RESEARCH ARTICLE

OPEN ACCESS

COVID-19 Lockdown and Mental Health Consequences among Farming Households in Nigeria

Toyin Samuel Olowogbon[1,3,*] iD, Aaron Moses Yoder[2] iD and Luke Oloruntoba Adebisi[3] iD

[1]*Research and Training, Centre for Sustainable Agricultural Empowerment, Ilorin, Nigeria*

[2]*Department of Environmental, Agricultural and Occupational Health, University of Nebraska, Omaha 68182NE, USA*

[3]*Institute of Food Security and Commercial Agriculture, Federal University Oye-Ekiti, Ikole Ekiti, Nigeria*

Abstract:

Aims: This study examined the mental health consequences of the COVID-19 lockdown among farming households in rural Nigeria.

Method: A structured questionnaire was utilised to elicit information from 585 crop farmers across four States in Nigeria. The collected data were analyzed using descriptive statistics and binary logistic regression.

Result: The mean age of respondents was 44 years, with an average farming experience of 21 years. The average farm size was found to be 2.4 hectares. About 56% of the respondents were able to identify COVID-19-induced farm business stress. About 70% reported they had experienced income loss due to the COVID-19 lockdown. About 54% of the respondents self-reported COVID-19-induced mental health stress. About 74% reported experiencing mental health effects in the form of headaches, 48% said anxiety, 44% reported worry, and 41% reported depression. Self-reported mental health coping strategies include rest (63%), social gathering (57%), religious gathering (52%), and the use of drugs (40%). Males were 3.7 times more likely to experience COVID-19-induced mental health issues from their farm business than their female counterparts. Single respondents were 2.44 times more likely to experience COVID-19-induced mental health issues from their farm business than their married counterparts. We also documented that households with larger family sizes had lower mental health stress. We also found that respondents with higher incomes had lower mental health stress.

Conclusion: We concluded that most farming households experienced COVID-19-induced mental health stress. Targeted mental health campaigns, support, and intervention are recommended to help farmers address mental health stressors.

Keywords: COVID-19, Farmers, Mental health, Stress, Nigeria, COVID-19 lockdown.

CrossMark

* Address correspondence to this author at Research and Training, Centre for Sustainable Agricultural Empowerment, Ilorin, Nigeria; E-mail: olowogbonsamuel@gmail.com

1. INTRODUCTION

Since the discovery of COVID-19 in Wuhan, China, the virus has spread globally [1]. The virus appears highly transmissible and is rated very high by the WHO Risk Assessment [2]. It has been documented that an average patient infects 1.6 to 2.4 other people, with a fatality rate in the 70s being 3-4 times larger than the average. The fatality rate under 40 years seems to be around 0.2%. Men

are twice as likely to get infected as women [3]. As COVID-19 started spreading globally in early 2020, many countries responded with severe restrictions to protect public health [4]. As a result, the COVID-19 pandemic has ravished local, national, and global economies [4]. However, evidence shows that developing countries face higher risks from pandemic [5].

In 2019, approximately 970 million individuals globally were affected by mental health disorders, including 301 million with anxiety disorders and 280 million with depressive disorders. Notably, 82% of those affected resided in low- and middle-income countries (LMICs) [6]. Following the onset of the COVID-19 pandemic in 2020, these figures surged dramatically, with early data indicating a 28% rise in major depressive disorders and a 26% increase in anxiety disorders [6]. Unlike many physical health conditions, mental disorders have a unique capacity to impact an individual's cognitive functioning, preferences, and beliefs, potentially creating a cycle that reinforces poverty [7]. Research has demonstrated that mental health conditions are linked to decreased productivity, elevated unemployment rates, and various economic consequences. A recent analysis by the World Economic Forum estimated that considering a wide range of mental health disorders, these conditions could impose a global economic burden of approximately US$ 6 trillion by 2030 [8].

Beyond its direct health consequences, the pandemic has had far-reaching impacts on employment, poverty, food security, nutrition, education, healthcare, and the overall operation of food systems [9-12]. Recent projections from the World Bank indicated that the pandemic was expected to push approximately 49 million people worldwide into extreme poverty in 2020 [13]. Over 45% of this total, equivalent to about 23 million people, are in Sub-Saharan Africa, highlighting the significant impact on the region. The United Nations World Food Programme (WFP) projected that the number of people experiencing acute food insecurity globally would nearly double by the end of 2020, rising from approximately 135 million before the crisis. This increase was attributed to income and remittance losses and disruptions to food systems caused by the pandemic [14, 15]. In addition, a study by FAO and the World Food Programme (WFP) identified 15 African countries, Nigeria inclusive, that are at high risk of severe deterioration of food security and nutrition attributed to the pandemic [16].

Approximately 5 million Nigerians are expected to fall into poverty due to the impacts of COVID-19, including mobility restrictions and lockdown measures [13, 14, 17]. For example, studies have projected that COVID-19-related lockdowns and social distancing measures could negatively impact incomes by disrupting economic and livelihood activities [9, 10, 18], directly affecting food security. In Nigeria, recent projections indicated that the economy could shrink by 3.5% to 5% in 2020 due to government-imposed lockdowns and mobility restrictions [13, 17, 19].

