



**ANALYSIS OF HOUSEHOLDS DIETARY DIVERSITY ON LEGUME CROPS
INTERVENTION OF KANO STATE AGRICULTURAL AND RURAL DEVELOPMENT
AUTHORITY/KANO STATE AGRO PASTORAL DEVELOPMENT PROJECT**

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ABSTRACT

The household dietary diversity survey was carried out to assess the food security status among the beneficiaries of legume crops intervention of Kano Agricultural and Rural Development Authority (KNARDA)/ Kano Agro-pastoral development project. Eighteen local government areas were selected across the three KNARDA zones. One hundred and eight (108) groundnut, cowpea and soybeans farmers respectively were randomly selected, making a total of 324 beneficiaries. Data were collected using questionnaire and analyzed descriptive statistics. The findings revealed that the average age of the three value chain crops (groundnut, cowpea and soybeans) were 44, 43, and 45 years respectively. The average number of the household members among the value chain crops were 8, 7 and 7 members respectively. The mean monthly income were ₦106,925.93, ₦106,648.15 and ₦108,759.26 respectively. Average total farm size owned by the farmers of the value chain crops were 1.9ha, 1.9ha and 1.8ha respectively. Most of them were males 88.9%, 86.1% and 85.2% and married 95.4%, 95.4% and 95.4% respectively. The respondents possessed one form of education or the other with farming as one of the major means of livelihood 88.9%, 90.7% and 89.8% respectively. Majority (84.3%, 88.9% and 78.7%) of them belongs to cooperative or farmers group, respectively. The findings further revealed that majority of the beneficiaries of the three value chain crops ground nut (64.0%), cowpea (63.0%) and soybeans (59.0%) were above the acceptable food consumption score of 42.0 points. In addition, majority of cowpea (60.0%) and soybean (69.0%) beneficiaries had good dietary diversity with forty percent of groundnut beneficiaries having the same good dietary diversity. Furthermore, majority of the beneficiaries of the crops value chain groundnut (54.0%), cowpea (65.0%) and soybean (66.0%) had no hunger in their households. It was equally found that majority (66.0%, 84.0%, and 73.0%) for groundnut, cowpea and soybean respectively adopted low coping strategies against moderate and severe hunger. It was concluded that majority of the beneficiaries among the value chain crops were food secured. It is recommended that more support should be targeted toward the beneficiaries to uplift those at the severe hunger to food secured level.

Keywords: Household, Dietary, Diversity, Legume, Crop, Intervention

INTRODUCTION

Food security as defined by the United Nations' Committee on World Food Security, is the condition in which all people, at all times, have physical, social and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (IFPRI, 2014). The global food consumption is growing rapidly, however, this growth is uneven with more developed countries having higher rates of food consumption than developing countries. Food consumption is simply the amount of food and calories that are consumed by people and food consumption is needed for survival as the average number of calories needed for a male human being per day is around 2500 and 2000 for women. The report of the United Nations mentioned on food security and nutrition in 2018 indicated that the world hunger rate has begun to rise again, threatening 815 million people in 2017 that is 11% of the world's population, after a remarkable steady decline during the past decade. The report showed that the increase in the number of people affected by hunger compared to the previous year has increased by 38 million people, as a result of extreme vulnerability in the area of productivity decline, conflicts, pest and diseases as well as climate change (WHO, 2018). The trend was similar in Africa and Nigeria particularly in rural areas where food availability,



accessibility and utilization has been a major livelihood constraint. Though coping strategies were employed by rural people to meet the unpleasant situation.

