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Impact of layering, sequencing, and integration approaches in mitigating food and nutrition insecurity in Zimbabwe

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Abstract

The reduction in food production due to climate shock has contributed to food and nutrition insecurity, malnutrition, and diet-related non-communicable diseases. There is an urgent need for adaptation measures to manage the impact of climate change on communities. Developing resilience in food and nutrition security remains a novel concept. The aim of the study was to determine the impact of Layering, Sequencing and Integration (LSI) of different interventions on food and nutrition outcomes among smallholder farmers. Participants were drawn from three wards in the Zvishavane District of the Midlands province in Zimbabwe. A total of 301 randomly chosen participants were interviewed. A mixed methodology using quantitative and qualitative tools was used to collect the data. The majority (95,3%) of the study participants had an acceptable diet based on the food consumption score (77,1%), with a high dietary diversity score, and 48,2% had an annual cereal surplus. A total of 69,1% of participants had no reduced coping strategies. Economic shocks (34,9%) were most severe, followed by climate-induced shocks (24,6%). The LSI approach can potentially increase diversified food production levels, thereby increasing access to diverse foods and resulting in improved food and nutrition security outcomes for a given community.

Keywords: Food, Insecurity, integration, layering, nutrition, sequencing

Introduction

Climate change, characterized by rising temperatures and rainfall invariability, notably droughts, heat waves, long dry spells, tropical storms, and localized floods, has a negative impact on agricultural production, namely, poor crop yields coupled with high incidences of pests, diseases, and livestock poverty deaths, resulting in severe household food insecurity (Mutengwa et al., 2023; Pickson et al., 2023). Climate change has resulted in more arid environments for agricultural production, shifting Zimbabwe's five main agro-ecological zones (or natural zones). Rainfall patterns and crop production progressively deteriorated from Regions I to V, which were characterized by warmer regions and erratic rainfall patterns.

Sixty three percent (63%) of Zimbabwe's 15,2 million population cannot afford a balanced diet and consume vegetables like covo and rape more than meat (Mushipe et al., 2023). There is an unfolding nutritional crisis with an increased wasting rate of 5,7% by Mid-Upper Arm Circumference (MUAC), which constitutes an increase of one-third compared to 2020. The first-time wasting has been above 5% since 2005, with a steady upward trend since pre-COVID 19 (Humanitarian Action for Children Zimbabwe HIGHLIGHTS 1, 2022). The 2022 Global Hunger Index (GHI) places Zimbabwe in the 'serious category with a score of 20-34.9 (Von Grebmer et al., 2022; Wiemers & Fritschel,

2020). In the last decade, Zimbabwe became a net importer of maize and relied on food aid, accounting for at least one-third of the total supply of maize in the market (Abbassian, 2020).

The fragmentation and duplication of efforts by the government and developmental agencies have been blamed for the cyclical intergenerational poverty. The food and nutrition field as a whole is characterized by a myriad of actors (Non-Governmental Organisations (NGOs) and technical support agencies) whose interventions are not well coordinated, leading to duplications of effort and inefficiencies in the provision of services (Prowse et al., 2020). Since 1980, the government and its cooperating partners have focused on supporting the country's food system with analytical and technical assistance in improving access to agricultural inputs, technologies, finance, linking smallholder farmers with markets, infrastructure, and skills for better jobs across the agricultural value chain(Banda, 2022; Mhembwe et al., 2019). The government, along with various stakeholders, has worked together to promote Climate Smart Agriculture (CSA), primarily among smallholder farmers, mostly in the drier agro-ecological regions IV and V. Broader CSA practices in the country incorporate research, development, advocacy, and training involving germplasm selection (i.e., breeding, introduction, and seed multiplication of drought-tolerant crops and animals) and diversification of crop and animal production(Mpala & Simatele, 2023). Emergency food aid is the most common response to food insecurity caused by climatic and economic shocks in developing countries dominated by emergency food aid(Harvey et al., 2005). Food aid interventions have been criticized for poor targeting and distribution to the same people in the same geographic area, causing the donor dependency syndrome and failure to sustainably build assets among vulnerable people (Harvey et al., 2005).

