

A MULTIDISCIPLINARY APPROACH TO CONFRONTING SECURITY AND FOOD CRISES IN NIGERIA: A COMMUNICATION FRAMEWORK FOR LEVERAGING ENVIRONMENTAL EDUCATION IN THE NORTH-EAST

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Abstract

The interconnected security and food crises in Nigeria, especially in the conflict-affected North-East, present a complex challenge. This paper argues that a sustainable solution requires a communication-driven strategy that addresses the environmental root causes of instability. Focusing on the Borno, Adamawa, and Yobe (BAY) states in the north-eastern part of Nigeria, this article develops a theoretical framework linking insecurity with environmental degradation and the failure of food systems. This framework is based on the Health Belief Model (HBM), the Diffusion of Innovations (DOI) Theory, and group theories of attitude change. The main goal is to promote functional, cultural, and critical environmental literacies that empower farming communities to reduce risks and build resilience. This approach recognizes that in an environment plagued by insurgency, banditry, and farmer-herder conflicts, environmental education is not a luxury but an essential tool for survival. The paper concludes with suggestions on how communication strategies can enhance food security and community-led solutions in the face of ongoing insecurity, providing a roadmap for practitioners and policymakers.

Keywords: Environmental education, environmental literacy, food security, communication theory, conflict, farmer-herder crisis.

1. The Vicious Cycle of Insecurity, Environmental Degradation, and Food Scarcity

The North-East of Nigeria faces an enduring humanitarian crisis. Ongoing insurgency has displaced communities, damaged infrastructure, and reduced agricultural productivity and market access. In 2025, OCHA estimated that about 7.9 million people in BAY states needed humanitarian aid, reflecting the combined effects of violence and economic disruption (OCHA, 2025). Environmental issues, such as desertification and the gradual decline of Lake Chad, exacerbate livelihood stress and intensify competition for resources. The shrinking of Lake Chad has reduced arable land and water supply, leading to out-migration and greater pressure on remaining resources, worsening local insecurity and food access problems (Okpara et al., 2016; World Bank, 2021; Ogundipe et al., 2020; Benjaminsen & Ba, 2009).

In this context, programs that assume stable access to land and markets are insufficient. The Cadre Harmonisé (CH) report estimates that millions in the northwestern and northeastern states of Nigeria could experience a crisis characterized by food consumption gaps and negative coping strategies, or worse, during the 2025 lean season (Food Security Sector Nigeria, 2025; OCHA, 2025; Asaju et al., 2025). Farmers and other rural residents also face significant protection risks, including attacks near farmlands. On June 8, 2025, an attack on the Yelewata community in Guma LGA, Benue State, killed over 200 people and displaced 3,078 residents, including more than 400 children. Houses, food stores, and other assets were destroyed, further worsening food insecurity and protection needs (UNICEF Nigeria, 2025a, 2025b, Onuoha-Ogwe, 2025c).

At a broader level, Jaiyesimi (2025) confirms that available data from the National Bureau of Statistics (NBS) indicate weak but positive growth in agriculture despite constraints, rather than a complete collapse. Environmental education and literacy are therefore framed here as tools for managing operational risk within food security and protection strategies, enabling practical measures such as cultivating plots closer to settlements and adopting water-efficient practices to lessen exposure to insecurity.

2. The Literature Review: Finding Gaps and Connecting Themes

Building on the idea that environmental education should be viewed as a practical tool for reducing risks in insecure farming areas, earlier research consistently demonstrates links between environmental degradation, institutional weaknesses, and food insecurity in Nigeria. From data spanning 1970 through 2017, Ogundipe et al. (2020) indicate that indicators of environmental degradation are strongly associated with lower food security, underscoring how pollution and land degradation limit agricultural output. Similarly, Osabohien, Mordi, and Ogundipe (2018) use an Autoregressive Distributed Lag (ARDL) approach to analyze the factors influencing food availability. Their findings indicate that institutional quality (e.g., strong governance, rule of law, and effective policies) and technological adoption (e.g., modern farming techniques, improved seeds, and efficient supply chains) are key determinants. The study reveals that regions with stronger institutions and greater use of technology achieve better food security outcomes, suggesting these factors are necessary policy tools for long-term food security. These studies confirm that Nigeria's food systems are inherently vulnerable to environmental stresses and governance issues, which align with the systemic challenges discussed earlier.