It is in line with this that Kano State Agro-Pastoral Development Project (KSADP) funded by the Islamic Development Bank, the Lives and Livelihood Funds, the Islamic Solidarity Fund for Development and the government of Kano State signed memorandum of understanding (MOU) with KNARDA for the implementation of legume crops value chain intervention for enhancing agricultural production, productivity and competitiveness along the value chain of legume crops namely, Groundnut, Cowpea and Soybean. The intervention will help in improving agricultural production components, extension service delivery, capacity building, post-harvest/agro processing, and access to markets and linkages to credit facilities for better food security. As such, the study analyzed the household dietary diversity of the beneficiaries. The specific objectives addressed were describing the socio-economics characteristics of the beneficiaries, determining food consumption, household dietary diversity, household hunger scale and coping strategies adopted by the beneficiaries.

METHODOLOGY

Study Area

Kano State lies between latitudes 10° 33' to 12° 37'N and longitude 07° 34' to 09° 25' E and it occupies a total land area of 20,131 square kilometers. It has a population of 9,383,682 people according to the 2006 population census (NPC, 2006). With the increase of 3% annually, the population as at 2024 is 14,450,870. The dominant ethnic group is Hausa with Islam as the main religion. The southern part of the state lies in the Northern Guinea Savannah, while the central region is covered by the Sudan Savannah and the northern most tip of the state is characterized by the arid Sudan-Sahel agro-ecological zone. The annual rainfall varies from 600 – 1200 mm in the Guinea Savannah to 400 – 600mm in the Sudan Savannah and 200-300mm in the Sudan-Sahel. The length of the growing periods ranges from 70 to 100 days in the Sudano-Sahel, 90 – 150 days in the Sudan Savannah and 150 – 200 days in the Guinea Savannah zone. The Sudan-Savanna covers more than 80% of the state and was the largest agro ecology. While the Sudan-Sahel and Guinea Savanna cover 15 and 5% of the state respectively. The state experienced varying durations of short raining and long dry seasonings. An average raining season starts in May and ends in October while the dry season starts in October and ends in May. The state also witnesses slight variation in the distribution of rainfall between its northern and southern parts. The temperature in Kano State usually ranges from 15.8°C to 33°C in a year with a mean temperature of 26°C. the major occupation of the inhabitant was farming

Sampling Techniques and Sample Size

The project was implemented in the entire forty-four (44) local government areas of the state. The state was divided in to three agricultural development project (ADP) zones. In line with this, six (6) local government areas were selected from each zone. Equal numbers of beneficiaries (6) were randomly selected from each value chain crop (Ground nut, Cowpea and Soybeans) across the selected local government areas given a total of one hundred and eight (108) beneficiaries for each value chain crop. This led to three hundred and twenty-four (324) sample size used for the study.

Method of Data Collection and Analysis

Data collection instrument (questionnaire) was used. The data were collected electronically using Kobo collect application by trained enumerators. The data were analyzed using descriptive statistics, food consumption score (FCS), household dietary diversity score (HDDS), household hunger scale (HHS) and coping strategy index (CSI)

Model Specification

Food Consumption Score (FCS) Estimation

The FCS is calculated based on the past 7-day food consumption recall for the household and classified into three categories: *poor consumption* ($FCS = 1.0$ to 28); *borderline* ($FCS = 28.1$ to 42); and *acceptable consumption* ($FCS = >42.0$). The FCS is a weighted sum of food groups. The score for each food group is calculated by multiplying the number of days the commodity was consumed and its relative weight. The following equation indicates the mathematical representation of FCS.



$$FCS = A_{cereal}X_{cereal} + a_{pulses}X_{pulses} + a_{veg}X_{veg} + a_{fruit}X_{fruit} + a_{animal}X_{animal} + a_{dairyproduct}X_{dairyproduct} + a_{suger}X_{suger} + a_{oilfatbutter}X_{oilfatbutter} + a_{condiments}X_{condiments} \dots \dots \dots \text{equation (1)}$$

Where:

a_i = Weight attributed to the food group;

x_i = Number of days each food group is consumed (≤ 7 days).

The different Food Groups and their Weighted Score considered for the study include Cereals & Root and tubers (bread, rice, maize, barley, cassava, potatoes, etc) (2), Pulses and nuts (beans, lentils, peas etc) (3), Vegetables (1), Fruits (1), Animal Product (Meat, egg, fish) (4), Dairy products (milk and milk products) (4), Sugar, honey (0.5), Oil, Fat, Butter (0.5) and condiments (0).

