Have households' livelihoods and food security rebounded from COVID-19 shocks in Nigeria? Results from a follow-up phone survey*

Bedru B. Balana, Motunrayo Oyeyemi, Adebayo Ogunniyi, Adetunji Fasoranti, Hyacinth Edeh, & Kwaw Andam

International Food Policy Research Institute (IFPRI), Nigeria, Abuja

Abstract

The effect of the COVID-19 pandemic on households' income, jobs, and food security have continued despite perceptible reductions in transmission and lifting of restrictive policy measures in several countries. To assess these effects on Nigerian households, we collected household data for the initial three months after the outbreak of the pandemic in Nigeria. To track the changes since the first survey, we conducted a follow-up phone survey with the same households a year later. We undertook a comparative analysis between the two surveys focusing on income loss, job loss, food security, and dietary diversity. The study also investigated how changes in income, wealth endowments, social capital, safety net programs, and recurrent conflicts affected the severity of food insecurity amid the pandemic. We found that both income and jobs have rebounded by 50 percentage points compared to the baseline results. In terms of food insecurity, households in a "severely food insecure" situation dropped to 65 percent in the follow up survey compared to 73 percent in the first survey and dietary diversity of households improved by 5-percenatge points in the follow-up survey. However, over 70 percent increase in conflicts were re[ported which affected farm investment decisions in 44 percent of smallholder farmers surveyed. While income loss significantly worsened households' food insecurity; livestock ownership and social capital cushioned many households from falling into a more severe food insecurity. However, safety net programs did not significantly protect households from falling into severe food insecurity amid the pandemic. We suggest four policy propositions: prioritize investment in job creation to curb income loss; enable households to build their wealth base (e.g., land tenure security or livestock) to enhance resilience to shocks; revisit the effectiveness of safety net programs; and finally, devise and implement conflict resolutions to induce investment and enhance productivity.

Key words:

COVID-19, Conflicts, Dietary diversity, Food insecurity, Livelihoods, Income loss, Households

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1. Introduction

The interruptions of general economic activities and within food supply chains, following the outbreak of the COVID-19 pandemic[1] have severely threatened the livelihoods and food security of households in developing nations like Nigeria (Laborde et al., 2020; Balana et al., 2020; Mahmud and Riley, 2021; Hirvonen et al., 2021; Amare et al., 2021). Studies published amid the pandemic have documented many of the dire effects of COVID-19 in developing countries, such as income losses (Dang and Nguyen, 2021; Mahmud and Riley, 2021); increases in food prices (Laborde et al., 2020); increased food insecurity (Ben-Hassen et al., 2020; Chenarides et al., 2021; Hirvonen et al., 2021; Amare et al., 2021); and hindering progress toward meeting the Sustainable Development Goal 2 of Zero Hunger (Otekunrin et al., 2020; Saccone, 2021). Households in developing countries like Nigeria with significant food insecurity and malnutrition problems prior to the onset of COVID-19 have seen those difficulties worsen under the pandemic.

The food insecurity that many Nigerian households face is situated within a context of serious socioeconomic challenges that include high rates of poverty, unemployment, and acute malnutrition, especially among vulnerable groups (Matthew et al., 2020; Andam et al., 2020; Okeke-Ihejirika et al., 2020). Forty-nine percent of Nigerians lived below the international poverty line of $1.90 per day before the pandemic (World Bank, 2018). Shortages of both energy- and nutrient-rich foods remain a major challenge. The stunting rate among children under five, a measure of chronic undernutrition, stands at 37 percent, among the highest in Africa south of the Sahara (Nigeria Demographic and Health Survey 2018; Government of Nigeria, 2020). Economic and social shocks induced by COVID-19 have exacerbated the vulnerability and food insecurity of Nigerian households. Moreover, beyond increasing economic volatility, the pandemic has heightened prevailing conflicts and insecurity threats, including increased insecurity in urban centers and greater inter-community conflicts in rural areas, such as between farmers and herders (George, Adelaja and Awokuse, 2020; George et al, 2021).

In July 2020 we conducted a phone survey to assess the effects of the pandemic on Nigerian households in the initial three months after the outbreak (April - June 2020)[2] of the pandemic in Nigeria. In the survey responses, about 88 percent of the households reported up to 50 percent income loss due to the pandemic; 66 percent reported reduced food consumption; and many households, especially poorer ones, indicated that COVID-19 significantly worsened their food insecurity (Balana et al., 2020). More than 80 percent of the respondents worried about not having enough food, and 77 percent ate less food than they

[1] The presence of coronavirus in Nigeria was first reported on February 27, 2020. According to the Nigeria Centre for Disease Control (NCDC), 211,496 confirmed COVID-19 cases and 2,886 deaths were recorded until October 19, 2021 (NCDC Coronavirus COVID-19 Microsite).

[2] The impacts of government policy responses to restrain the spread of COVID-19 were expected to be heightened over this initial period.

thought they should. Survey households also reported a significant reduction in consumption of proteins (eggs, meat, and dairy products) and fruits since the pandemic struck. Increases in food prices were felt by most households (85 percent). Nonetheless, the severity of both the direct and indirect impacts of COVID-19 on livelihoods and food insecurity were found to be heterogeneous both spatially and across the population (Ayebare et al., 2020; Caggiano et al., 2020). Studies indicate that the poor and vulnerable households are the most affected (Andam et al, 2020; Obayelu et al., 2020). Similar findings were reported in other studies conducted within the first three months of COVID-19 in Nigeria (Amare et al., 2020; World bank and NBS, 2020).

Despite the rising cases of infections toward the last quarter of 2020 and the first quarter of 2021 (https://covid19.ncdc.gov.ng/state/), the government of Nigeria gradually lifted restrictive lockdown and travel measures and decided to expedite vaccination efforts. With the relaxation of lockdowns and other measures, as a response to restored normality, people working in the farm and nonfarm sectors gradually returned to business. However, loss of income and high inflation rates in the wake of COVID-19 and an economic recession in 2020 have continued to diminish the purchasing power of many households with negative implications for food consumption.

To assess the changes in the livelihoods and food security situation of households over a year (between the two surveys i.e., July 2020 - July 2021), we interviewed the same households participated in the first-round survey in a follow-up phone survey in July 2021. Key questions on incomes, employment, labor movement, food security and nutrition, and coping strategies in the first-round survey (Balana et al., 2020) were maintained in the follow-up survey. The follow-up survey included additional questions on conflicts, insecurity, shocks other than COVID-19, access to basic services (such as markets, credit, and clean water), COVID-19 testing, and vaccines. The results presented in this paper are based on data obtained from the follow-up phone survey and some comparative analysis with the first-round survey data on key livelihood factors such as income, employment, and food security.

