicted in Table 5, placing strong input, extension, credit, and market services leads to a multiplier effect and game-changing impact on food and nutrition security.

Table 4. Improved agricultural practices against FIES and DDS levels

Practice	Adoption	+ Food secure (%)	+ Good DDS (%)	Leverage
Improved/certified seed variety	22%	+10	+6	Needs credit + extension
Inorganic fertilizer use	45% (70% broadcast)	+8	+5	Shift to row/band placement
Organic amendments	68%	+6	+4	Home-produced inputs ready
Legume rotation & cover crops	56%/30%	+7	+5	Protein boost
Contour farming/terracing	42%/35%	+4	+3	Strong on slopes >15%
Irrigation	8.2%	+12	+9	Highest single-practice impact

Table 5. Input and farmer services against the FIES & DDS levels

Services	Adoption	FIES (%)	DDS (%)	Remarks
Regular extension	29%	+11	+7	Multiplier effect
Input dealer ≤10 km	43% fertilizer /28% pesticide	+9	+6	Distance critical
Credit facility	78%	+8	+4	Collateral and rates constrain
Co-op marketing	12%	+6	+4	Price stabilization
All-weather road	20%	+7	+5	Transport cost share
Farmer organizations	42%	+5	+3	Leadership and finance gaps

Conclusion

Ultimately, the household survey underscores a critical paradox in the CHEF region: thriving agricultural diversity exists alongside growing food insecurity. The declining trend in food security, despite increased adoption of farming practices, points to the overwhelming impact of constraints like soil degradation, climate risks, and inadequate services. Addressing these interconnected biophysical and systemic barriers is therefore essential to unlocking the region's full production potential and improving household nutrition.

While biophysical and systemic constraints are currently driving food insecurity in the CHEF region, the survey identifies a clear pathway for improvement. The findings highlight that achieving food and nutrition security in the CHEF region requires moving beyond promoting farming practices alone. Effective interventions must directly address the primary constraints of environmental degradation, climate-related risks, and poor market access, which currently outweigh gains and hinder household resilience. The key interventions lie in strengthening service systems—inputs, extension, credit, and market access—which can create a multiplier effect. Leveraging integrated packages of practices alongside these robust services offers the greatest potential to unlock the region's inherent agricultural potential and reverse the decline in food and nutrition security. By prioritizing integrated support systems (inputs, credit, markets, and extension) and appropriate farming practices (improved variety, legume intensification, cover crops, irrigation, organic amendments, and soil and water conservation) the region can unleash a multiplier effect, transforming its agricultural diversity into tangible food and nutrition security for its households and the overall foodscape in the region.

Recommendations

1. The interlocking of biophysical and socio-economic constraints weakens farm productivity and profitability while simultaneously limiting the adoption of inclusive farm and climate-resilient farming practices. Overcoming these constraints requires integrated solutions that address both biophysical and socio-economic drivers, and open pathways to sustainable agricultural development well aligned to TNC programmatic thematic focus areas, including water governance, rangeland management, adaptive financing, and watershed action plan across priority value chains. Lasting agronomic gain cannot be achieved through isolated interventions but demands an integrated, multi-dimensional interventions, anchored in innovation systems and inclusive partnerships, that identifies and prioritizes constraints and local demands across different farmer groups.
2. Building on the baseline assessment of current practices, diagnostic assessments, and context-specific intervention design are an essential step to close knowledge gaps and prioritize effective solution bundles tailored to diverse farmer contexts that integrate both farm management solutions, farmer-responsive interventions, livelihoods, and social measures to overcome priority farm-to-landscape constraints.
3. The success of the integrated farm management solutions depends on effective collaboration among the stakeholders, a prerequisite for scaling. A stakeholder mapping exercise will then identify key stakeholders and assess what role they can play and their target locations in the CHEF region. Where possible, validated integrated farm management solutions will be embedded into collective decision support systems and digitally enabled advisories, making them accessible and tailored to diverse farmers, and enabling fast diffusion, adoption, and scaling.
4. Capacity building of stakeholders, particularly the extension agents, small holder and commercial farmers, and key value chain actors, is essential to change their knowledge, skills, and behavior towards improving their decision context for ensuring multidimensional farm to landscape management interventions.

Annex

Table 1. Constraints, practices and services by farmer groups

Categories	Cluster 1 (25% of HHs)	Cluster 2 (15% of HHs)	Cluster 3 (19% of HHs)	Cluster 4 (40% of HHs)
Constraints				
Labor constraint	75.7	69.8	58.7	81
Pest and diseases	76.3	79.3	61.8	69.5
Poor soil fertility	64	58.7	59.4	70.6
Water shortage /drought	92	11	80	2.1
Agriculture practices				
Certified Seeds	49.6	58.3	52.7	75.7
Inorganic fertilizer use	100	94.4	100	100
Irrigation use	3.2	89	3.7	97.7
Organic amendments	80.9	100	89	99.5
Contour farming & cover crops	91	71	69	96.5
Farmer services				
Fertilizer access	84.3	67.6	75.8	93.5
Organic input access	66.4	72.7	75	76.4
Machinery access	34.2	42.3	31.8	5.8
Extension services	73	72.8	73.2	63.0

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Attribution: Gizaw Desta, Henok Desalegn, Kinyua Michael, Shadrack Nyawade, Banchayehu Assefa, Waswa Boaz.

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The CGIAR Sustainable Farming Science Program will address key challenges in agrifood systems by fostering efficient production of nutritious foods and safeguarding the environment to create fair employment opportunities, as we simultaneously tackle climate change, soil degradation, pests, diseases, and desertification.