The lockdown policy in Nigeria lasted from March 30 to July 27, 2020, with three easing phases [20]. The disruption of the lockdown and COVID-19-induced food systems has been projected to adversely affect Nigerian food systems. Rural dwellers, mostly smallholder farmers, are more vulnerable because they lack resilience against such shock. This may be attributed to several factors, including poverty, small scale of production, low level of literacy, heavy reliance on manual labour, and poor access to insurance, among others. While vaccinations may help, some risks are still evident and impact all sectors of the economy [21, 22]. Such risks include the mental health stress that farmers are exposed to due to the pandemic, which has many implications for farmers' health status and productivity.

In some cases, suicide among farmers has been noted amid the pandemic resulting from their inability to pay debts and to find labourers during the lockdown, leading to a helpless situation [23]. Also, adverse health consequences linked to the pandemic have been noted among the most vulnerable groups, including smallholder farmers [24-26]. While researchers have made several efforts to investigate the effects of the pandemic on various aspects of livelihoods, little is known about the mental health effects of the pandemic among smallholder farmers in rural Nigeria. Therefore, this present study bridged this information gap by advancing relevant policy recommendations regarding the pandemic's mental health effects on smallholder farmers. Findings from this study are critical in dealing with the aftermath of the pandemic and developing an adequate and effective response system for smallholder food producers, considering their demographic peculiarities and focusing on their mental health.

2. METHODS

The study was carried out in Nigeria. Nigeria has about 75 percent of the estimated 195 million Nigerian population engaged in Agriculture [27]. The study employed primary data collected using a structured questionnaire. This was augmented with phone interviews where appropriate. Data were collected between October 16 and November 10, 2020. This was about 4 months after the lockdown policy was lifted. A three-stage sampling method was used for the study. First, two (North-Central and South-West) out of the six geo-political zones in Nigeria were randomly sampled in the study. Then, two States were sampled from each geo-political zone selected. Next, the North-Central Zone-(Kogi and Kwara States) and South-West Zone-(Ekiti and Ondo States) were randomly sampled from the designated geo-political zones in Nigeria (See a map of Nigeria showing the States in Fig. (**1**). The third stage involved sampling 150 farmers from each State using a snowball approach. Snowball sampling is a method where current participants help identify and recruit future participants from among their acquaintances. This is usually referred to as chain referral sampling. The total number of sampled respondents was 600 crop farmers. However, during data cleaning, 15 were found unsuitable for data analysis, and 585 questionnaires were used for analysis. Collected data were analyzed using descriptive statistics, charts, and binary logistic regression analysis.

Fig. (1). Map of Nigeria showing the states in Nigeria State. Source: https://gisgeography.com/nigeria-map/. Retrieved on 13 December, 2024.

The implicit model for the binary logistic regression at stage one is stated as follows:

$$\ln\left(\frac{p}{1} - p\right) = a + \beta x + \varepsilon \qquad (1)$$

Where ln is natural log Exp and Exp=2.71

P is the probability the event occurred p(y=1); in this case, the probability a farmer's mental health was affected by COVID-19. P/1-p is the odd ratio, and ln(p/1-p) is the log odds or logit

The implicit form is modelled thus:

$$\text{Ydit} = \beta 0 + \beta 1\ X1 + \beta 2\ X2 \\ + \ldots\ldots\ldots\ldots + \beta 6\ X6 + Uit \qquad (2)$$

Ydit indicates the effect of COVID-19 on farmers' mental health (1=Yes;0=otherwise)

X1= Age of the farmer (years);

X2=Gender (1=male;0=otherwise)

X3= Marital status (single=0; married=1)

X4=Highest schooling level in years

X5=Farming Experience (years)

X6=Average Monthly Income (Naira)

X7=Membership of Farmers' group (1=Yes;0=otherwise)

X8=General farm business being affected by the pandemic (1=Yes;0=otherwise)

e =Error term

3. RESULTS

As shown in Table **1**, the mean age of respondents was found to be 44 years. The modal household size for the study was between six and ten, with a mean of 7 persons. The farming experience of the farmers shows that the majority of the farmers were seasoned farmers, having a mean experience of 21 years with an average of 2.4

hectares. The average monthly farm income from their farming enterprises was ₦43,182.

Table 1. Socio-economic characteristics of farmers (N=585).

	Mean	Standard Deviation
Age (Years)	44.0	13.78
Household Size (Number)	7.0	2.6
Farming Experience (Years)	21.0	12.88
Farm Size (Hactares)	2.4	1.02
Average Monthly Farm Income (Naira)	43,182	31,500

Source: Data Analysis, 2020.

As shown in Table **2**, seventy (70%) of the respondents were found to be male. About 94 percent of the farmers were married, while 9.47 percent were single. The high percentage of married arable crop farmers may imply large household sizes. Most of the respondents were found to be educated. About 85% had formal education, with tertiary education being the modal class. The average monthly income was over 43,000 ($96) Naira. About 71% were members of farmers' social groups. Membership in social groups could also aid information access among farmers and help cushion the effect of the pandemic on the well-being of farmers.

Table 2. Other relevant characteristics (N=585).