At the household level, conflict worsens these vulnerabilities. Olanrewaju and Balana (2023) use nationally representative household data to demonstrate that conflict-induced shocks, including fatalities, abductions, and forced migration, significantly exacerbate household food insecurity, reduce dietary diversity, and lower farm investment, thereby harming both current and future food access. Their findings provide Nigeria-specific evidence that characterizes climate variability and conflict as compound risks, which intensify social tensions in farming communities already strained by resource scarcity.

However, despite these findings and some relevant work on using communication for development, extension, and environment-related education in fragile or precarious settings, few rigorous studies explicitly apply and test named communication theories as analytical frameworks for agricultural or environmental education in insecure areas.

The literature consistently emphasizes how conflict and environmental stress place an unequal burden on vulnerable populations. While Olanrewaju and Balana (2023) examine household shocks, there is a gap in studies that systematically analyze how gender and displacement status affect access to environmental information and the adoption of resilient practices. Understanding these gendered vulnerabilities is important, as women often face increased security risks and have limited control over productive assets, which directly affects their ability to adopt climate-smart strategies. This challenge is especially pronounced in conflict-affected regions. We will focus on the three main gaps in the literature.

1. Theoretical Framework of Communication in Conflict-Affected Agricultural Settings.

While the causal links between environment, governance, and food security are well understood, few studies explicitly apply communication theories to agricultural and environmental education in insecure contexts. Conversely, Diffusion of Innovation (DOI) and the Health Belief Model (HBM), which are widely used in public health, provide conceptual tools to view environmental practices not only as ecological goals but also as risk-reduction behaviors. Public health research on Risk Communication and Community Engagement (RCCE) shows that rumor-tracking, two-way engagements, and feedback mechanisms are more effective than one-way messaging in fragile environments (Dick, Moodie, & Greiner, 2022). This theoretical gap justifies applying HBM and DOI in affected areas, such as the BAY states, where environmental actions must be framed as immediate survival strategies to reduce exposure to violence and prevent livelihood collapse.

2. A multi-dimensional view of environmental literacy that goes beyond simple awareness.

Existing research on environmental literacy in Nigeria primarily focuses on students and preservice teachers rather than on adult smallholders. For example, Odunyemi (2023) and Igwe & Akinnubi (2023) focus on gains in knowledge and awareness among students, while Ogunyemi et al. (2011) examine the attitudes of preservice teachers. These studies clarify the role of education at early stages of development. However, they do not discuss how adult farming households in insecure rural areas acquire, interpret, and use environmental knowledge in the face of immediate threats. This paper, therefore, redefines environmental literacy for conflict-affected farmers as including functional (practice-based skills, such as water-efficient irrigation), cultural (integrating practices into locally accepted traditions and community structures), and critical (the ability to analyze systemic causes and advocate for protective policies) dimensions. Framing environmental literacy this way is crucial if it is to serve as a resilience tool rather than just an educational goal.

3. Operationalization in a high-risk conflict environment.

Much of the current agricultural development literature in Nigeria assumes stable conditions. However, the BAY states, for example, face limited mobility, protection risks on farm-to-market routes, and broken trust networks. Evidence from agricultural extension models suggests that interpersonal and peer-based approaches are more effective in these settings. A review of Farmer Field Schools (FFS) reveals consistent improvements in knowledge and practice adoption, with impacts on yields and income varying across contexts (Waddington et al., 2014). In contrast, one-way communication, whether through mass media or top-down dissemination, has limited influence when insecurity restricts access and erodes trust. Applying these lessons to BAY states involves prioritizing small-group, locally led, and feedback-enabled communication models, which are more likely to succeed in insecure communities than purely didactic campaigns.