Household Dietary Diversity Score (HDDS) Estimation

HDDS: Regroup the food groups used for FCS in to 7 food groups. For each food group create a new binominal variable that has two possible values: 1 – yes: the household / individual consumed that specific food group and 0 – no: they did not consume that food. Sum all the binominal variables in order to create a HDDS. The new variable will have a range from 0 through the maximum number of food groups collected (7). IFPRI proposes to use the following thresholds: 6+: high = good dietary diversity; 4.5 – 6: medium dietary diversity and <4.5: low dietary diversity.

Household Hunger Scale (HHS)

The HHS covers a recall period of 30 days, and consists of two types of questions (three "occurrence" and three "frequency-of-occurrence" questions). The respondent is first asked if a given condition was experienced (yes or no) and, if it was, then with what frequency (rarely, sometimes, or often). All questions are worded to be as universally relevant as possible, and focus strictly on the hunger-specific experience of insecure access to food. The resulting responses can be transformed into either a continuous or a categorical indicator of hunger. When calculating the HHS as a continuous indicator, each of the six questions is scored 0-2, with 0 being "did not occur," 1 being "rarely and sometimes," and 2 being "often." The score for each of the three questions is then added together, and the total HHS ranges from 0 to 6, indicating the degree of insecure food access. As a categorical variable, households are categorized as "little to no hunger in the household" (0-1), "moderate hunger in the household" (2-3), or "severe hunger in the household" (4-6)

Coping Strategy Index (CSI) Estimation

Coping Strategy Index (CSI) measures behavior: the things that people do when they cannot access enough food. CSI is based on a list of behaviors (coping strategies). It combines: the frequency of each strategy (how many times each strategy was adopted?); and their severity (how serious is each strategy?) for households reporting food consumption problems. Household CSI scores are then determined by multiplying the number of days in the past week each strategy was employed by its corresponding severity weight, and then summing together the total. The total CSI score is the basis to determine and classify the level of coping into three categories: No or low coping (CSI= 0-3), medium (CSI = 4-9) and high coping (CSI ≥ 10).

RESULTS AND DISCUSSION

Socio-economic Characteristic of the Beneficiaries

Age of the farmers

The findings from the survey revealed that the minimum age of the groundnut farmers was 24 years, the maximum was 67 years and the average age was found to be 44 years. In related issue, the minimum age of cowpea farmers was found to be 23 years, the maximum was 62 years and the average was 43 years. Similarly, the findings also revealed that the minimum age of soybeans farmers was found to be 26 years, the maximum was 65 years and the average was found to be 45 years. Looking at the average age of the farmers across the three value chains, it was shown that the farmers were at their active age which indicates the possibility of making good decision in accepting innovative ideas that facilitate sustainability of production and productivity of the three value chain crops. Many related studies shows that farmers were at their active age in Nigeria. This is in line with the study of Ibrahim *et al.* (2013) where majority of the farmers are at their active age of less than forty years of age.



Household Size of the Farmers

Findings from the study showed that the minimum number of household size among the groundnut farmers to be 1 member, the maximum was 18 members and the average household size was found to be 8 members. In addition, it was also revealed that the minimum household size of cowpea farmers was 1 member and maximum was 19 members while the average was 7 members. The findings further revealed that minimum household size of soybeans farmers was 1-member, maximum household size was 16 members and the average was 7 members. Household size contributes to the farming activities among the households through engagement in the production activities and processing of the produce. This finding implies that, the farming households of the three value chain crops has reasonable number of household members that can be used in the production and processing activities as family labor which contributes in the reduction of cost of production and increase in the profitability of the enterprises. These findings agreed with that of Idris (2019) who stated that majority of the farmers had 1-13 household members.