Characteristics	Frequency	Percentage
Gender		
Female	175	30.00
Male	410	70.00
Marital Status		
Single	055	9.47
Married	450	76.84
Separated	021	3.51
Widowed	060	10.18
Educational Level		
No formal	089	15.23
Primary	152	25.99
Secondary	159	27.24
Tertiary	185	32.00
Membership of Farmers Group		
Yes	413	71.00
No	172	29.00

Source: Data Analysis, 2020.

As presented in Table **3**, about 62% of the respondents noted high seed costs during the lockdown, 81% reported a high price of labour input, 71% stated a high cost of fertilizers, 70% noted an increased cost of herbicides, and 83% said a high cost of transportation attributed to the pandemic. This finding is corroborated by a study [28], which indicated that temporary foreign worker shortages

leading to high labour costs had exposed farmers to mental health challenges. Further evidence showed that the quarantine measures reduced labour availability for important farming activities like sowing vegetable crops, picking fruits, *etc*.

Table 3. Effect of COVID-19 confinement on input cost and farm business.

High Cost of Seed		
Yes	363	62.00
No	222	38.00
The Increased Cost of Farm Labour		
Yes	474	81.00
No	111	19.00
High Cost of Fertilizers		
Yes	415	71.00
No	170	29.00
High Cost of Herbicides		
Yes	410	70.00
No	176	30.00
Increased Transportation Cost		
Yes	486	83.00
No	099	17.00
COVID 19 Induced Farm Business Stress		
Yes	328	56.00
No	257	46.00
Finance and Income Loss Due to the Lockdown		
Yes	410	70.00
No	075	30.00
The Experienced Farm Produces Spoilage		
Yes	088	15.00
No	497	85.00
Experienced Poor Market Sales		
Yes	059	10.00
No	526	90.00

Source: Data Analysis, 2020.

Furthermore, we found that about 56% were able to identify COVID-19-induced farm business stress. About 70% reported they had experienced income loss due to the COVID-19 lockdown. About 15% and 10% reported farm-produced spoilage and poor market sales, respectively.

Table **4** shows that 38% of the respondents were challenged to adhere to the lockdown rule. About 34% were challenged using face masks. About 24% were challenged using alcoholic-based sanitizers, while only 1% reported having issues with handwashing.

3.1. COVID-19 and Perceived Mental Health Effects among Farmers

As presented in Fig. (**2**), the study found that 54% self-reported COVID-19-induced mental health stress. This may be due to various reasons, including the high cost of farm inputs, labour shortage, and farm produce wastage due to the lockdown policy.

Table 4. Challenges in adhering to lockdown and non-pharmaceutical measures.

Challenged adhering to the Lockdown Rule	Frequency	Percentage
Yes	222	38.00
No	363	62.00
Challenged using facemask		
Yes	199	34.00
No	386	66.00
Challenged washing hands		
Yes	006	01.00
No	579	99.00
Challenged using alcoholic sanitizers		
Yes	140	24.00
No	445	76.00

Source: Data Analysis, 2020.

COVID-19 and perceived mental health effects among Farmers
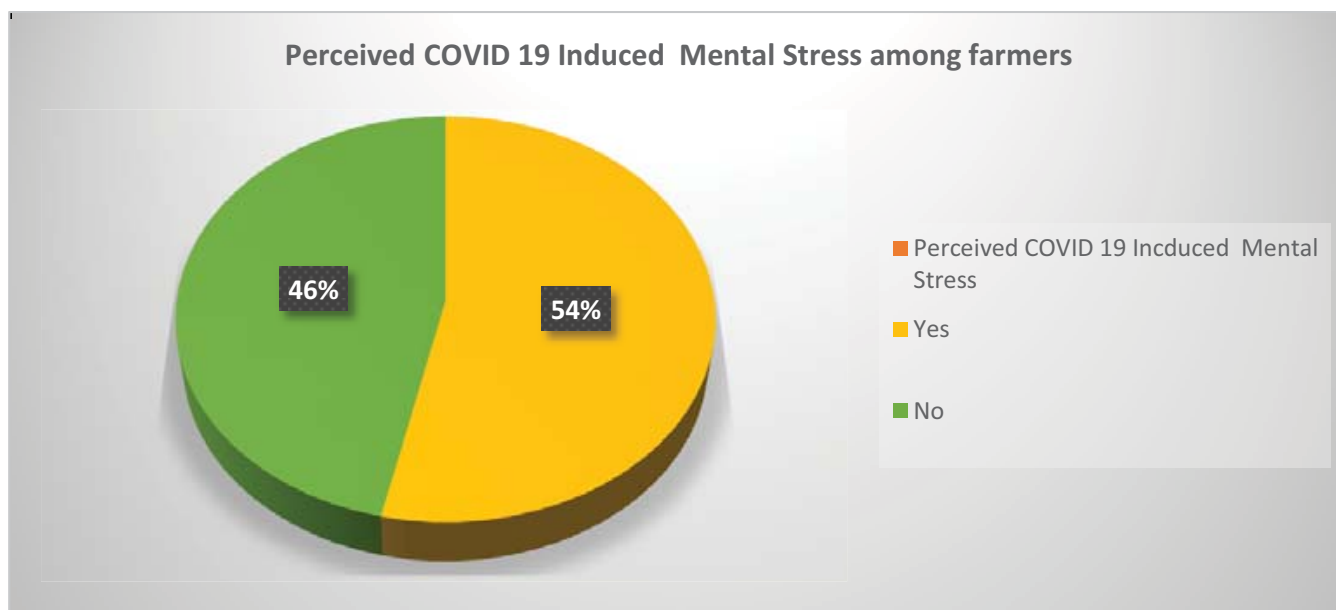
Fig. (2). COVID-19-induced mental health stress among farmers.