Resilience is the ability of at-risk individuals, households, communities, and systems to anticipate, cushion, adapt, bounce back better, move on from the effects of shocks and hazards in a manner that protects livelihoods and recovery gains, and supports sustainable transformation (Peacock et al., 2010). Over the last two decades, interest in resilience has grown significantly in the scientific community (Douxchamps et al. 2017). The concept of resilience has emerged as a plausible framework among humanitarian and development actors and governments as a long-term and more cost-effective strategy to substantially improve the regional or local capacity to withstand shocks and stresses, ultimately leading to a reduced need for a humanitarian response (Douxchamps et al., 2017). The growing interest in resilience building partly comes from the widespread acknowledgement that previous humanitarian responses have failed to adequately address the needs of vulnerable populations and have a disincentive effect on local production, labor, and markets (Harvey et al., 2005). Major resilience-building activities include the introduction of the Zimbabwe Resilience Building Fund (ZRBF) in 2017 with many activities(Murendo et al., 2023). Activities implemented in consortia include climate-smart nutrition-sensitive agriculture, climate-smart water, livestock production, crisis modifiers, and inclusive markets (Murendo et al., 2023). All of these are complemented by farmer training that targets agronomy practices, disease prevention and control, and market linkage programs for income generation.

This study investigated the impact of layering, sequencing, and integration of different interventions on climate-induced food and nutrition insecurity among smallholder farmers in the Zvishavane district of the Midlands province of Zimbabwe.

Methods

Study Design

A cross-sectional descriptive study was conducted to assess the frequency and distribution of food and nutrition insecurity among smallholder farmers in Zvishavane. Both qualitative and quantitative questionnaires were administered to the farmers. A household questionnaire, key informant interviews, Focus Group Discussions (FGDs) and observations were used to gather information. Quantitative data were subjected to both descriptive and advanced statistical analyses, whereas qualitative data were analyzed using a thematic framework or a domain analysis approach.

Study Area

The Zvishavane District is located in the southern part of the Midlands Province of Zimbabwe. It is a semi-arid region characterized by a low annual rainfall of 250 mm, which is poorly distributed. It shares boundaries with the

Shurugwi district in the north, Chivi District in the east, and Mberengwa and Insiza districts to the west. The district has a total land size of 2,538,3 km^2, rural land size of 2,476 km^2, and urban area of 62,38 km^2. The rural district has 19 wards, with a total population of 85,035 people and 19,719 households, with an average household size of 4,3 (14). They were partly communal (85%) and resettled (15%). The district lies in semi-arid natural region IV (32%) and part of Natural Region V (68%), which is characterized by high temperatures and low rainfall (250–300 mm) and is poorly distributed. Mid-season dry spells are common, making it a perennial drought district with low crop yields that induce high food deficit and food insecurity.

Sampling and Sample Size

The Zvishavane district has 19 wards, which are classified into three zones based on food production. For low-production zones, consumption from production lasts for three months. In the medium production zone, consumption from own production lasts for six months, and in the high production zones, consumption from own production lasts for nine to 12 months. Stratified random sampling was used to sample three wards from all three zones (with one ward from each zone).

A cluster sampling technique was used to select the households. In this case, three clusters were based on the food production level: low (consumption from own production lasting 0–3 months), medium (consumption from own production up to 6 months), and high (consumption from own production lasting 9–12 months). Households from each cluster were randomly selected for the quantitative survey. This was based on the assumption that each household in the cluster received treatment from the government of NGO projects.

For this study, sample size selection was based on a 95% confidence level, and the Slovin method was used to determine the sample size (Stephanie, 2003):

$$n = N/1+N\,(e)^2$$

where;

n = sample size

N = population size (being the number of households in this scenario)

e = level of precision.

For the Qualitative survey, four (4) Focus Group Discussions were conducted. With men, two (2) adults that is those aged 36 and above, and male youths aged 18 to 35 years. With women, two (2) adults that is those aged 36 and above, and female youths aged 18 to 35 years.

Data Collection Procedures

A semi-structured questionnaire was designed to provide quantifiable answers to each question. These were then separated into themes. As an illustration, the first section of the survey asked about the households' demographic characteristics, including age, sex, marital status, level of education, and age distribution.

The households' major sources of income (including production levels over the previous two years, income level and sources, asset ownership (including those that improve food security and nutrition), and the degree to which the farmers' sources of income and asset base meet their survival thresholds) were all covered in the second section of the questionnaire.