2. Methodology

2.1 Sampling and data collection

To track changes in the effects of the pandemic on households since the first-round survey, we administered a follow-up phone survey with respondents who participated in the first survey sampled from four Nigerian states (Kebbi, Delta, Ebonyi, and Benue). Details of the sampling frame and selection of survey households were reported in Balana et al. (2020). About 82 percent of the original sample households (n=840) were recovered in our follow-up survey. In addition to updating some of the questions from the first-round survey to accommodate the changes since then, the follow-up survey included new modules on conflicts,

insecurity, shocks other than COVID-19, access to basic services (such as markets, credit, and clean water), and their perception of and access to COVID-19 testing and vaccines.

To maintain consistency of the interview, enumerators who administered the first survey were hired for the follow-up survey. In addition to the enumerators, four field coordinators who supervised the first survey were rehired to undertake advance calls to the sampled respondents, inform them about the study, and obtain initial consents. The enumerators administered the final phone survey in July 2021 to those respondents who consented in the advance calls.

2.2 Conceptual framework

We adopt a livelihood approach (DFID, 1999) for our analysis, focusing on four key livelihood enhancing variables—income, wealth endowments, social capital, and government/NGOs support programs—and how the changes in these variables during COVID-19 were associated with the severity of food insecurity and dietary diversity of households. Studies have shown that economic shocks in the context of *income decline* can adversely affect household food security, especially for the poor (Akter and Basher, 2014; Smith et al., 2018; Rufai et al., 2021). In contrast, increases in household incomes play a significant role in access to food, promoting both adequate consumption and dietary diversity (Deaton and Deaton, 2020; Manda et al., 2020). *Wealth endowments* including natural capital (e.g., land) and physical capital (e.g., livestock), can play an important role in determining households' food security and diet quality (Mulwa and Visser, 2020; Wodajo et al., 2020).

While food security in developing countries often depends on a household's ability to produce its own food combined with its capacity to purchase foods, the strength of a household's *social capital*—its bonds with the rest of the community (e.g., family, relatives, and friends)—significantly helps it minimize the severity of food insecurity, especially in times of shock (Mbugua and Nzuma, 2020). However, considering the nature of the indiscriminate shocks imposed by COVID-19, which are likely to affect every household in a community, the potential of social capital to serve as a buffer for other households may be undermined. The support mechanisms offered to vulnerable households by the government and NGOs through *social safety nets* programs may also play an important role in minimizing the negative consequence of COVID-19 (Devereux et al., 2020; Headey et al., 2020; Laborde et al., 2020). Devereux (2016) noted that food insecurity can be addressed most directly by giving food insecure people food (food aid) or the means to access food (conditional or unconditional cash transfers).

Conflicts and insecurity such as the Boko Haram terrorist insurgencies in the northeast, pastoralist attacks in the central belt and southeast of the country, and banditry are major threats affecting livelihoods, agriculture, and food security in recent years. These could exacerbate the food insecurity of households amid COVID-19. Review of available literature show that such insecurity and conflicts reduce area cultivated, agricultural output and productivity, and investments (Kimenyi et al., 2014; Adelaja and George,

2019; Mitchell, 2019). Conflicts also reduce farmers' cattle holdings by increasing cattle thefts and losses and reducing cattle purchases (George et al., 2021).

2.3 Construction of food insecurity and dietary diversity indicators

Food insecurity indicators were constructed from the eight-standard experience-based food insecurity experience scale (FIES) questions (FAO, 2016) (see appendix Table A1). This metric has been widely used in the analysis of food insecurity (Cafiero, et al., 2018; FAO, 2016). Based on the individual's "yes/no" responses to the eight FIES questions (FAO, 2016), the household's food insecurity condition was grouped into four categories:

1) *Food secure* (=1): If the household responded 'no' to all the eight questions, i.e., if $Q_1=Q_2=Q_3=Q_4=Q_5=Q_6=Q_7=Q_8=0$.
2) *Mildly food insecure* (=2): If the household respond 'yes' to at least one of the first three FIES questions (i.e., if $Q_1=1$ or $Q_2=1$ or $Q_3=1$) and zeros to the rest of the FIES questions i.e., $Q_4=Q_5=Q_6=Q_7=Q_8=0$.
3) *Moderately food insecure* (=3): If the household responded 'yes' to either Q_4 or Q_5 and zeros to Q_6, Q_7, and Q_8.
4) *Severely food insecure* (=4): If the household responded 'yes' to one or more of the last three FIES questions i.e., $Q_6=1$ or $Q_7=1$ or $Q_8=1$.

Dietary diversity is measured by the number of different food groups from which food was consumed by a household over the given reference period. We constructed a household dietary diversity indicator using the 'yes/no' responses to the household dietary diversity score (HDDS) questions (see appendix Table A2). Following Vhurumuku (2014), we constructed the HDDS as follows: (1) re-group the 12 food groups into 7 food groups (appendix Table A2); (2) create a binary response (1=yes) if the household consumed any food from the specific food group during the reference period; (3) sum horizontally the binomial variables to generate a count value; and (4) the new variable, the HDDS, ranges from a minimum of 0 to a maximum of 7.

2.4 Other variables

COVID-19 testing and vaccination – two dummy variables on households' behavior related to the coronavirus testing and vaccination are constructed: (1) household where any member got tested for coronavirus (yes/no) and (2) household where any member got vaccinated for COVID-19.

Independent variables – Table 1 (section 3) presents the list of independent variables used in the econometric models. As highlighted in the conceptual framework (section 2.3), our focus is on the *livelihood indicators* (income loss and job loss); *asset and wealth indicators* (land size and livestock numbers); *social capital indicators* (support from friends and family members); *external intervention indicators* (support from government and NGOs); and the effect of conflicts/insecurity threats though

control variables (demographic characteristics, geographic factors, and information access) were included in the models.

2.5 Analytical models

2.5.1 Logit model

A basic binary outcome model was used to predict the probability of individual's COVID-19 testing and vaccination decision (Cameron and Trivedi, 2010; Wooldridge, 2010).