Similarly, as shown in Fig. (**3**), the study showed that 74% perceived the effects of mental health in the form of headaches, 48% reported anxiety, 44%-worry, 41%-depression, and 34% lost their temper, respectively.

As presented in Fig. (**4**), the respondent self-reported mental health coping strategies to include rest (63%), social gathering (57%), religious gathering (52%), and the use of drugs (40%); 28% engaged in recreation, while 17% resorted to alcohol intake as a coping strategy against COVID-19-induced mental health effects among farmers.

As shown in Table **5**, we found that the male respondents were 3.7 times more likely to experience COVID-19-induced mental health issues from their farm business than their female counterparts. Similarly, single/unmarried respondent were 2.44 times more likely to experience COVID-19-induced mental health issues from their farm business than their married counterparts. We also documented that respondents with more household members experienced less mental health stress. In addition, we found that higher-income respondents have less mental health stress. Economic factors were recorded as being crucial for the mental health of farmers.
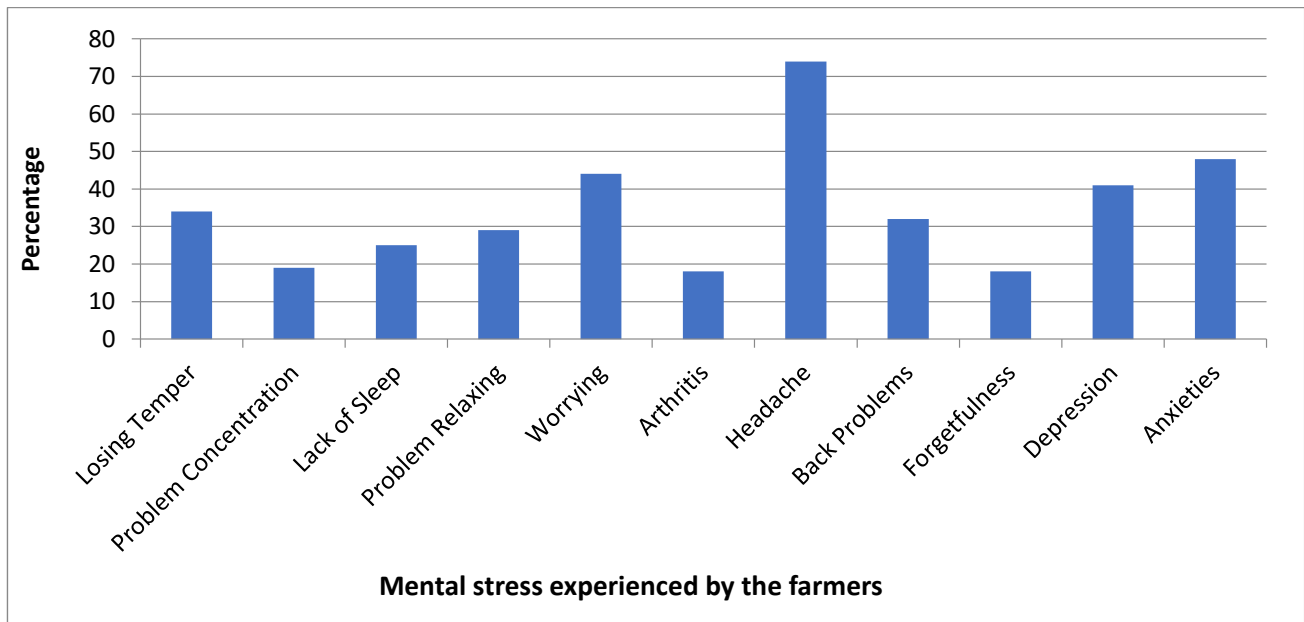
Fig. (3). Perceived effects of COVID-19 mental stress experienced by farmers.
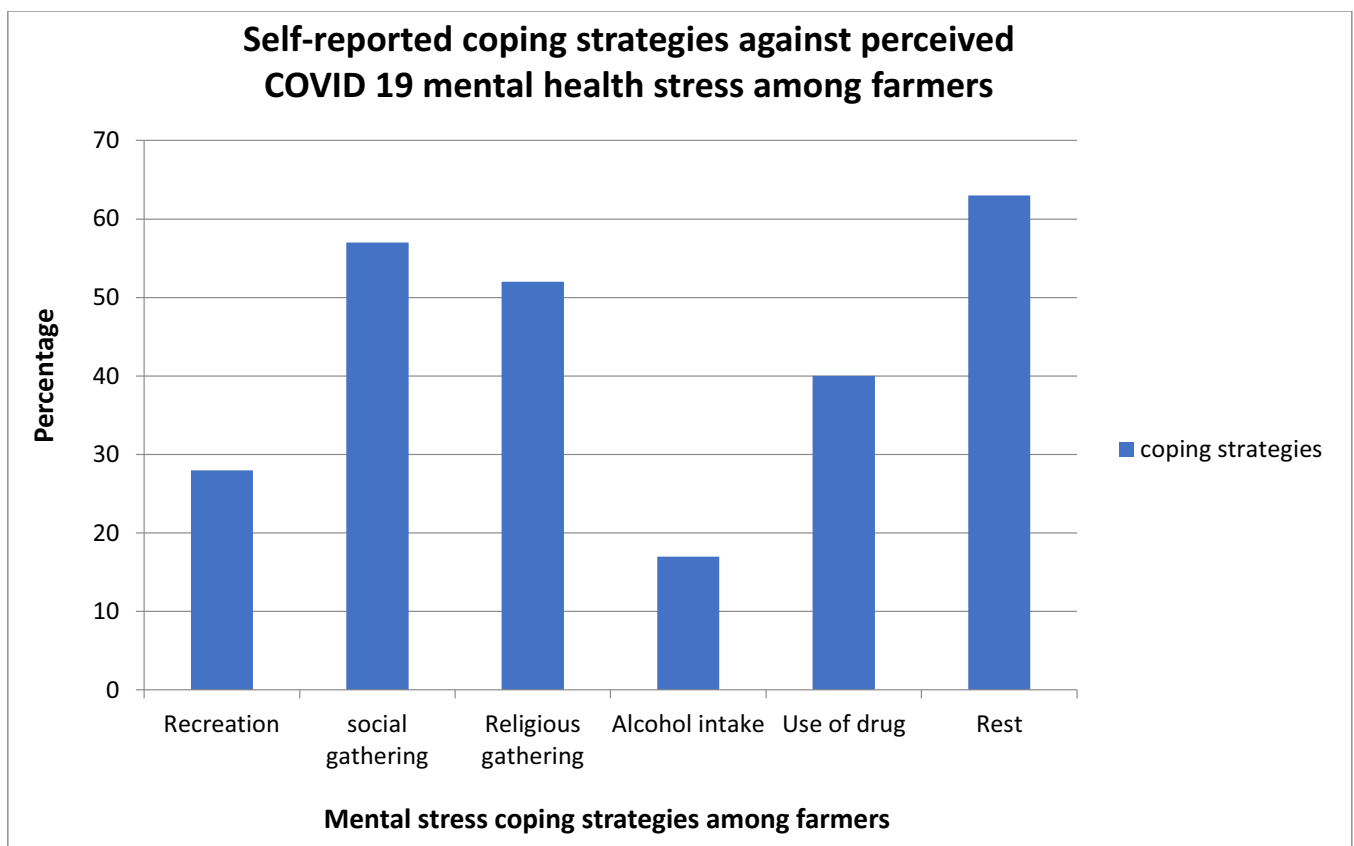