Section three covered the treatment by various government and non-governmental organization (NGO) programs in the last five years and the farmers' perception of these in terms of layering, sequencing, integration, effectiveness, efficiency, timing, and impact fullness. Five years were chosen, as this coincides with the onset of the most predominant resilience-building project in Zvishavane (Stack, 2021).

The fourth section covers matters related to farmers' perceptions of issues that affect layering, sequencing, and integration, including the role of leadership in coordination issues and the best combination of activities. They thought that they were the best to address food and nutrition security issues. The fifth section covers the exposure to shocks and stresses. Shocks are defined as external short-term deviations from long-term trends that have substantial negative effects on people's current state of well-being, level of assets, livelihoods, safety, and ability to withstand future shocks.

Shocks can be covariate events that directly affect a large number of people in each geographic area (e.g., drought and pandemic), or idiosyncratic events that affect specific individuals or households within a community

(e.g., illness or death within a family). Shocks can also have a slow onset, such as droughts, or a relatively rapid onset, such as flooding, disease outbreaks, or market fluctuations. Stresses are long-term trends or pressures that undermine the stability of a system and increase its vulnerability. Stresses could include factors such as population pressure, climate variability, chronic poverty, persistent discrimination, and protracted crises such as intergroup conflict. Similar to shocks, stresses can be covariates, affecting large numbers of people in each geographic area, or idiosyncratic, affecting individuals or households within a community.

A Focus Group Discussion (FGD) guide was developed. The FGDs were not conducted in a vacuum but rather as a crucial component for assessing farmers' perceptions of food and nutrition security issues using a resilience approach of layering, sequencing, and integration. To allow for triangulation of data, the FGD included questions that were taken directly from the household questionnaire. All research questions from the perspective of farmers were included in the FGDs (Johnson, 2007).

The Layering, Sequencing, and Integration of projects to address food and nutrition insecurity issues were the focus of a Key Informant Guide created to assist in gathering detailed information to identify opportunities, successes, and challenges (ZIMVAC, 2022). To allow for triangulation of information, key informants were asked the same questions in the questionnaires as during the FGDs. Layering, Sequencing, and Integration of Food and Nutrition Security issues are resilience-building strategies. These interviews were conducted to gain insight into the ideas and policies related to this strategy.

Statistical analysis

Data from household interviews were analyzed using SPSS. To provide summaries of farmers' responses to various questions, descriptive statistical measures, including the use of means, medians, ranges, and frequencies, were conducted using SPS. To identify patterns and underlying traits that would allow us to draw conclusions about the layering, sequencing, and integration of food and nutrition insecurity issues, cross-tabulations of key variables were performed against income, age, gender, and other variables. These cross-tabulated variables paved the way for more complex statistical analyses, such as chi-square, t-test, correlation analysis, and Analysis of Variance (ANOVA).

To provide a complete record of the discussions held and to make data analysis easier, the information gathered through the FGDs and KIIs was initially transcribed. Information from FGDs and KIIs was analyzed using the thematic framework method. The goal of the analysis was to identify any trends and patterns that emerged from a single focus group, an interview, or a number of focus groups.

Ethical clearance

The study was approved by the Department of Food Science Research Ethics Committee of Midlands State University (clearance number FSN 2022/10/02).

Result and Discussion

Description of Participants

The total number of people who participated in the study was 301, of which 58,1% were female and 41,9% were male. The average age of the participants was 48,6 years with a minimum of 20 years and maximum of 86 years. A total of 57,5% of the participants were in the middle-aged category (36-59 years). The average household size was 5,3, with a minimum household size of one and a maximum of 16, The majority (71,5%) had medium-sized households (4-6 members). Over one-third (34,9%) of the respondents were married and staying apart. The majority attained an Ordinary Level as the highest educational qualification, and 6,6% had attained at least an undergraduate university degree. Table 1 summarizes the participants' demographic data.