2.5.2.Ordered logit model

The household's FIES indicator variable defined in section 2.3 is an ordered outcome with four categories. We use an ordered logit model to examine the factors conditioning the FIES situation of a household amid the COVID-19 pandemic. Let the categorical variable y_i take values $j = 1, 2, 3, 4$ that represents the household's FIES category. Defining y_i^* as the latent unobserved measure of the i^{th} household FIES, we specify an index model for y_i^* as in equation 1 (Cameron and Trivedi, 2010):

$$y_i^* = x_i'\beta + u_i \quad \text{.....(1)}$$

Where the x_i' is a vector of regressors, β is equal to the parameters to be estimated and u_i is an error term. From equation 1, higher values of y_i^* indicate the more severe food insecurity situation of the household. For an m–categorical ordered logit model, we define a household's FIES category j as in equation 2:

$$y_i = \text{j if } \alpha_{j-1} < y_i^* \leq \alpha_j, \text{ for } j = 1, \dots, m \quad \text{..... (2)}$$

Where α_j indicates threshold values for the j^{th} FIES category. The probability that the i^{th} household falls in the j food insecurity category (P_{ij}) can be presented as in equation 3:

$$P_{ij} = P(y_i = j) = P(\alpha_{j-1} < y_i^* \leq \alpha_j) = \text{F}(\alpha_j - x_i'\beta) - \text{F}(\alpha_{j-1} - x_i'\beta) \text{.....(3)}$$

The marginal effects on the probability of being in food insecurity category j by the i^{th} household when the regressor x_r changes is given by (equation 4) (Cameron and Trivedi, 2010; Wooldridge, 2010).

$$\frac{\partial P(y_i=j)}{\partial x_r} = [F'(\alpha_j - x_i'\beta) - F'(\alpha_{j-1} - x_i'\beta)]\,\beta_r \text{.....(4)}$$

where $F(.)$ is the cumulative distribution function (cdf) of u_i and $F'(.)$ is the partial derivatives with respect to the regression covariates. It is assumed that u_i has a logistic cumulative distribution function with $F(z) = e^z/1 + e^z$. The parameters β and the $m-1$ threshold parameters, α_1, $\alpha_{2,\dots,\alpha_{m-1}}$ are estimated by maximizing the log likelihood of equation 3 using the maximum likelihood estimator.

3. Descriptive results

3.1 Comparative statistics of key variables

Table 1 presents summary statistics from the two surveys. As shown in Table 1, household income loss has reduced from an average income loss of 43.4 percent in the baseline to 22 percent in the follow-up survey later a year (i.e., a reduction in income loss by 50 percentage points between the two surveys). This is a

significant rebound in household income. A similar trend is observed in employment; 42 percent of the respondents reported job loss in the first survey against 21 percent in the follow-up survey. While social support mechanisms increased significantly (19 percent and 39 percent of respondents received support from family and friends in the first and follow-up survey, respectively), support from the government and NGOs shows a reduction in 3 percentage points (from 12.3 percent to 9.4 percent).

Results further indicate a marginal occupational shift from farming to nonfarm activities. In the first-round survey, approximately 68 percent of the respondents were engaged in farming or farm-related activities as their primary occupation, while this figure drops to 62 percent in a follow-up survey. Some of the key coping strategies pursued in responses to the COVID-19 shocks (included livelihood diversification (nonfarm activities), seasonal migration, and sales of assets and livestock. These results are consistent with past studies in developing countries (Barrett and Carter, 2013; Mitter, et al., 2015, Martin and Lorenzen, 2016; Asfaw et al., 2018).

Table 1. Descriptive summary statistics of key variables

Variables	Round-I (July 2020)		Round-II (July 2021)	
	Mean	**Std.**	**Mean**	**Std.**
Livelihood variables				
HH income loss amid C-19 (%)	**43.390**	27.283	**22.00**	25.20
HH member lost job (0/1)	**0.419**	0.493	**0.213**	0.410
HH livelihood on-farm (0/1)	**0.680**	0.470	**0.621**	0.490
Demographic and geographic variables				
HH in rural area (0/1)	0.724	0.446	0.702	0.457
Location north state (0/1)	0.258	0.437	0.273	0.445
HH head male (0/1)	0.600	0.491	0.614	0.487
HH head age (years)	40.00	11.45	41.06	11.14
HH head married (0/1)	0.77		0.83	0.370
Household size (#)	7.38	5.09	7.92	4.00
Human and social capital variables				
Education secondary (0/1)	0.251	0.460	0.290	0.454
Education above secondary (0/1)	0.552	0.494	0.613	0.487
Received family/friends support (0/1)	**0.190**	0.292	**0.393**	0.488
HH member migrated amid C-19 (0/1)	0.096	0.294	0.234	0.423
HH member of local association (0/1)	n.a.	n.a.	0.55	0.498
HH assets/wealth indicators/external support				
HH own agricultural land (0/1)	0.876	0.328	0.795	0.403
Land size owned (ha)	3.373	6.829	2.830	3.83
Livestock size owned (TLU)	2.283	6.298	2.754	8.125
Received government/NGO support (0/1)	**0.123**	0.328	**0.094**	0.292
HH exposed to insecurity (0/1)	n.a.	n.a.	0.500	0.500
Access related variables				
Access to all weather roads (0/1)	n.a.	n.a.	0.699	0.459
Access to C-19 related info (0/1)	0.922	0.267	0.681	0.466
Access to health services (0/1)	n.a.	n.a.	0.869	0.338
Access to C-19 protective measures (0/1)	n.a.	n.a.	0.857	0.35
C-19 testing and vaccination				
HH member got tested (0/1)	n.a.	n.a.	0.239	0.427
HH willing to get tested if free (0/1)	n.a.	n.a.	0.740	0.439
HH member got vaccinated (0/1)	n.a.	n.a.	0.236	0.425
HH willing to get vaccinated if free (0/1)	n.a.	n.a.	0.236	0.425

Source: Authors' construction

Note: HH= Household; (0/1)= no/yes dummy responses (0=no, yes=1); ha= hectare; TLU=Tropical livestock unit; Std= standard deviation; n.a.= Not asked in follow-up survey/not applicable. #=numbers (count); C-19= COVID-19.

3.1 Changes in agricultural activities

In the second-round survey we asked respondents whether "*they had adopted any innovations or changes in their farming and business operations or changed the crop types they grow because of the COVID-19 pandemic*" since the baseline survey. The responses show that 55 percent of crop farmers adopted changes in their farming, such as planting fewer crops and reducing cropping areas. Comparing the changes in the baseline survey, we observe an increase in the number of farmers who modified their farming practices in the follow-up survey. A reduction in cropping areas is adopted by most farmers (32 percent) followed by reducing fertilization application (31 percent), planting fewer crops (30 percent), and shifting from hired labor to family labor (21 percent). Studies elsewhere document similar findings on the effects of COVID-19 on agriculture and food supply chains in terms of disrupting the agricultural inputs supply chain, reducing areas cultivated, and constraining transport of goods to processing facilities and/or markets (FAO, 2020; Wei and Lu, 2020).