Average Monthly Income

Income contributes to the production activities and served as means of attaining livelihood requirement of the farmers and their households. The finding from the survey shows that the minimum monthly income obtained by groundnut farmers was found to be ₦10000, the maximum amount obtained was ₦450000 and, on the average, they obtained ₦106925.93 monthly. It was equally found that cowpea farmers obtained ₦10000 as minimum amount per month and ₦300000 as maximum. The average obtained was ₦106648.15. Similarly, soybeans farmers obtained a minimum of ₦10000 in a month and maximum of ₦500000. The average monthly income obtained by soybeans farmers was found to be ₦108759.26. These amount of income comprises of both farm and non-farm income. The findings implies that farmers across the three value chain crops obtained a reasonable amount of money that warrant them to provides for their household and saved certain amount for purchase of inputs for the next cropping season. These findings were in line with what was obtained from Oyegbami *et al.* (2020) where farmers obtained an average of twenty-three-thousand-, six-hundred-and eighty-naira ₦23,680 monthly.

Farm Size of Farmers

Farm size determines the scale of operation of the farmers. The findings from the study revealed that groundnut farmers had a minimum of 0.5ha, the maximum farm size among them was found to be 5ha with an average of 1.9ha. Considering the cowpea farmer, it was found that they had a minimum farm size of 0.5ha and the maximum was 7ha with an average farm size of 1.9ha. The result also shows the minimum of farm size of soybeans farmers as 0.25, the maximum was 5ha and the average was found to be 1.8940ha. Farm sizes revealed the operational scale of farmer whether he is small, medium or large scale. The findings revealed that the farmers across the value chain crops were small scale in terms of operation. This is based on the classification made by food and agriculture organization. The findings implies that mechanization among such farmers is difficulty due to the size of their farms. This will surely influence the production capacity of these value chain crops, because to obtained the optimum output, mechanization need to be embraced. These findings also agreed with that of Idris (2019) who reported that majority of the farmers considered were operating in small scale.



Table 1: Quantitative Socio-economic Characteristic of the Beneficiaries

Value Chain Crops Variables	Ground Nut	Cowpea	Soybeans
Age			
Minimum	24	23	26
Maximum	67	62	65
Mean	44.59	43.63	45.72
Standard Error	0.980	0.863	0.775
Household Size			
Minimum	1	1	1
Maximum	18	19	16
Mean	7.53	7.36	7.45
Standard Error	0.379	0.368	0.343
Average Monthly Income			
Minimum	10000	10000	10000
Maximum	450000	300000	500000
Mean	106925.93	106648.15	108759.26
Standard Error	6320.158	6386.294	7429.732
Farm Size			
Minimum	0.50	0.50	0.25
Maximum	5.00	7.00	5.00
Mean	1.9352	1.9056	1.8940
Standard Error	0.10935	0.11657	0.10317

Marital Status of Farmers

Marriage is one of the religion and cultural obligations which has high recognition more especially among the people in the study locations. These gave the household head recognition as more responsible individual within the society. The findings from the survey revealed that majority of the groundnut (95.4%), cowpea (95.4%) and soybeans (95.4%) farmers respectively were married. These implies that, they were shouldered with responsibility and make them to engaged in agricultural production and other activities to earn means of living for the survival of the household. In addition, these gave way for bearing children and used for family labor in agricultural activities. Similar finding was obtained from Idris (2019) were majority of the farmers considered in the study were male.

Level of Education of Farmers

The findings shows that majority of the groundnut (72.6%), cowpea (75.9%) and soybeans (68.5%) farmers had formal level of education. The education possess enable them to read and write, skills and innovative ideas developed and promoted by researchers that helps in improvement of production and productivity of the three value chain crops. These increased output for improvement in livelihood of the beneficiaries and beyond. Idris (2019) findings with related to educational level were contrary with these findings.