Table 1. Description of participants

Description	n=301	%
Sex of Household Head		
Male	126	41,9
Female	175	58,1

Age Category		
Youth Headed (18-35 years)	54	17,9
Middle Aged (36-59 years)	173	57,5
Aged (60+ years)	74	24,6
Household Size		
Single Headed (1 member)	4	1,3
Small (2-3 members)	28	9,3
Medium (4-6 members)	215	71,5
Large (7-9 members)	48	15,9
Very Large (10+ members)	6	2,0
Civil Status of Household Head		
Married living together,	99	32,9
Married spouse living elsewhere (>3 months in Zimbabwe	92	30,6
Married spouse living elsewhere (>3 months outside of Zimbabwe)	13	4,3
Divorced/Separated	12	4,0
Widowed	79	26,2
Never Married	6	2,0
Education Level of Household Head		
Ordinary Level	136	45,2
Advanced Level	59	19,6
Tertiary Level	48	15,9
Tertiary (University)	20	6,6
ZJC Level	15	5,0
Primary Level	23	7,7

Three-quarters (75,7%) of participants had at least two income sources, as shown in table 2. The average annual household income was US$2,020.60, with a minimum of US150.00 and a maximum of US$7,700.00. Food crop production was the major source of income for most households (62,7%), with remittances contributing as the second income source for approximately a quarter (24,2%) of households.

Table 2. Income sources

Description	n=301	%
Number of Income Sources		
One	301	100
Two	228	75,7
Three	141	46,8
Main Source of Income		
Food Crop Production	189	62,7
Remittances (both domestic and International)	73	24,2
Livestock Production Sales	20	6,6
Small Scale mineral sales	6	2,0
Skilled trade/artisan	3	1,0
Own Business	3	1,0
Petty trade	3	1,0
Casual labour	2	0,7
Vegetable Production sales	2	0,7
Rentals	1	0,3

Livestock Ownership

Most households (72,4%) owned at least ten poultry birds, as summarized in Table 3, The average number of birds owned was 14, with a minimum of 0 and maximum of 56, Close to a quarter, 24,6% owned between five and ten cattle and 6% did not own a beast, The average number of cattle owned was five, and with a

maximum of 17, In terms of goats, the average number of goats owned was 3 and maximum 18, Approximately one-third (31,6%) did not own goats, while 14,3% owned between 5 and 10 goats.

Table 3. Livestock ownership

Livestock Type	Range of Ownership	n=301	%
	0	18	6,0
Cattle	1-4	172	57,1
	5-10	74	24,6
	Above 10	37	12,3
	0	95	31,6
Goat	1-4	144	47,8
	5-10	43	14,3
	Above 10	19	6,3
	0	8	2,7
Poultry	1-4	13	4,3
	5-10	62	20,6
	Above 10	218	72,4

Intervention Intensity

Most households (45,5%) participated in five to eight interventions (medium intensity), 29,6% in nine plus interventions (high intensity), and 24,9% in only one to four interventions (low intensity), as shown in Figure 1.

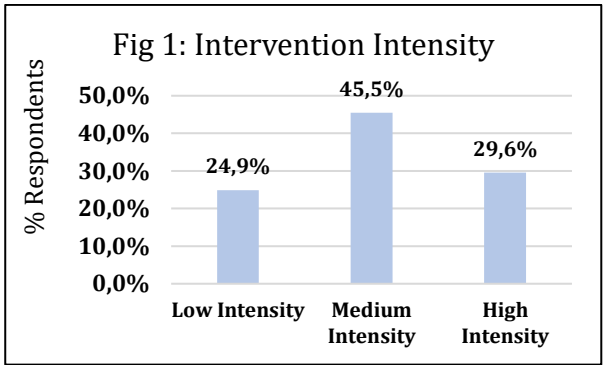

Figure 1. Intervention intensity

Table 4 summarizes the various interventions introduced as part of the Layering Sequencing Integration (LSI) approach in the study area. The majority (81,1%) participated in training in agricultural production (drought-tolerant small grains and legumes). Forty-two percent (42,2%) participated in production management and the health of small livestock (poultry and goats). Disaster risk reduction was an integral intervention of the LSI approach in inculcating sustainability issues for food and nutrition security; hence, 60,1% participated in DRR training activities. Close to three-quarters (70,8%) benefited from water infrastructure-related activities, and 42,9% had participated in VSLA activities.