Fig. (4). COVID-19 coping strategies against mental health effects among farmers.

Table 5. Determinants of COVID-19-induced mental health issues among smallholder farmers.

Variables	Odd Ratio	Standard Error	z-value
Age	1.024177	.0160063	1.53
Gender	3.669502*	2.158854	2.21
Marital status	2.440609*	.6773471	3.21
Household size	.8281476*	.0553015	-2.82
Highest educational level	.8274687	.0807918	-1.94
Farming experience (years)	1.023773	.0206516	1.16
Average monthly income	.9999724*	.0000104	-2.64
Membership in the farmers association	1.019044	.4049016	0.05
COVID-19	2.989259	3.154331	1.04
Constant	.018572**	.0271421	-2.73

Source: Field survey, (2020)
LR chi2 (11) = 57.47; Prob> chi2 = 0.0000;
Log-likelihood = -171.49403 and Pseudo R2 = 0.2059
*Significance level at 5%,

4. DISCUSSION

The age distribution of farmers in the study shows that most respondents were young, which suggests a strong potential for resilience, energy, and a greater willingness to take risks and embrace innovation. The average farming experience of 21 years was anticipated to significantly influence the acquisition of skills and the ability to adopt technological innovations in crop production.

This finding also showed that most respondents are literate, as high literacy levels among farmers could also aid COVID-19-related information access. High membership (71%) in social groups could also aid information access among farmers and help cushion the effect of the pandemic on farmers' well-being. When considering the effect of COVID-19 confinement on input cost and farm business of farmers, the majority of the farmers noted high seed costs, the high price of labour input, high cost of fertilizers, herbicides, and transportation costs during the lockdown, which was attributed to the pandemic. This finding is corroborated by a study that indicated that temporary foreign worker shortages leading to high labour costs had exposed farmers to mental health challenges [28]. Further evidence showed that the quarantine measures reduced labour availability for important farming activities like sowing vegetable crops and picking fruits [29-32]. With the deepening economic crisis caused by the world pandemic, these impacts might be even more severe for agricultural sectors. Our study corroborates the study which reported that COVID-19 had a detrimental impact on the daily lives of farmers [33], worsening conditions by 61.2%. The pandemic led to a rise in the cost of planting (57.4%) and agrochemicals and fertilizers (69.9%). Additionally, it caused a decrease in the prices of agricultural products (73.5%) and agricultural extension services (66.5%). The markets and logistics for agricultural products became more challenging during the pandemic compared to prior conditions at 72.8% and 65.1%, respectively [26].