Livelihood Option of Farmers

The livelihood options found among the farmers was revealed and reported as follows that groundnut farmers engaged mostly in farming (88.9%) Trading (4.6%) Civil Servant (5.6%) and handcraft (0.9%). Similarly, cowpea farmers also engaged in these livelihood option as farming (90.7%), Trading (5.6%), Civil Servant (1.9%) and handcraft (1.9%). In addition, soybeans farmers also engaged in farming (89.8%) Trading (5.6 %) Civil Servant (2.8 %) and handcraft (1.9%). Farming is not the only livelihood option among the farmers of the three crops value chain but in addition they engaged in other income generating activities. Their engagement implies that farmers explored other options in earning means of living for their survival and that of household members for improvement in their production activities through obtaining quality inputs and other necessary activities that enhanced more output realization. These findings were in line with Idris (2019) where farmers considered in their study engaged in many livelihood options such as farming, civil servant, trading and livestock rearing.

Table 2: Qualitative Socio-economic Characteristics of the Beneficiaries

Crop Value Chain Variables	Ground Nut		Cowpea		Soybeans	
	Frequency	%	Frequency	%	Frequency	%
Marital Status						
Single	4	3.7	4	3.7	1	.9
Married	103	95.4	103	95.4	103	95.4
Widow	0	0	1	.9	4	3.7
Divorce	1	.9	0	0	0	0
Level of Education						
No Formal Education	35	32.4	26	24.1	34	31.5
Primary	16	14.8	18	16.7	17	15.7
Secondary	35	32.4	49	45.4	35	32.4
Diploma	15	13.9	8	7.4	19	17.6
Degree/ Postgraduate	7	6.5	7	6.5	3	2.8
Livelihood Option						
Farming	96	88.9	98	90.7	97	89.8
Trading	5	4.6	6	5.6	6	5.6
Civil Servant	6	5.6	2	1.9	3	2.8
Handcraft	1	.9	2	1.9	2	1.9

Sex of Farmers

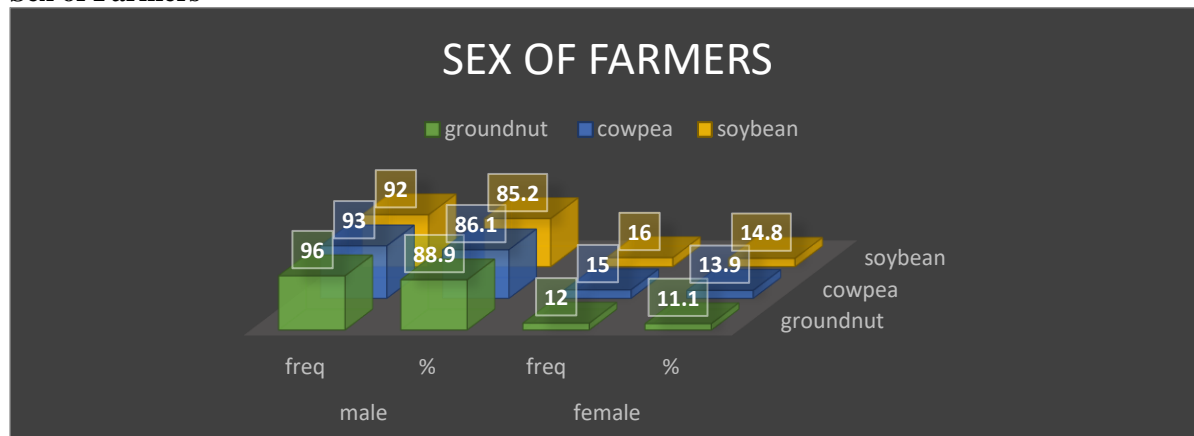


Figure 1: Sex of Farmers

The findings revealed that majority of the respondents across the three value chain crops groundnut (88.9%), cowpea (86.1%) and soybeans (85.2%) were male with female accounting only (11.1%), (13.9%) and (14.8%) respectively. Engagement of women in farming activities did not still meet its expectation. This has to do with so many factors more importantly economic factors which hindered women participation in production of different crops. Though awareness was created and with support of different projects on board, women are embracing agriculture either in the area of crop production or livestock. In addition, they are also engaged in other activities along the value chain. These findings were supported with that of Mohammed *et al* (2015) where majority of the farmers were male.