Table 4. Intervention participation

Intervention	n=301	%
Crop Related Activities		
Training in Agriculture production (Drought tolerant small grains and legumes)	244	81,1
Plot on new Irrigation scheme/Irrigation Services		
Seed Support for nutrition gardens, horticulture/vegetable production and training	203	67,4
Participation in Crop Value chains including contract farming, non-contracted crops, non-traditional crops (e,g,, sesame, chillies, flower seed, mushrooms, quinoa, amaranth)	197	65,4
Pfumvudza/Intwasa	86	28,6
Livestock Related Activities	44	14,6
Small (poultry & goats) livestock Rearing (management and health)	127	42,2
Poultry value chain (Boschveld chickens, indigenous chickens, broilers)	121	40,2
Fodder Preservation (e,g,, silage, hay) training	37	12,3
Production of Fodder (e,g,, lab -lab, velvet bean, training)	32	10,6
Fish Farming	13	4,3
Improved Livestock housing (cattle, goats, poultry)	6	2,0
Cattle/Beef Pen Fattening value chain	5	1,7
Main Streaming Activities		
Capacity Building/Training on Disaster Risk Management & preparedness/Disaster Risk Response	181	60,1
Climate/Weather Prediction: PSP (Use of scientific&/indigenous knowledge)	171	56,8
Gender training		

Community Action Adaptation Planning	112	37,2
Nutrition (Specific &Sensitive) Training	101	33,6
Economic Empowerment Activities		
VSAL/ISAL/Savings groups training	129	42,9
Post-Harvest Management Training/Agri Business Support (thresher, peanut butter processing, Bush meal production)	6	2,0
Vocational skills/Enterprise groups		
Support in (NTFP) harvesting, processing, organic certification (including honey)	12	4,0
Capacity Building on Business management (e,g,, Farming as a business	3	1,0
Infrastructure and Energy	2	0,7
Management of Water Infrastructure/Access to (dip tanks, solar powered borehole, borehole maintenance, small weir/earth dams, harvesting structures for water)	213	70,8
Renewable Energy	8	2,7
	6	2,0

Household Important Food Sources the Last Twelve Months

The most significant food source was own production (82,7%), as shown in Figure 2, followed by cash purchases from household income (15,6%), remittances (1,0%), and casual labor (0,3%). There was a significant improvement in HHFS in families who used LSIs compared with those who did not (F=4,896, df =2, p =0,008).

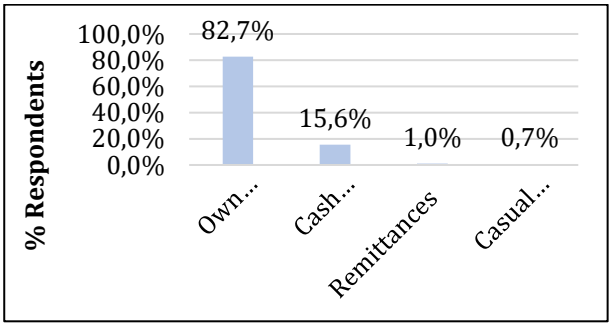

Figure 2. Most significant food sources over the past 12 months

Food Consumption Score

The majority (95,3%) of the respondents had an acceptable food consumption score, 3% had a borderline food consumption score, and 1,7% had a poor food consumption score. Only 0,3% of the high-intensity category had poor food consumption compared to 0,7% each of the low- and medium-intensity categories, as shown in Table 4. The main source of crop-based food types and fruits was their own production (at least 90%), whereas meat constituted 10% of the same source. The interviewed households relied on purchasing milk, fats, oils, sugars, and condiments.

There was a positive association between food consumption category (FCS) and participation in small-grain production (p<0,05), Households using LSI had a significantly higher food consumption score (F=21,439, df = 2, p = 0,000) than those without LSI. There was a positive correlation (r = 0,09, p = 0,00) between the Food Consumption Score and number of interventions.

Table 4. Food Consumption Score Category by Intervention Intensity

Intervention Intensity	Poor FCS		Borderline FCS		Acceptable FCS	
	n = 301	%	n = 301	%	n = 301	%
Low (1-4 Activities)	2	0,7	5	1,7	68	22,6
Medium (5-8 Activities)	2	0,7	3	1,0	132	43,9
High (9+ Activities)	1	0,3	1	0,3	87	28,9
Total	5	1,7	9	3,0	287	95,3

Dietary Diversity

The majority (77,1%) had a High Dietary Diversity Score, with 33,6% in the medium-intensity category, as shown in Table 5, Approximately one-fifth of participants (20,9%) had a Medium Dietary Diversity Score. For those with an HDD, production constituted 90% of the food consumed.