In summary, although Nigerian scholarship highlights strong links among environmental degradation, conflict, and food insecurity, it overlooks integrating communication theory, multidimensional literacy, and operational feasibility in high-risk farming communities. Addressing these gaps is fundamental for

developing interventions that are effective not only in theory but also in the unpredictable realities of affected regions.

3. The Theoretical Framework: Navigating Insecurity with Communications Theory

This framework is designed to operate in situations of ongoing conflict and insecurity, using communication theories to help communities make safer and more sustainable livelihood choices. It challenges the notion that environmental education is a luxury by presenting it as a vital survival tool. The focus is not on abstract ecological principles but on risk-reducing practices that decrease exposure to violence while maintaining productivity. For example, promoting small-scale, diversified farming closer to villages reduces the need to travel far into remote farmlands and lessens the risk of attack or kidnapping. The framework adapts established models, especially the Diffusion of Innovations (DOI) theory and the Health Belief Model (HBM), to address the challenges of environmental education in Nigeria's conflict zones.

3.1 The Health Belief Model (HBM) for Risk Management

The HBM, initially created to explain preventive health behaviors (Rosenstock, 1974; Glanz, Rimer, & Viswanath, 2015), can be adapted to depict environmental practices as protective actions for farming households in insecure settings.

- **Perceived Susceptibility:** Messages can highlight how communities are vulnerable not only to drought and soil degradation but also to security threats arising from resource scarcity. For example, desertification that reduces grazing land has been shown to increase clashes between herders and farmers in the Lake Chad Basin (Okpara, Stringer, & Dougill, 2016). Framing desertification as a direct personal risk makes the threat more concrete and relatable.
- **Perceived Severity:** Communities are already aware of the seriousness of environmental and security threats. For example, the June 2025 attack on Yelwata in Benue State killed over 200 people and displaced 3,078 residents, including more than 400 children (UNICEF Nigeria, 2025a, 2025b). Communication should acknowledge these experiences and demonstrate how sustainable practices, such as growing shorter-cycle crops or irrigating near settlements, can help reduce exposure to danger.
- **Perceived Benefits:** The advantages of adaptation should be highlighted in terms of both safety and livelihoods. Pilot climate-smart agriculture (CSA) projects in vulnerable areas report household income increases of up to 40%, while also reducing dependence on risky coping strategies (CGIAR, 2021). At the same time, household-level analysis shows that conflict shocks reduce food security by limiting investment and market access (Olanrewaju & Balana, 2023). In Nigeria, large-scale livelihood programs that combine advisory services with input and asset support, such as improved seeds, small equipment, and productive assets, have demonstrated the adoption of better practices and increased income. With additional funding, these programs explicitly aim to restore livelihoods for conflict-affected households (World Bank, 2020; World Bank Independent Evaluation Group, 2019).
- **Cues to Action:** For adoption to happen, cues must be shared through secure, trusted channels. Public gatherings can be risky in unsafe areas; instead, small-group training led by local leaders or

radio broadcasts in a language everyone understands that provide weather updates and safety-focused farming tips are effective alternatives. Reports from humanitarian RCCE programs show that community-trusted messengers and two-way communication are crucial for adoption in fragile settings (Dick, Moodie, & Greiner, 2022).

3.2 Functional, Cultural, and Critical Literacies in Conflict Zones

Environmental literacy in insecure rural settings should be seen as a set of survival skills rather than just educational achievements. Furthermore, interventions must address varying levels of vulnerability within communities, recognizing that conflict worsens gender-based inequalities and protection risks, and that tailored communication strategies are needed to ensure that all members, especially women, achieve literacy.