3.2 Shocks and coping strategies

To capture income loss amid COVID-19, respondents were asked a "yes/no" question: "*Have you or any member of your household experienced income loss due to the coronavirus?*" A "yes" respondents were asked a follow-up question in the percentage income loss. Whereas 88 percent of the households reported up to 50 percent income loss in the baseline survey, this dropped to 62 percent of survey households in the follow-up survey with reported income loss of 35 percent. This shows that the share of households reporting income loss as well as the magnitude of income loss are lower in the second survey. This may imply a gradual recovery and rebound of livelihoods from the shock. Besides income loss, households also experienced multiple shocks amid the COVID-19 pandemic. Job loss was reported by 21 percent of survey households; however, it is noted that not all job losses were because of the pandemic, yet most respondents (72 percent) associated job losses with COVID-19.

Table 2. Shocks experienced by households

Types of shock	Has the household experienced the shock? (Yes, %)	Do you believe this shock was caused by the coronavirus? (Yes, %)
Job loss	21	72
Nonfarm business closure	26	80
Theft/looting of cash or property	23	40
Disruption of farming, livestock, fishing activities	33	29
Increase in price of major food items consumed	90	66
Illness/injury/death of income earning household member	39	11
Kidnapping/hijacking/robbery/assault	9	31
Poor rains that caused harvest failure	33	8
Flooding that caused harvest failure	28	9
Pest invasion that caused harvest failure or storage loss	28	8

Source: Authors' compilation from the second-round phone survey data (July 2021).

The survey further explored key coping strategies households adopted in response to the COVID-19 related or other types of shocks. Food price inflation is the most prevalent shock, faced by 90 percent of households (Table 2). In Nigeria, food prices continued to rise in 2020, and in March 2021 food inflation of basic food commodities hit 22.95 percent, the highest in the past two years (NBS, 2021). However, since then there has been a gradual decrease in this consumer price index to 20.3 percent in August 2021 (NBS, 2021). Reducing food consumption (50 percent) and non-food consumption (34 percent), depleting savings (36 percent), and selling assets (20 percent), are the key coping strategies adopted by the majority of households to cope with food price inflation. These are negative coping strategies with consequent food insecurity and overall degradation of well-being.

3.3 Changes in employment

Though restrictions were not imposed directly on farming activities in Nigeria, employment in the agricultural sector was impacted indirectly through disruptions of the food supply chains and nonfarm livelihood activities (Andam et al., 2020). To assess the employment effects of the pandemic and the changes over time, respondents in the follow-up survey were asked a series of employment related questions. Results indicate that about 37 percent of the respondents were unemployed at the time of the survey, 16 percent had changed their employment[3], and 32 percent were re-employed after being laid-off due to COVID-19. But the overwhelming majority of the unemployed did not have a job in the first place or were casual farm or nonfarm workers who recently lost their jobs for reasons not related to COVID-19. Thus, the unemployment problem appears to be an existing structural problem, though the economic disruptions caused by the COVID-19 played a part.

3.4 Food security and dietary diversity

Table 3 presents a comparative summary of the distributions of the four categories of FIES measured three months before COVID-19, in the initial three months of COVID-19 (July 2020), and a year later in the follow-up survey (July 2021). As shown in Table 3, there is a slight increase in *food secure* households (from 7 to 13 percent) in the follow-up survey and a 1 percentage point–increase in *mildly food insecure* households (from 8 to 9 percent). Households in the *moderately food insecure* group remain almost the same, but the *severely food insecure* households dropped from 73 percent at the baseline survey to 65 percent in the follow-up survey (a drop of 8 percentage points). This indicates positive transitions of households from more severe food insecurity to less severe food insecurity situations may be partly attributed to the opening-up of economic activities and easing of COVID-19 restrictions over time. Disaggregating the factors that triggered a "yes" response to each of the eight FIES questions into COVID-

[3] But most of these job changes (68 percent) are for reasons not related to COVID-19.

19 and other factors, we find that pre-existing factors not related to the pandemic also played a part in affecting food insecurity situation experienced by the household (see appendix Table A1).

Table 3. Distribution of households across the FIES categories (pre-COVID 19, initial 3 months of COVID-19, and a year after the first survey)

FIES-based categories of food insecurity	3 months before C-19		Initial 3 months of C-19		Survey-II	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Food secure	588	57.0	71	6.9	115	13
Mildly food insecure	170	16.5	82	7.9	77	9
Moderately insecure	79	7.7	130	12.6	104	12
Severely food insecure	194	18.8	748	72.6	544	65

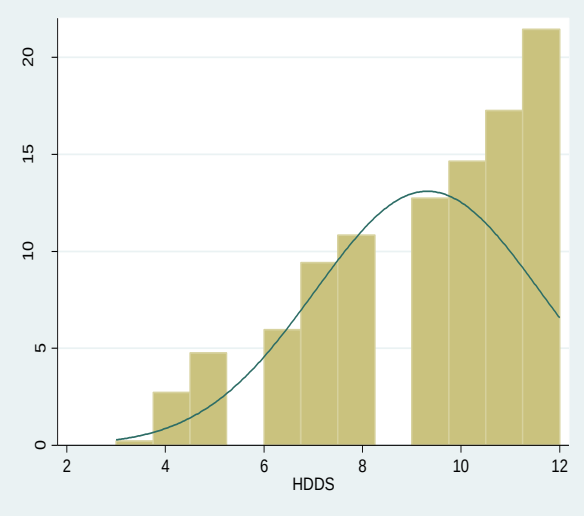
Source: Authors' compilation from phone survey-I data in July 2020 (n=1,031) and a follow up survey in July 2021 (n=840).
Note: C-19= COVID-19.

In terms of dietary diversity HDDS Table 4 and Figure 4 show the distribution and changes in the dietary diversity of the households. The results show high consumption of cereals, oils, and vegetables (Ogechi and Chilezie, 2017; Onyeji and Sanusi, 2017) and low consumption of protein-rich foods such as dairy products eggs. This may be partly associated to the relatively high prices of animal-source foods compared to cereals or vegetables. Overall, we found that more than 75 percent of households have a diversity score of above 6. Comparison of this figure with the baseline result a year ago (70 percent), demonstrates a 5-percentage points improvement in the HDDS in the follow-up survey.