Furthermore, we found out that farmers experienced several business stresses induced by COVID-19. among which include income loss (70%), farm produce spoilage (15%), and poor market sales (10%), respectively. The result agreed with a study that showed that the pandemic to lockdown, unsold crops to rotten crops, and financial crisis to acute hunger had brought agricultural activities to a standstill [22], which may have contributed to health issues among farmers [15]. Covid-19 impacts losses of farmers' goods, especially fresh vegetables, fruit, and milk products. These losses were associated with restrictions imposed by countries for movement and interactions, labour losses, and demand reduction due to the closure of restaurants, hotels, *etc* [32, 34-36], as 54% of the farmers reported COVID-19-induced mental health stress. This may be due to various reasons, including the high cost of farm inputs, labour shortage, and farm produce wastage due to the lockdown policy. This finding corroborates an earlier study, which reported that the COVID-19 pandemic had affected mental health in rural Ontario [28] particularly among farmers. In addition, several studies provided [3, 22, 24, 26] reviews of these hazards for farmers and rural communities, including cases of suicide among farmers [19]. Furthermore, it was also noted that the novel coronavirus disease (COVID-19) has become a global health concern impacting both physical and mental health across populations [19]. The farmers (74%) perceived the effects of mental health in the form of headaches, anxiety, worry, depression, and loss of their temper, respectively. This study agreed with the University of Guelph's research that farmers are already at high risk for depression and anxiety [28]. Pandemic is associated with depression, anxiety, distress, phobia, and many other psychological impacts, which have been associated with suicidal behaviour among farmers [23, 32].

The self-reported mental health coping strategies of the respondents included rest, social gatherings, religious gatherings, use of drugs, and recreation activities. At the same time, 17% resorted to alcohol intake as a coping strategy against COVID-19-induced mental health effects among farmers. The identified coping strategy helps build

support for farmers to adapt to the lockdown effects on their mental health. In terms of determinants of COVID-19-induced mental health issues, we found that the male respondents were 3.7 times more likely to experience COVID-19-induced mental health issues from their farm business than their female counterparts. This finding corroborates a study indicating that male farmers had a higher prevalence of mental health problems [33]. In addition, a study also suggests that men were more pessimistic about income loss than women [37].

Also, single/unmarried respondent were 2.44 times more likely to experience COVID-19-induced mental health issues from their farm business than their married counterparts. This suggests that married people are perceived as more likely to have greater social support, so marriage enhances psychological well-being [33]. We also documented that respondents with more household members experienced less mental health stress. In addition, we found that higher-income respondents have less mental health stress. Economic factors were recorded as being crucial for the mental health of farmers. This result agrees with a study that reported that farmers who faced financial problems had a higher prevalence of mental health problems than those who did not [33]. Our result further agreed with the WHO survey that stated that isolation, loss of income, the deaths of loved ones, and a barrage of information on the dangers of the new virus have stirred up stress levels and triggered mental health conditions or exacerbated existing ones [8].

CONCLUSION

In this study, we employed survey data to present empirical evidence on the consequence of the pandemic lockdown on the mental health of farmers. We found that most of the farmers self-reported COVID-19-induced farm business stress. In addition, about 70% reported income loss due to the COVID-19 lockdown. Most farmers self-reported COVID-19-induced mental health stress with manifested effects including headache, anxiety, worry, and depression. Adopted coping strategies included rest, social gatherings, religious gatherings, and the use of drugs. We documented that males were 3.7 times more likely to experience COVID-19-induced mental health issues from their farm business than their female counterparts. Also, single respondents were 2.44 times more likely to experience COVID-19-induced mental health issues from their farm business than their married counterparts. We also documented that households with larger family sizes had lower mental health stress. We also found that respondents with higher incomes had lower mental health stress. Thus, there is a need for targeted mental health campaigns, support, and interventions to help farmers address mental health stressors. Such interventions should incorporate gender, marital status, and income-related factors into their design to aid effectiveness.

Study Limitations and Future Research

The following limitations have been Identified in this Study:

[1] **Limited Generalizability**: The study focuses on farming households in four States in Nigeria, which may not adequately reflect the mental health experiences of farming communities across the entire country or in other rural contexts globally.

[2] **Reliance on Self-Reported Data**: Data on mental health stress and coping strategies were self-reported, potentially introducing biases, such as underreporting or overreporting due to recall issues or social desirability.

[3] **Cross-Sectional Design**: The study employs a cross-sectional design, which restricts the ability to draw causal links between the COVID-19 lockdown and observed mental health outcomes.

[4] **Non-Validated Mental Health Metrics**: General terms, such as headaches, anxiety, and depression, are used without clinical validation, potentially limiting the precision and reliability of the mental health assessment.

Recommendations for Future Research

Based on these limitations, the following recommendations are proposed for future research:

[1] **Expand Geographic Scope**: A broader geographic range should be included across Nigeria or extended to other countries to improve the generalizability of findings.

[2] **Adopt Longitudinal Designs**: Longitudinal studies should be conducted to track mental health changes and establish causal relationships with stressors induced by events such as the COVID-19 lockdown.