- **Functional Environmental Literacy:** This involves equipping farmers with practical skills to maintain production on smaller, safer plots, thereby promoting sustainable agriculture. Examples include water-efficient irrigation, fast-maturing crop varieties, and small-scale livestock systems to reduce the need for long-distance grazing. These skills help ensure food security while lowering exposure to violence (Ogundipe, Obi, & Ogundipe, 2020). This dimension is extended to include *digital* and *security* literacy, ensuring farmers can safely access and use information technologies (e.g., secure messaging for early warning alerts and market price checks) to mitigate immediate security and market risks in a fragile context.
- **Cultural Environmental Literacy:** In displaced and fragmented communities, rebuilding trust requires incorporating practices within culturally appropriate frameworks. Working with traditional leaders and religious figures can reframe stewardship as a community value. Evidence from Farmer Field Schools shows that peer learning and modeling improve knowledge and the adoption of practices, particularly when grounded in community norms (van den Berg et al, 2020; Waddington et al., 2014).
- **Critical Environmental Literacy:** This dimension emphasizes the ability to analyze the systemic causes of vulnerability, including political and economic forces that lead to degradation and insecurity. For example, farmers in Borno need to recognize that the shrinking of Lake Chad is influenced by regional hydropolitics and climate change, not just natural variability (World Bank, 2021). Critical literacy also involves using evidence-based indicators, such as household dietary diversity and expenditure, which are valuable tools for measuring vulnerability and guiding engagement (Ogundari, 2017). This enables communities to transition from passive recipients of aid to active participants in shaping policies and advocating for improved infrastructure, irrigation, and security support.

4. The Communication Strategy: Operationalizing a Framework in a High-Risk Context

Building on the theoretical foundations outlined, the communication strategy for the crisis-affected states should be resilient, adaptable, and rooted in trust. It emphasizes multi-channel approaches that combine the

broad reach of mass media with the credibility of personal communication, while integrating environmental literacy into community norms and governance frameworks.

4.1 Measurement and Impact Assessment

Evaluating the impact of communication-focused interventions in high-risk areas requires a mixed-methods approach that combines quantitative and qualitative data.

Quantitative metrics should include pre- and post-intervention surveys of knowledge and attitudes, as well as adoption rates of practices such as conservation plowing or water-efficient irrigation. Additionally, satellite imagery for vegetation cover and market price monitoring should be used as indicators of food access. In Nigeria, combining household dietary diversity scores with expenditure-based measures has proven effective for categorizing food security states (Ogundari, 2017; Iruonagbe & Omotayo, 2021). In insecure settings, specific household-level indicators provide consistent, low-burden data on food access (Swindale & Bilinsky, 2006; Coates, Swindale, & Bilinsky, 2007). For area classifications and decision rules, the IPC Technical Manual, version 3.1, specifies phase thresholds and their contributing factors (IPC Global Partners, 2021).

For a robust assessment of the theoretical framework, measurement must extend beyond functional practice. Cultural Literacy should be assessed using indicators of social cohesion (e.g., trust indices and participation rates in communal resource management or joint planning), as cohesion plays a key role in reducing food insecurity risk by facilitating resource sharing and collective coping strategies (Weldegiargis et al., 2023; Shelembe et al., 2025). Furthermore, Critical Literacy should be measured using advocacy action metrics (e.g., the number of community-initiated engagements with local governance, disaggregated by policy topic, or the public presentation of evidence-based indicators), reflecting the importance of grassroots political involvement in agricultural policy.

Qualitative metrics, such as focus groups, ethnographic observation, oral histories, and participatory rural appraisal, help understand the “how and why” of behavior change. Mixed-methods approaches are strongly recommended in food security research because they reveal both behavioral drivers and systemic barriers (Shelembe et al., 2025; Weldegiargis et al., 2023; Maxwell, Coates, & Vaitla, 2013).

4.2 Channels and Trust

The communication strategy must strike a balance between reach, credibility, and safety. The approach must be vulnerability-sensitive to address the differential security risks and mobility constraints faced by various groups. Anchoring communication in cultural environmental literacy ensures that messages are seen as part of community values and traditions, rather than as external impositions.

- **Primary channels (traditional media):**

Radio remains one of the most effective media in rural Nigeria, with evaluations indicating that, for example, Hausa-language broadcasts enhance farmers’ agricultural knowledge and practices (Adeyeye & Akinwumi, 2021). Programs should be broadcast in local languages and include trusted

figures, such as religious leaders, traditional rulers, or agricultural extension workers, to strengthen their legitimacy and credibility.