Table 4. Distribution of food groups consumed by the households

Food group	'Yes' responses (%)
Cereals	93.21
Tubers	79.40
Legumes	71.79
Dairy	49.52
Meat	73.45
Eggs	46.79
Fish	82.98
Oils	98.81
Vegetables	98.81
Fruits	65.12
Sugar	74.29
Condiments	97.62

Figure 1. The distribution of household dietary diversity during the pandemic (bins are percent of respondents and the line graph is a quadratic fit)



Source: Authors' compilation from the second-round phone survey data (July 2021). Note: HDDS = Household Dietary Diversity Score

4. Conflicts, insecurity, and farming activities

The risks imposed by conflicts and general insecurity including kidnapping, banditry, the Boko Haram insurgency, and farmer–herder conflicts are major concerns in the present Nigeria. The incidence of conflict has been rising in the past year and this might probably be linked to restrictive COVID-19 measures but could more broadly be a manifestation of the underlying socioeconomic pressures, including unemployment and economic instability. These affect the livelihoods activities, agricultural production, productivity, food security, and nutrition (Kimenyi et al., 2014; Adelaja and George, 2019; Mitchell, 2019). For instance, the farmer–herder conflict resulted in intense land competition and led to violent clashes among herders and farmers in many parts of Nigeria (George et al., 2021). Conflicts also reduce farmers' cattle holdings by increasing cattle thefts and losses and reducing cattle purchases (George et al., 2021). Climate-change related shocks and the COVID-19 crisis may likely exacerbate the incidence of conflicts and subsequently affect livelihoods and food security of households (Abel et al., 2019).

Based on the responses to conflicts/insecurity related questions in the follow-up survey (see appendix Table A5), , about 40 to 70 percent of survey households experienced insecurity threats in the 12 months prior to the survey. Comparable results to ours in northern states of Nigeria were reported (Verjee, 2020). However, it should be noted that the conflicts and insecurity in northern Nigeria have existed over a decade before COVID-19; thus, we are cautious not to directly associate the rise in insecurity threats with COVID-19. However, 73 percent of survey respondents indicated that the insecurity threats had increased over the last 12 months compared to the situation the year before COVID-19. As shown in Table 6, the agricultural activities of 33 to 44 percent of survey households were extremely or moderately severely affected by conflicts or insecurity. Farm investment decision is the most affected activity (44 percent of farmers) which could potentially reduce future farm productivity, income, and food security.

Table 5. Effects of insecurity threats on agricultural activities

Questions: How severely has the presence of insecurity threats affected your household's: […….]	Respondent's subjective assessment of severity of insecurity threats on major agricultural activities, prices, and markets (%)				
	Extremely severe (a)	Moderately Severe (b)	(a)+(b)	Slightly severe (c)	Not at all (d)
1. …access to **agricultural input markets**?	18.33	17.26	**36**	20.83	43.57
2. …access to **market to sell agricultural produce**?	16.79	16.31	**33**	21.07	45.83
3…. **normal farm operations** (planting, ploughing, weeding, harvesting)?	19.17	16.07	**35**	21.43	43.33
4….**farm investments** (e.g., expand cultivated area; more livestock)?	18.93	15.12	**44**	21.10	44.76

Source: Authors' compilation from the second-round phone survey data (July 2021)

5. Econometric results

5.1 COVID-19 and household FIES

Table 7 reports the estimation results of ordered logit model. The regressors are jointly statistically significant at 1 percent level (Wald Chi^2 (16) test statistic, p= 0.000). The ordered logit threshold parameters in the model appear to be statistically significant, i.e., they are significantly different from each other, so the four FIES categories should not be collapsed into three categories. The coefficients of the key factors of our interest (income, wealth endowments, social capital, safety net programs, and conflicts) remain sizeable and strongly statistically significant even after controlling for other covariates. In ordered logit models, positive coefficients increase the probability of the subject being in the "higher" category. A "higher" category in this study refers to the more severe food insecurity and a "lower" category indicates a less severe food insecurity situations. Income loss has positive and statistically significant (at 1 percent level) coefficient. This is in accordance with *a priori* expectations. For example, a rise at the margin of 1 percent income loss increases the probability of a household being in the most severe food insecurity category by 3 percent.

Land and livestock are two important household assets in rural Africa (Mulwa and Visser, 2020; Wodajo et al., 2020). These assets can be used as productive factors (e.g., expand cultivated land or using livestock as draught animal power); as income sources (e.g., land rent income or selling animals or animal products); and as direct food sources (e.g., milk and meat). The combined effects of these assets could increase the household's capacity to withstand shocks. The negative and statistically significant (at 5 percent level) coefficients of "land size" and "'livestock size" show that the severity level of the food insecurity indicator (FIES), decreases with increases in these assets. In other words, households with more of these assets are less likely to fall into the more severe food insecurity categories.

Results show that the social support mechanisms are statistically significant[4] (at 1 percent level); but against our a priori expectation, safety net programs were not significant in preventing households from falling into a more severe food insecurity condition. The explanations for this could be that government/NGO may be too stretched to reach millions of vulnerable households. Further explanations could be logistical challenges, poor infrastructure, inefficiencies, and corrupt practices along the distribution channels (Ozili, 2020).

[4] In the baseline survey, the effect of social support mechanism on FIES was not statistically significant. The plausible explanation then was that everyone was suffering the COVID-19 shock and there had been little time to adjust for the shock. Thus, individuals and households less able to support one another as they did in more normal times. However, just after a year later, due to adjustment, social support started functioning again.

Table 6. Estimation results of ordered logit model for Food Insecurity Experience Scale (FIES), coefficients and marginal effects†