Farmer Group

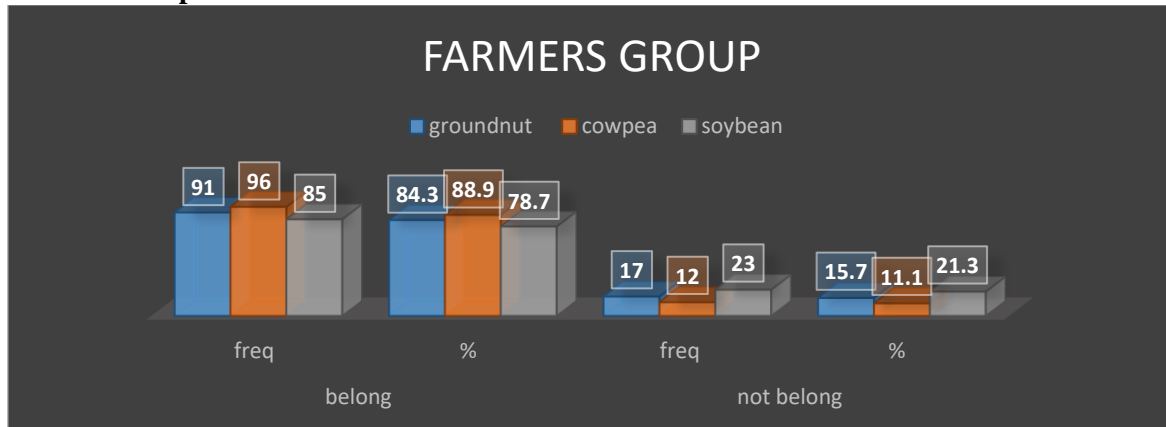


Figure 2: Farmers Group

As revealed by the findings of the survey, majority of the groundnut (84.3%), cowpea (88.9%) and soybean (78.7%) farmers belong to cooperative association or farmers group. One of the advocacies by many projects were farmers form group for ease of problems and the benefits in group formation. As shown in the result, farmers along the three value chain crops derived a lot of benefits for been a member of the cooperative group like getting support from the project which increase their output. These has direct impact on their livelihood. Idris (2019) reported that almost all the farmers belong to cooperative associations.

Food Security Status of the Beneficiaries

Food Consumption Score (FCS)

The findings in Table 3 revealed that the food consumption estimation as one of the indicator of measuring food security status among the beneficiaries of the project showed that majority of the beneficiaries of the three value chain crops ground nut (64.0%), cowpea (63.0%) and soybeans (59.0%) were above the acceptable food consumption score of 42.0 points. Others were at border line ground nut (28.0%), cowpea (26.0%) and soybeans (38.0%) with few percent at poor consumption level. Attained consumption level were attributed to the increased output obtained over the period of the project intervention resulted to increase income among the beneficiaries leading to increase in chances of obtaining balance diet food requires by the members of the households. These implies that majority of beneficiaries have physical, social and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for active and healthy life. These agreed with the findings of Nurudeen and Shaufique (2019) were majority of their respondents found to be at the acceptable level of food consumption which make them food secured.

Table 3: Food Consumption Score (FCS) Estimation

Crop Value Chain	Groundnut	Cowpea	Soybean	Pooled
FCS Level				
Poor	8.0%	11.0%	3.0%	15.5%
Borderline	28.0%	26.0%	38.0%	35.7%
Acceptable	64.0%	63.0%	59.0%	48.8%

Categories: *poor consumption* (FCS = 1.0 to 28); *borderline* (FCS = 28.1 to 42); and *acceptable consumption* (FCS = >42.0).