Table 5. Dietary Diversity Score

Intervention Intensity	Low Dietary Diversity		Medium Dietary Diversity		High Dietary Diversity	
	n=301	%	n=301	%	n=301	%
Low Intensity	1	0,3	23	7,6	51	16,9
Medium Intensity	4	1,3	32	10,6	101	33,6
High Intensity	1	0,3	8	2,7%	80	26,
Total	6	2,0	63	20,9	232	77,1

n=301

Seed provision for horticulture and small gain production were positively associated with or related to the DDS category ($p < 0,05$).

Households using LSI had significantly higher dietary diversity scores than those who did not use LSIs ($F=1,801$, $df = 15$, $p= 0,034$). There was a positive correlation ($r = 0,33$, $p = 0,000$) between the Dietary Diversity Score and number of interventions that participated in LSIs.

Household Hunger Score

None of the households showed moderate or severe hunger (Table 7)**Table 6**. The majority 80,7% had no hunger, whereas 19,3% had little. In the little hunger category, 13,3% were in the medium-intensity activity category, 3,3% were in the low-intensity activity category, and 2,7% were in the high-intensity activity category.

Households using LSI had a significantly lower Household Hunger Score ($F=2,124$, $df = 15$, $p = 0,009$) than those without LSI. There was a weak negative correlation ($r = -0,081$, $p = 0,159$) between the household hunger score and the number of interventions in which a family participated.

Table 6. Household hunger category

Activity Intensity	No Hunger n =301	%	Little Hunger n=301	%
Low Intensity	65	21,6	10	3,3
Medium Intensity	97	32,2	40	13,3
High Intensity	81	26,9	8	2,7
Total	243	80,7	58	19,3

Discussion

For both cattle and goats, close to half of the households had livestock holdings that were within the survival threshold (1-5). This is consistent with earlier reports: 52 percent (52%) of rural households in Zvishavane-owned cattle and goats (59%) (Zimbabwe Vulnerability Assessment Committee (ZimVAC) 2022. In Zimbabwe, the minimum survival threshold for a household with six members is at least three beasts of cattle and five beasts of goats (Solomon, 2016). Livestock contributed 6,6% of the household income. However, livestock production activities were weak, with 42,2% participating in small livestock production, management, and health activities, 12,3% in fodder preservation, and 10,6% in fodder production.

The FCS is a composite score based on the dietary diversity and food frequency relative to the nutritional importance of different food groups. The FCS could increase with the addition of additional activities, namely training in nutrition-sensitive activities, such as food preparation and fortification (19,2%), water infrastructure (71,4%), and small plot irrigation (68,3%). In a study conducted in Afghanistan, access to irrigation facilities had a mixed effect on various foods (Kawsary et al., 2018).

In Ethiopia, in contrast to the production diversity/food consumption results, data indicate that the production of a non-cereal food group in the past 12 months is positively associated with the consumption of that group(Kennedy et al., 2018). Specifically, households that reported producing pulses, roots, and eggs were nearly twice as likely to consume these food groups, whereas households producing fruit and dairy were 2,7 – 3,9 times more likely to consume these types of foods than those that did not produce their own foods(Kennedy et al., 2018).

Although there was a positive correlation between FCS and LSI, there was a lack of association between FCS Category and various variables, such as access to irrigation and horticulture input support. This may be attributed to the incorrect layering of activities

due to factors like the Covid 19 pandemic and subsequent national lockdowns imposed by the Government of Zimbabwe starting March 2020(Prosper Bright et al., 2021; Rukasha et al., 2021). Interviews with FGDs noted that some interventions were introduced late in the program and were still in their infancy, notably fish farming and irrigation schemes.

Overall, a greater proportion (95,3%) of participants had an acceptable diet. By 2022, 62% of the population in Zvishavane will have an acceptable diet, an improvement of 58% by 2021(Zimbabwe Vulnerability Assessment Committee (ZimVAC) 2022). Households with an acceptable diet participated in at least one of the following activities: crops (small grain, 82,2%; horticulture, 66,2%; and small livestock, 42.5%).