Variable name	Model coefficients		Marginal Effects (ME) of covariates for FIES: 1, 2, 3 and 4							
	Coeffici-ent	Standard error (Robust)	ME, FIES=1 (dy/dx)	Standard error ME, FIES=1	ME, FIES=2 (dy/dx)	Standard error ME, FIES=2	ME, FIES=3 (dy/dx)	Standard error ME, FIES=3	ME, FIES=4 (dy/dx)	Standard error ME, FIES=4
HH income loss amid-COVID (%)	1.527***	0.350	-0.160***	0.038	-0.072***	0.017	-0.060***	0.014	0.292***	0.064
Land size owned (ha)	-0.053**	0.021	0.006**	0.002	0.002**	0.001	0.002**	0.001	-0.010**	0.004
Livestock size owned (TLU)	-0.021**	0.010	0.002**	0.001	0.001**	0.000	0.001**	0.000	-0.004**	0.002
Received family/friends support (yes=1)	0.535***	0.161	-0.056***	0.017	-0.025***	0.008	-0.021***	0.007	0.102***	0.030
Received gov./NGO support (yes=1)	-0.026	0.261	0.003	0.027	0.001	0.012	0.001	0.010	-0.005	0.050
HH exposed insecurity threat (yes=1)	0.279*	0.158	-0.029*	0.017	-0.013*	0.008	-0.011*	0.006	0.053*	0.030
Number of shocks encountered (#)	0.278***	0.044	-0.029***	0.005	-0.013***	0.002	-0.011***	0.002	0.053***	0.008
Location Northern states (yes=1)	0.770***	0.184	0.081***	0.020	0.036***	0.009	0.030***	0.008	-0.147***	0.034
HH in rural area (yes=1)	0.278*	0.164	-0.029*	0.017	-0.013*	0.008	-0.011*	0.007	0.053*	0.031
HH head male (yes=1)	-0.216	0.165	0.023	0.017	0.010	0.008	0.009	0.007	-0.041	0.031
HH head married (yes=1)	-0.265	0.221	0.028	0.023	0.012	0.010	0.010	0.009	-0.051	0.042
HH head age (years)	-0.026***	0.007	0.003***	0.001	0.001***	0.000	0.001***	0.000	-0.005***	0.001
Education above secondary (yes=1)	-0.282*	0.158	0.030*	0.017	0.013*	0.007	0.011*	0.006	-0.054*	0.030
Household size (#)	0.054***	0.023	-0.006**	0.002	-0.003**	0.001	-0.002**	0.001	0.010**	0.004
HH member of MFI (yes=1)	0.122	0.156	-0.013	0.016	-0.006	0.007	-0.005	0.006	0.023	0.030
HH member migrated_COVID-19 (yes=1)	-0.072	0.191	0.008	0.020	0.003	0.009	0.003	0.008	-0.014	0.037
HH receive non-farm income(yes=1)	-0.042	0.185	0.004	0.019	0.002	0.009	0.002	0.007	-0.008	0.035
/Cut1	-1.811	0.441								
/Cut2	-1.088	0.437								
/Cut3	-0.364	0.435								
Mean dependent var	3.282		SD dependent var.		1.099					
Pseudo r-squared	0.096		Number of obs.		840					
Wald Chi2(16)	164.498		Prob > chi2		0.000					

Source: Authors' ordered logit estimation results (Data: Follow-up phone survey, July 2021)

*** *p<0.01*, ** *p<0.05*, * *p<0.1*. Note: †Marginal effects (dy/dx) are average marginal effects (AME), i.e., evaluated at the sample values and then averaged. ME= Marginal effects. MEs for factor variables is the discrete change from the base level. HH= Household; ha= hectare; TLU=Tropical Livestock Unit. MFI= microfinance institutions

Food insecurity and poverty levels have spatial heterogeneity in Nigeria due to differences in environmental or socio-cultural factors. For instance, the northern regions have been severely affected by conflicts and security threats (e.g., attacks from Boko Haram), which have affected the lives and livelihoods people in the region facing hunger and acute malnutrition (Kah, 2017; Amare et al., 2018). We introduced a regional dummy as well as an insecurity dummy to account for this spatial dimension of the pandemic. The positive and statistically significant coefficients of these two dummies suggest that households in the northern region of Nigeria and those exposed to conflicts are significantly more likely to fall in the highly severe food insecurity class. The results in Table 6 show that households in northern Nigeria are 77 percent less likely to be food secure compared to their counterparts in the other regions of the country. Similarly, a typical household exposed to conflicts is 28 percent less likely to be food secure compared with households not exposed to conflicts amid the pandemic. Our finding is consistent with previous studies (Ogunniyi et al., 2016; Amare et al., 2018) that report the high prevalence of food insecurity and acute malnutrition problems in northern Nigeria. The results suggest that the COVID-19 pandemic likely aggravated the already existing food insecurity challenges in the northern Nigeria.

5.2 Household behaviour on COVID-19 testing and vaccination

Generally, like many other African countries south of the Sahara, Nigeria is among the lowest in terms of COVID-19 testing and vaccination. As of October 23, 2021, only 1.6 percent and 1.4 percent of the total Nigerian population were respectively tested and fully vaccinated for COVID-19. A combination of several micro- and macro-economic, social, cultural, logistical, and religious factors can explain the observed low rate of testing and vaccination in the country. To understand how micro-level factors affect households' decisions on COVID-19 testing and vaccination, in our follow-up phone survey we collected household-level data related to testing and vaccination. Selection of the key covariates included in the models was based on the importance of the factors in influencing individual or household-level decisions in the context of Nigeria. Table 8 reports the coefficients and marginal effects logit models on the likelihood of households for COVID-19 testing and vaccination decisions.

Table 7. Estimation results of logit models on factors affecting COVID-19 testing and vaccination decisions, coefficients, and marginal effects (M.Es.)

Variable name	Got tested for C-19			Got vaccinated for C-19		
	Coefficient	Std. error (robust)	M.Es. (dy/dx)	Coefficient	Std. error (robust)	M.Es. (dy/dx)
Northern states (yes=1)	-0.264	0.203	-0.046	0.424**	0.198	0.070**
HH in rural area (yes=1)	0.012	0.184	0.002	-0.022	0.185	-0.004
HH head male (yes=1)	0.190	0.182	0.033	-0.307*	0.185	-0.051*
HH head age (years)	-0.004	0.008	-0.001	0.004	0.009	0.001
Household size (#)	0.061***	0.021	0.011***	0.084***	0.023	0.014***
Educ. above secondary (yes=1)	0.307*	0.179	0.053*	0.386**	0.184	0.064**
HH livelihood on-farm (yes=1)	0.246	0.184	0.043	0.283	0.188	0.047
Non-farm business income(yes=1)	0.270	0.203	0.047	-0.347**	0.194	-0.058*
HH wage income (yes=1)	-0.234	0.175	-0.041	0.007	0.968	0.318
Access to C-19 info (yes=1)	0.338*	0.190	0.059*	0.264	0.193	0.044
Access to health (yes=1)	0.270*	0.271	0.047*	0.598**	0.297	0.099*
Access to roads (yes=1)	0.423**	0.196	0.074*	0.117	0.196	0.019
Member association (yes=1)	0.251	0.176	0.044	0.058	0.183	0.010
HH exposed insecurity (yes=1)	0.257	0.173	0.045	0.379**	0.178	0.063**
Constant	-3.052**	0.540	-	-3.182***	0.528	-