- **Secondary channels (interpersonal communication):**

Farmer Field Schools (FFS) and small-group training encourage peer-to-peer sharing. FFS enhances knowledge and the adoption of practices across Africa, especially when integrated into community norms (Rapid Response Brief, 2021; Waddington et al., 2014). In Nigeria, trust in local leaders and extension agents significantly influences the willingness to adopt innovations (Chete & Bukola, 2025).

- **Vulnerability-Sensitive Tailoring:**

To address heightened insecurity and control over resources, the use of secondary channels must be tailored: Gender-segregated small groups should be prioritized where needed, and female community leaders must be engaged as trusted messengers to ensure that women, who face higher insecurity and often control household food preparation, equitably access and adopt the practices required for functional literacy.

4.3 Harnessing Social Proof for Behavior Change

Behavior change is more likely when community members see peers successfully adopting practices. Communication should emphasize the success stories of farmers who, despite facing insecurity, have adopted new methods and increased their yields. According to Social Cognitive Theory, observational learning and social modeling are essential for adoption (Bandura, 2001). Diffusion of Innovation theory also highlights peer influence, as testimonials from respected community members act as pointers to action that validate adoption (Greenhalgh et al., 2004). Program evaluations indicate that visibly providing agricultural inputs and productive assets, along with extension or advisory support, shows viable adaptation options and encourages peer adoption risk. (World Bank, 2020; World Bank Independent Evaluation Group, 2019).

4.4 Advocacy for Infrastructure and Policy Change

Ultimately, effective communication promotes critical literacy by enabling communities to advocate for structural support. Advocacy efforts should focus on enhancing irrigation infrastructure, strengthening security patrols in farming regions, and implementing sustainable land-use policies. Evidence indicates that unsuccessful top-down grazing policies, such as Nigeria's National Grazing Reserve Bill, have worsened farmer-herder conflicts instead of resolving them (Benjaminsen & Ba, 2009). Regional studies of Lake Chad show that governance failures combined with climate stress have increased insecurity and displacement (World Bank, 2021). By integrating advocacy into community-driven communication, the strategy encourages grassroots pressure to promote policy reform, ensuring that farmers' voices are heard in developing lasting solutions.

5. Conclusion and Recommendations

Insecurity, environmental degradation, and food insecurity in Nigeria reinforce each other in ways that overwhelm responses focused on just one sector. Humanitarian analyses highlight significant unmet needs

in critical regions of Nigeria, while food security projections anticipate ongoing stress in the affected states during the 2025 lean season (Food Security Sector Nigeria, 2025; OCHA, 2025). Environmental pressures, such as desertification and the shrinking of Lake Chad, reduce land and water availability, increase competition over resources, and lead to displacement and loss of livelihoods (Okpara et al., 2016; World Bank, 2021). Protection risks are severe, with mass-casualty attacks displacing thousands and destroying food assets (UNICEF Nigeria, 2025a, 2025b; Onuoha-Ogwe, I.). On a larger scale, official reports describe agriculture as a low-growth sector rather than one in decline, noting a positive year-on-year trend. This indicates the importance of protecting and maximizing current productive capacity, rather than assuming systemic failure (Central Bank of Nigeria, 2024; Jaiyesimi, 2025). Studies in Nigeria also link environmental degradation and weak institutions to worsening food security, showing that conflict shocks increase household food insecurity, limit dietary diversity, and hinder farm investments (Ogundipe et al., 2020; Olanrewaju & Balana, 2023; Osabohien et al., 2018).

A communication-focused approach logically stems from this evidence. Framing environmental education as operational risk management rather than abstract instruction aligns with established behavioral theory and the realities of high-risk farming environments. The Health Belief Model explains how perceived susceptibility, severity, and benefits can be arranged to show environmental practices as protective actions; Diffusion of Innovations and risk-communication research highlight why peer influence, trusted messengers, and feedback loops are crucial for adoption when mobility is limited and trust is delicate (Dick et al., 2022; Glanz et al., 2015; Greenhalgh et al., 2004; Rosenstock, 1974). In practice, effective communication channels must combine reach and credibility. For instance, radio broadcasts in local languages, trusted community leaders, and peer-to-peer methods such as farmer field schools have been successful in increasing knowledge and encouraging adoption. Moreover, the strategy must be sensitive to vulnerability, ensuring that marginalized groups, particularly women, have equitable access to information through secure, gender-aware channels to prevent worsening existing inequalities amplified by conflict. The Functional Literacy dimension is therefore extended to include digital and security literacy, empowering communities to navigate the exchange of information securely and address associated security risks.