The household dietary diversity score was used as a proxy for the quality of household food consumption. On average, the households consumed seven food groups. Statistical tests concluded that LSI had an influence on DDS. On the other hand, only activities two crop and livestock-based activities; seed provision for horticulture activities and small grain production. Small-grain production was achieved using a Climate Smart Agriculture approach. Diversification of production to strengthen resilience is a key tenet of climate-smart agriculture (CSA), which can help address the complex vulnerabilities of agriculture-dependent rural communities (Douxchamps et al., 2017).

While this study showed no association between DDS and the use of irrigation services, a study In Ethiopia found that access to irrigation improved the nutritional status of farm households. Specifically, access to irrigation improves the diet diversity score by 2,14 for users, whereas DDS for non-users would have increased by 0,34 if they had utilized irrigation technologies(Ahmed, 2022). As with the FCS, the study was conducted soon after the aftermath of the Covid 19 pandemic and most farmers were affected by national lockdowns, which also negatively affected production levels.

The approach used by the Household Hunger Score is based on the idea that the experience of household food deprivation causes predictable reactions that can be captured through a survey and summarized in a scale. This is also sometimes referred to as an experimental or perception-based method for collecting data (McKay et al., 2023). The ZIMVAC report stated that 87,2% of people in Zvishavane had little or no hunger, 7,6% had moderate hunger, and 0,5% had severe hunger (Zimbabwe Vulnerability Assessment Committee (ZimVAC) 2022). This resonates well with the study findings that no households had moderate or severe hunger, 80.7% had no hunger, and 19,3% had little hunger. While LSI cannot be ruled out in reducing hunger, community members and relatives often report helping one another prevent hunger (Sharma & Kharki, 2020).

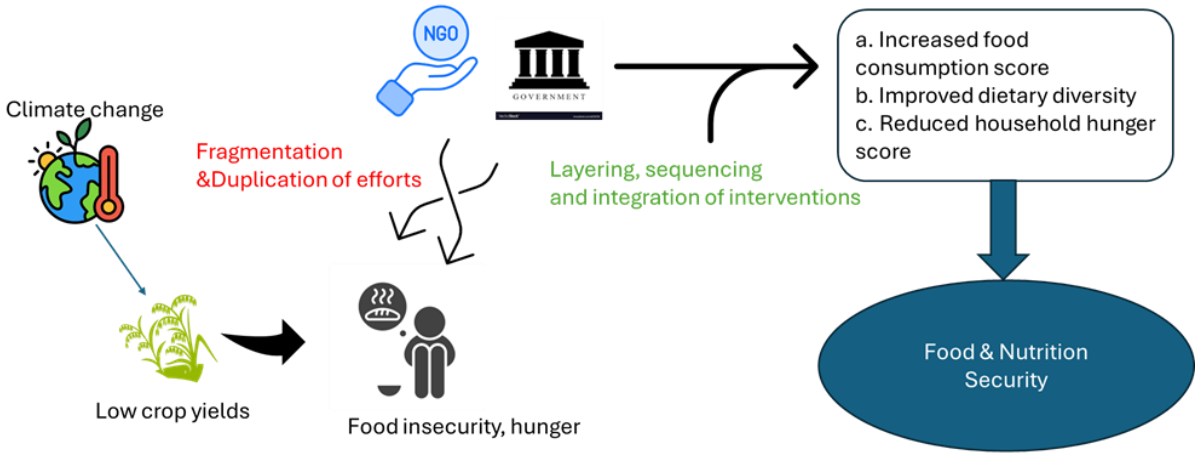

Figure 3. Mitigating food and nutrition insecurity

Reduced CSI uses the five most common behavioral changes in response to food shortages. While it accurately reflects the food security status of households, it does not provide detailed information about the range of food-insecure households(Maxwell et al., 2013).

However, it also facilitates the comparison of food security across various strata by normalizing the behaviors and severity cores used to create the index. The Zimbabwe Vulnerability Assessment Committee reported that 12% of people in the Midlands province had a high coping score, which is relatively high compared to the 0,6% reported in this study (Zimbabwe Vulnerability Assessment Committee (ZimVAC) 2022)

Conclusion

Layering, sequencing, and integration as an approach to building resilience have the potential to improve household nutrition and security through diversified food production and nutritious diets.

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