[3] **Utilize Clinical Diagnostic Tools**: Validated clinical tools should be incorporated to diagnose mental health conditions, enhancing the accuracy and reliability of assessments.

[4] **Explore Sectoral Differences**: Mental health impacts should be examined across various agricultural sectors, such as livestock and aquaculture, to inform the development of tailored, sector-specific interventions.

AUTHORS' CONTRIBUTIONS

It is hereby acknowledged that all authors have accepted responsibility for the manuscript's content and consented to its submission. They have meticulously reviewed all results and unanimously approved the final version of the manuscript.

LIST OF ABBREVIATIONS

LMICs = Low- and middle-income countries

WFP = World Food Program

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was approved by the Centre for Sustainable Agricultural Empowerment, Nigeria research and ethics committee with code CSAE/REC/RTD/00002.

HUMAN AND ANIMAL RIGHTS

All methods were carried out per our study protocol, along with relevant guidelines and regulations associated

with the research and ethics committee of the Centre for Sustainable Agricultural Empowerment, Nigeria. This research was conducted on humans in line with the Helsinki Declaration of 1975, as revised in 2013 (http://ethics.iit.edu/ecodes/node/3931).

REFERENCES

[1] Kang Y-J. Mortality rate of infection with COVID-19 in Korea from the perspective of underlying disease. Disaster Med Public Health Prep 2020; 14(3): 384-6.
http://dx.doi.org/10.1017/dmp.2020.60 PMID: 32228738

[2] WHO Africa, (2020) COVID-19 halting crucial mental health services in Africa, WHO survey. 2020. Available from: https://www.afro.who.int/news/covid-19-halting-crucial-mental-health-services-africa-who-survey Retrieved on 29/04/2023.

[3] COVID-19: Implications for business. McKinsey & Company 2020; 19. Available from: https://www.mckinsey.com

[4] Weible CM, Nohrstedt D, Cairney P, et al. COVID-19 and the policy sciences: Initial reactions and perspectives. Policy Sci 2020; 53(2): 225-41.
http://dx.doi.org/10.1007/s11077-020-09381-4 PMID: 32313308

[5] Surico P, Galeotti A. The economics of a pandemic: The case of COVID-19. The Economics Observatory 2020.
http://dx.doi.org/10.1111/1475-5890.12280

[6] Dinarte-diaz L. An overlooked priority: Mental health. World Bank Blog 2023. Available from: https://blogs.worldbank.org/impactevaluations/overlooked-priority-mental-health?CID=WBW_AL_BlogNotification_EN_EXT Retrieved on 05/05/2023

[7] Ridley M, Rao G, Schilbach F, Patel V. Poverty, depression, and anxiety: Causal evidence and mechanisms. Science 2020; 370(6522): eaay0214.
http://dx.doi.org/10.1126/science.aay0214 PMID: 33303583

[8] WHO. World mental health report: transforming mental health for all. Geneva: World Health Organization 2022. License: CC BY-NC-SA 3.0 IGO.

[9] Barrett CB. Actions now can curb food systems fallout from COVID-19. Nat Food 2020; 1(6): 319-20.
http://dx.doi.org/10.1038/s43016-020-0085-y PMID: 37128084

[10] Devereux S, Béné C, Hoddinott J. Conceptualising COVID-19's impacts on household food security. Food Secur 2020; 12(4): 769-72.
http://dx.doi.org/10.1007/s12571-020-01085-0 PMID: 32837651

[11] Swinnen J, McDermott J. COVID-19 and global food security. EuroChoices (Uckfield) 2020; 19(3): 26-33.
http://dx.doi.org/10.1111/1746-692X.12288

[12] Global Alliance for Improved Nutrition (GAIN). Impact of COVID-19 on food systems: A situation report. GAIN 2020. Available from: https://www.gainhealth.org

[13] World Bank. Poverty and shared prosperity 2020: Reversals of fortune. World Bank Group 2020.
http://dx.doi.org/10.1596/978-1-4648-1602-4

[14] Amare M, Abay KA, Tiberti L, Chamberlin J. COVID-19 and food security: Panel data evidence from Nigeria. Food Policy 2021; 101: 102099.
http://dx.doi.org/10.1016/j.foodpol.2021.102099 PMID: 36570064

[15] World Food Programme (WFP). WFP Global Update on COVID-19: September 2020. World Food Programme 2020. Available from: https://www.wfp.org

[16] African Union Commission (AUC) & Food and Agriculture Organization (FAO). The Impact of COVID-19 on Food Security in Africa: Policy Responses for Strengthening Food Systems. 2020. Available from: https://www.fao.org

[17] International Monetary Fund (IMF). Nigeria: 2020 Article IV Consultation—Press Release; Staff Report. International Monetary Fund. 2020. Available from: https://www.imf.org

[18] Reardon T, Bellemare MF, Zilberman D. Poverty and food insecurity could grow dramatically as COVID-19 spreads. COVID-19 and global food security, eds Johan Swinnen and John McDermott Part One: Food security, poverty, and inequality, Chapter 2. Washington, DC: International Food Policy Research Institute (IFPRI) 2020; pp. 16-9.
http://dx.doi.org/10.2499/p15738coll2.133762