C-19 testing logit model diagnostics		**C-19 vaccination logit model diagnostics**	
Mean dependent var.	0.239	Mean dependent var.	0.236
Pseudo r-squared	0.038	Pseudo r-squared	0.068
Chi-square	35.181	Chi-square	53.883
SD dependent var	0.427	SD dependent var	0.425
Number of obs.	840.00	Number of obs.	840.00
Prob > chi2	0.001	Prob > chi2	0.000

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Note: C-19= COVID-19; HH= Household; ha= hectare; TLU=Tropical Livestock Unit. AME= average marginal effects

Four factors including *household size, education, access to COVID-19 related information,* and *access to health services* reveal positive and statistically significant influences on decisions to get tested for COVID-19. Given the human-to-human transmission of the coronavirus, households with larger family size are more likely to be exposed to the virus. Thus, the predicted increased likelihood of testing with increasing household size seems intuitive. The likelihood of testing increases in education, information access, and access to health services. We find that geographic factors (northern, rural), social capital (association membership), livelihood activities (farm vs. nonfarm), and exposure to conflicts are not statically significant.

Examining the coefficients for vaccination decisions, we see that households in the northern Nigeria are more likely (significant at 5 percent) to get vaccinated. This is a counterintuitive result because, given religious conservatism and frequent insecurity threats, we expected high resistance to vaccination. One possible explanation for this counterintuitive finding could be the impacts of several interventions by various NGOs in the region. These interventions might have influenced positive thinking and hence willingness to get vaccinated. Another seemingly counterintuitive result is the negative coefficient for the "male-headed households" which implies that these households are less likely to get vaccinated for coronavirus. However, this result appears to reflect a possible association of gender roles in Nigerian society. Smallholder women are the main market agents in micro and small businesses, including for agricultural products, and hence have more social interactions a active market operators. This might have influenced women's decisions to get vaccinated to minimize the risk of contracting the virus. We also see a positive and statistically significant (at 5 percent level) coefficient of the "insecurity exposure" variable to vaccination decision. Like the "regional" variable above, this might also be associated to the impact of many NGOs operating in conflict-affected zones. Other significant variables in the vaccination regression (i.e., household size, education, and access to health services) can be interpreted in the same way as in the COVID-19 testing regression model.

6. Summary and policy implications

The effects of economic and livelihood disruptions caused by the COVID-19 pandemic on households' income, jobs, and food security have continued over the last two years despite perceptible reductions in transmission rates and lifting of lockdowns and other restrictive policy measures in several countries. To assess the effects on Nigerian households, we collected data from a sample of households in the initial three months after the outbreak of the pandemic in Nigeria (April- June 2020). Results from the first survey showed that about 88 percent of the households reported 50 percent income loss due to the pandemic; 66 percent reported a reduced food consumption; and COVID-19 significantly worsened the food insecurity situation of many households, especially poorer households (Balana et al., 2020). Survey households also reported a significant reduction in consumption of proteins (eggs, meat, and dairy products) and fruits since the pandemic struck. Increases in food prices were felt by most households (85 percent). Similar findings were reported in other studies conducted within the first three months of COVID-19 in Nigeria (Amare et al., 2020; World Bank and NBS, 2020; Andam et al., 2020).

The purpose of this study was to assess the changes in the livelihoods and food security situation of households since our first survey a year ago. We administered a follow-up survey a year later (July 2021) with respondents who had participated in the first-round survey.

Our comparative analysis between the two surveys focused on the changes on key variables including income, job , food security, and dietary diversity of households since the baseline survey. We focused on food security as our main outcome variable and how changes in income, wealth endowments, social capital, and safety net programs, and conflicts affect the severity of food insecurity of households amid COVD-19 with the following key summary findings:

Changes in income loss – Whereas the average household income loss was 43 percent during the first three months of the pandemic; the corresponding income loss in the follow-up survey was 22 percent. This appears to be a significant rebound in household income. In terms of the number of households that suffered income loss, while 88 percent of the households reported up to a 50 percent household income loss in the first survey, the corresponding figure fell to 62 percent in the follow-up survey, with an average income loss of about 35 percent.

Changes in job loss We observed a rebound in employment too from a reported job loss of 42 percent in the first survey to 21 percent in the follow-up survey. However, it should be noted that job losses or unemployment problems amid COVID-19 cannot be attributed entirely to the pandemic; rather, the problem appears to be an existing structural problem though the economic disruption caused by COVID-19 played its part.

Changes in food insecurity – In both surveys the severity of households' food insecurity was measured using experienced-based individual's "'yes/no" responses to the eight FIES questions. Comparison of the results from the two surveys indicate that there is a slight increase in "food secure" households (from 7 to 13 percent) and a 1 percentage point increase in "mildly food insecure" households (from 8 percent to 9 percent). Households in the "moderately food insecure" group remain almost the same. Importantly, the "severely food insecure" households dropped from 73 percent in the first survey to 65 percent in the follow-up survey (i.e., a drop of 8 percentage points). This indicates positive transitions of household from more severe food insecurity to less severe food insecurity situations.

Changes in dietary diversity – We found that more than 75 percent of households have a diversity score of above 6. Comparison of these results with the findings in first survey data (70 percent households had scores above 6) demonstrates an improvement of 5 percentage points in the HDDS results in the follow-up round survey.

Conflicts and insecurity threats – About 73 percent of the respondents in the second survey indicated that insecurity threats had increased over the 12 months prior to the survey compared to the situation in the same period before COVID-19. we find that the agricultural activities of 33 to 44 percent of survey households were 'extremely severely' or 'moderately severely' affected by insecurity threats. Particularly, farm

investment decisions are the most affected activity (by 44 percent of farmers). This highlights the long-term significance of the effects of insecurity on smallholder farm households because lack of investment reduces farm productivity, income, and food security in future.

The econometric estimation results show that income loss has significantly affected the food security condition of households. Livestock ownership significantly cushioned households from falling into a severe food insecurity situation amid the pandemic. The capacities of households to help each other recovered in the follow-up survey time, i.e., social capital regained to play its usual risk-mitigating role in the times of shocks. However, safety net programs were not yet significant in providing protection to households from severe food insecurity or malnutrition. This may be because such support is limited in either scale or scope compared to the magnitude of the shock.