Household Dietary Diversity Score (HDDS)

The findings from Table 4 showed that majority of cowpea (60.0%) and soybean (69.0%) beneficiaries had good dietary diversity with forty percent of groundnut beneficiaries having the same good dietary diversity. These findings supported by the food consumption estimation were majority of



the beneficiaries among the value chain crops were found to have acceptable food consumption and by consuming. This implies that beneficiaries had economic ability to access a variety of foods that are of good quality and at required quantity for consumption which were strengthen their ability to think and act positively for development. The economic ability was as a result of increase in income among the beneficiaries over the project period. These findings contradicted that of Ajani (2010) who reported medium dietary diversity among the respondents he studied.

Table 4: Household Dietary Diversity Score (HDDS) Estimation

Crop Value Chain	Groundnut	Cowpea	Soybean	Pooled
HDDS				
Good dietary diversity	40.0%	60.0%	69.0%	52.7%
Medium dietary diversity	34.0%	27.0%	17.0%	10.7%
Low dietary diversity	26.0%	13.0%	14.0%	33.3%

Key: 6+: high = good dietary diversity; 4.5 – 6: medium dietary diversity and <4.5: low dietary diversity

Household Hunger Scale (HHS)

Result in Table 5: shows that majority of the beneficiaries of the crops value chain groundnut (54.0%), cowpea (65.0%) and soybean (66.0%) had no hunger in their households with severe hunger of groundnut (23.0%), cowpea (18.0%) and soybeans (24.0%) respectively. These implies that beneficiaries that experienced hunger, have low productivity in every aspect of human endeavor as hunger is a serious disease. Whereas those with zero hunger are expected to be active, good and sound decision making and productive. The severe hunger among the beneficiaries despite the intervention may be as a result of the economic hardship and increase in inflation of basic commodities couple with the number of members within their households. Alero, James and Victor (2019) in their study found that less than forty percent of their respondents are at zero hunger.

Table 5: Household Hunger Scale (HHS) Estimation

Crop Value Chain	Groundnut	Cowpea	Soybean	Pooled
HHS				
None	54.0%	65.0%	66.0%	50.3%
Moderate	23.0%	17.0%	10.0%	19.0%
Severe	23.0%	18.0%	24.0%	31.0%

Coping Strategy Index (CSI) Estimation

Result from Table 6 reveals that coping strategy adopted by affected households among the three value chain crops on trying to coup with issue of food insecurity. It was found that majority of the three value chain crops beneficiaries that ware food in secured groundnut (66.0%), cowpea (84.0%) and soybean (73.0%) respectively adopted low coping strategies of maximum of three (3). The low coping strategies adopted by beneficiaries was as a result of low percentage of beneficiaries that were food in secured.

Table 6: Coping Strategy Index (CSI) Estimation

Crop Value Chain	Groundnut	Cowpea	Soybean	Pooled
CSI				
Low	66.0%	84.0%	73.0%	75.7%
Medium	34.0%	16.0%	27.0%	24.3%
High	0.0%	0.0%	0.0%	0.0%

Key: low coping (CSI= 0-3), medium (CSI = 4-9) and high coping (CSI ≥10).

CONCLUSION AND RECOMMENDATION

In conclusion, majority of the beneficiaries across the three value chain crops (groundnut, cowpea and soybean) were food secured. The food security was as a result of increase in output obtained due to the intervention offered by the project which led to increase in income of the beneficiaries. All



these were attributed to the adoption of good agronomic practices promoted by the project in line with the production of the value chain crops. The adoption level was due to the trainings offered by the project on application of the good agronomic practices and the various demonstration plots made. Equally linking farmers with the (financial institutions, agro input dealers, seed companies' aggregators) contributed immensely toward realizing the output obtained. These resulted in obtaining more output leading to significant increase in income. Increase in income contributed in accessing quality food required by the household members. It is recommended that more support should be targeted toward the beneficiaries to uplift those at the severe hunger to food secured level.

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