[19] Ibrahim RL, Ajide KB, Olatunde Julius O. Easing of lockdown measures in Nigeria: Implications for the healthcare system. Health Policy Technol 2020; 9(4): 399-404.
http://dx.doi.org/10.1016/j.hlpt.2020.09.004 PMID: 32959012

[20] Horner R. Towards a new paradigm of global development? Beyond the limits of international development. Prog Hum Geogr 2020; 44(3): 415-36.
http://dx.doi.org/10.1177/0309132519836158

[21] Patrinley JR Jr, Berkowitz ST, Zakria D, Totten DJ, Kurtulus M, Drolet BC. Lessons from operations management to combat the COVID-19 pandemic. J Med Syst 2020; 44(7): 129.
http://dx.doi.org/10.1007/s10916-020-01595-6 PMID: 32519285

[22] Hossain M, Purohit N, Sharma R, Bhattacharya S, McKyer ELJ, Ma P. Suicide of a farmer amid COVID-19 in India: Perspectives on social determinants of suicidal behaviour and prevention strategies. SocArXiv 2020.
http://dx.doi.org/10.31235/osf.io/ekam3

[23] Abrams EM, Szefler SJ. COVID-19 and the impact of social determinants of health. Lancet Respir Med 2020; 8(7): 659-61.
http://dx.doi.org/10.1016/S2213-2600(20)30234-4 PMID: 32437646

[24] Poudel K, Subedi P. Impact of COVID-19 pandemic on socioeconomic and mental health aspects in Nepal. Int J Soc Psychiatry 2020; 66(8): 748-55.
http://dx.doi.org/10.1177/0020764020942247 PMID: 32650687

[25] Singh DR, Sunuwar DR, Adhikari B, Szabo S, Padmadas SS. The perils of COVID-19 in Nepal: Implications for population health and nutritional status. J Glob Health 2020; 10(1): 010378.
http://dx.doi.org/10.7189/jogh.10.010378 PMID: 32582440

[26] World Bank. Agriculture, forestry and fishing, value added (% of

GDP) – Nigeria. 2018. Available from: https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=NG Accessed on November 16, 2024.

[27] Longthorne K. Helping farmers cope with the pandemic. University of Guelph Research Magazine Volume XXXVII 2021; 1.

[28] Bochtis D, Benos L, Lampridi M, Marinoudi V, Pearson S, Sørensen CG. Agricultural workforce crisis in light of the COVID-19 pandemic. Sustainability (Basel) 2020; 12(19): 8212.
http://dx.doi.org/10.3390/su12198212

[29] Adhikari J, Timsina J, Khadka SR, Ghale Y, Ojha H. COVID-19 impacts on agriculture and food systems in Nepal: Implications for SDGs. Agric Syst 2021; 186: 102990.
http://dx.doi.org/10.1016/j.agsy.2020.102990 PMID: 33191971

[30] Bisht IS, Rana JC, Pal Ahlawat S. The future of smallholder farming in India: Some sustainability considerations. Sustainability (Basel) 2020; 12(9): 3751.
http://dx.doi.org/10.3390/su12093751

[31] Cortignani R, Carulli G, Dono G. COVID-19 and labour in agriculture: Economic and productive impacts in an agricultural area of the Mediterranean. Ital J Agron 2020; 15: 172-81.
http://dx.doi.org/10.4081/ija.2020.1653

[32] Sapbamrer R, Chittrakul J, Sirikul W, *et al.* Impact of COVID-19 Pandemic on daily lives, agricultural working lives, and mental health of farmers in Northern Thailand. Sustainability (Basel) 2022; 14(3): 1189.
http://dx.doi.org/10.3390/su14031189

[33] Harris J, Depenbusch L, Pal AA, Nair RM, Ramasamy S. Food system disruption: Initial livelihood and dietary effects of COVID-19 on vegetable producers in India. Food Secur 2020; 12(4): 841-51.
http://dx.doi.org/10.1007/s12571-020-01064-5 PMID: 32837650

[34] Henry R. Innovations in agriculture and food supply in response to the COVID-19 pandemic. Mol Plant 2020; 13(8): 1095-7.
http://dx.doi.org/10.1016/j.molp.2020.07.011 PMID: 32711125

[35] Richards TJ, Rickard B. COVID-19 impact on fruit and vegetable markets. Canadian Journal of Agricultural Economics/Revue Canadienne D'agroeconomie. Wiley - Online Library 2020; 68: pp. (2): 189-94.
http://dx.doi.org/10.1111/cjag.12231

[36] Ragasa C, Lambrecht I, Mahrt K, Aung ZW, Wang M. Immediate impacts of COVID-19 on female and male farmers in central Myanmar: Phone-based household survey evidence. Agric Econ 2021; 52(3): 505-23.
http://dx.doi.org/10.1111/agec.12632 PMID: 34149133

[37] Vaingankar JA, Abdin E, Chong SA, *et al*. The association of mental disorders with perceived social support, and the role of marital status: Results from a national cross-sectional survey. Arch Public Health 2020; 78(1): 108.
http://dx.doi.org/10.1186/s13690-020-00476-1 PMID: 33133595