Based on these findings, we suggest the following policy propositions: (1) People with casual and informal jobs seem more likely to lose their jobs and consequently their income and are susceptible to severe food insecurity in times of shocks. Thus, investment in job creation needs to be a policy priority to prevent income losses and improve the resilience of households to shocks. (2) Building the wealth and asset base of households is an important strategy in the long run to reduce vulnerability to shocks. Policy also should encourage livelihood diversification in the form of mixed crop-livestock farming systems because livestock ownership demonstrated a positive and significant impact on food security during the shock. (3) Safety net programs need to revisit the outreach strategies to enhance the effectiveness of interventions. (4) Recurrent conflicts and persistent insecurity threats affect investment decisions of farmers. This will negatively affect farm productivity, income, and food security. Thus, government should devise and implement workable conflict resolution approaches as a key policy priority to create a favorable environment for ordinary economic activities to take place.

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Appendixes

Table A1. Food insecurity experience scale (FIES) questions and summary of 'Yes' responses

FIES questions	Percentage of 'Yes' responses	Of 'Yes' respondents (caused by COVID-19)
Q1. Was there a time that you **worried you would not have enough food** to eat because of a lack of money or resources?	76.66	69.57
Q2. Were you or a member of your household **unable to eat healthy and nutritious food** because of a lack of money or resources?	69.52	73.97
Q3.Was there a time when you or others in your household **ate only a few kinds of foods** because of a lack of money or other resources?	74.28	72.76
Q4.Was there a time when you or others in your household **had to skip a meal** because of a lack of money or resources?	69.52	75.32
Q5. Was there a time when you or others in your household **eat less than you thought you should** because of a lack of money or resources?	55.47	76.73
Q6. Was there a time when your household **ran out of food** because of a lack of money or other resources?	67.73	78.64
Q7. Was there a time when you or others in your household **were hungry but did not eat** because of lack money or resources?	53.21	73.29
Q8. Was there a time when you or others in your household **went without eating for a whole day** because of a lack of money or other resources?	12.26	73.99

Source: Authors' compilation from survey-II data (July 2021)

Table A2. Seven- day recall questions of consumption of food groups

Food group	In the last 7 days, have your household consumed *[Food Group]?* 1=Yes, 2=No	If 'Yes', how often have you consumed [food Group] in the last 7 days? 1= Rarely (1 time/week) 2= Sometimes (2-3 times/week 3= Often (4 or more times/week)
1. **Cereals and grains** (rice, maize, sorghum, millet…)		
2. **Tubers and roots** (cassava, yam, potatoes…)		
3. **Legumes/nuts/seeds** (beans, cowpeas, peanut, lentils, soya,...)		
4. **Dairy** products (milk, butter, yogurt, …)		
5. **Meat** (beef, goat meet, sheep meat…)		
6. **Eggs**		
7. **Fish** (shellfish, tuna, dried fish, …)		
8. **Oil/fat** (palm oil, vegetable oil, shea butter ….)		
9. **Vegetables** (onion, cabbage, tomatoes, carrots, pepper, pumpkin, spinach …)		
10. **Fruits** (banana, avocado, orange, papaya, mango….)		
11. **Sugar/sweet** (sugar, honey, jam, candy, Cookies, cakes….)		
12. **Condiments**, spicy (salt, garlic, tea, condiments, yeast,….)		

Source: Authors' compilation from survey-II data (July 2021)

Table A3. Coping strategies adopted in response to food price inflation

Type of coping strategy	**Percentage of households**
Sale of assets	20.45
Engaged in additional income generating activities	19.92
Received assistance from friends & family	6.33
Borrowed from friends & family	8.71
Took a loan from a financial institution	3.30
Credited purchases	10.69
Delayed payment obligations	1.72
Sold harvest in advance	5.41
Reduced food consumption	49.47
Reduced non-food consumption	33.77
Relied on savings	35.88
Received assistance from NGO	0.13
Took advanced payment from an employer	0.13
Received assistance from the government	0.40
Was covered by insurance policy	0.00
Did nothing	10.16

Source: Authors' compilation from survey-II data (July 2021)

Table A4. Non-farm income sources for the household

Non-farm income sources for household	Yes (%)	Changes in income from this source amid COVID-19 (% of respondents)		
		Increased	Same	Decreased
Non-farm family business	76.55	26.84	17.74	55.42
Wage employment	46.55	21.33	53.87	24.8
Remittance from abroad	2.74	16.67	38.89	44.44
Assistance family/friends within the country	38.69	10.22	14.96	74.82
Income from properties or investments	13.93	16.49	53.61	29.9
Pension	5.95	7.50	82.5	10.00
Assistance from government	6.67	11.36	25.00	63.64
Assistance form NGO/charitable organizations	2.98	43.75	6.25	50.0
Others	0.95	33.33	66.67	0.00

Source: Authors' compilation from survey-II data (July 2021)

Table A5. Questions on conflicts/local insecurity situation and farm activities

	Questions	**Response Category**
1	Have your household exposed to or experienced any security threats in the last 12 months? [1=Yes, 2=No]	1=Yes 2=No
2	If 'Yes' to I.1, compared to the situation before the corona virus in Nigeria (March 2020); how have such security threats changed?	1=Increased 2-Decreased 3=No change
3	If 'Yes' to I.1, what are the 3 most dominant security threats to your household or your local community?	1=Farmer-herder conflict 2=Robbery 3=Kidnapping 4=Banditry 5=Rustling of livestock 6=Others
4	How severely has the presence of these security threats affected your households' […….]? [for questions: 4.1- 4.4]	
4.1	----- access to agricultural input markets (i.e., acquiring inputs like fertilizers, seeds, tractors, etc.)?	1=Extremely severe 2=Moderately Severe 3=Slightly sever 4=Not at all
4.2	------access to market to sell your produce (harvested produce)?	1=Extremely severe 2=Moderately Severe 3=Slightly severe 4=Not at all
4.3	------farm operations (planting, ploughing, weeding, harvesting)?	1=Extremely severe 2=Moderately Severe 3=Slightly severe 4=Not at all
4.4	------expansion of your farm (e.g., cultivating more land; more livestock)?	1=Extremely severe 2=Moderately Severe 3=Slightly severe 4=Not at all
5	How have the security threats affected your household's non-farm business participation?	1=Increased 2=Decreased 3= No impact
6	How have food prices changed in your local areas due to the presence of security threats?	1=Increased 2=Decreased 3=No impact
7	Has the insecurity threat affected access to schools, religious centers, health centers etc.?	1=Yes 2=No
8	Has the insecurity threat affected your psychological wellbeing (anxiety, fear,..)?	1=Yes 2=No

Source: Authors' compilation from survey-II data (July 2021)