Using mixed-methods monitoring with established indicators (e.g., dietary diversity and expenses) enables credible assessment and adjustment (Adeyeye & Akinwumi, 2021; Chete & Bukola, 2025; Ogundari, 2017; Waddington et al., 2014). Ultimately, lasting improvements depend on effective governance. Evidence from grazing policy failures and the political aspects of the Lake Chad crisis suggests that bottom-up advocacy must work in conjunction with top-down reforms (Benjaminsen & Ba, 2009; World Bank, 2021).

Recommendations

- **Integrate communication into security and food-security operations.** Risk communication should be considered a key protective role, framing practical, security-sensitive environmental

practices as protective behaviors and offering trusted cues to action (Dick et al., 2022; Rosenstock, 1974; Glanz et al., 2015).

- **Fund the delivery that is led by the community itself.** Small-group and peer-to-peer approaches, delivered by trusted figures and supported by local-language radio, are more achievable during movement restrictions and tend to have higher adoption rates (Adeyeye & Akinwumi, 2021; Chete & Bukola, 2025; Greenhalgh et al., 2004; Waddington et al., 2014). This delivery model must be gender-sensitive and use secure channels to reach vulnerable groups.
- **Institutionalize mixed-methods monitoring** by implementing pre- and post-surveys, tracking practice adoption, and using recognized household indicators such as dietary diversity and expenditures, along with qualitative feedback to assess effects and improve programming (Ogundari, 2017). Measurement must be expanded to include social cohesion metrics for Cultural Literacy and advocacy action tracking for Critical Literacy.
- **Link community efforts to policy changes.** Encourage critical literacy and organized advocacy for irrigation, land use, and conservation efforts, while recognizing the governance failures underlying the farmer-herder conflict and the Lake Chad crisis (Benjaminsen & Ba, 2009; World Bank, 2021).

Taken together, these measures integrate empirical constraints with practical delivery models. By combining behavioral theory with culturally appropriate communication and credible monitoring, environmental education becomes an effective tool for reducing exposure to violence, stabilizing production, and strengthening household resilience within Nigeria's conflict-affected farming systems (Central Bank of Nigeria, 2024; Food Security Sector Nigeria, 2025; OCHA, 2025; Ogundipe et al., 2020; Olanrewaju & Balana, 2023; UNICEF Nigeria, 2025a, 2025b; Onuoha-Ogwe, I.; World Bank et al., 2021).

References

- [1] Adeyeye, B., Amodu, L., Odiboh, O., Oyesomi, K., Adesina, E., & Yartey, D. (2021). Agricultural Radio Programmes in Indigenous Languages and Agricultural Productivity in North-Central Nigeria. *Sustainability*, 13(7), 3929. <https://doi.org/10.3390/su13073929>
- [2] Asaju, K., & Kwakano, A. (2025). "Armed conflict on food security in Nigeria." *International Journal of Recent Advances in Multidisciplinary Research*, 12, (06), 1151-11461
- [3] Bandura, A. (2001). Social cognitive theory of mass communication. *Media Psychology*, 3(3), 265–299. https://doi.org/10.1207/S1532785XMEP0303_03
- [4] Benjaminsen, T. A., & Ba, B. (2009). Farmer–herder conflicts, pastoral marginalisation and corruption: a case study from the inland Niger delta of Mali. *Geographical Journal*, 175: 71–81. <https://doi.org/10.1111/j.1475-4959.2008.00312.x>

- [5] Central Bank of Nigeria. (2024). *Economic report: Fourth quarter 2024*. Abuja: CBN.
<https://www.cbn.gov.ng/Out/2025/RSD/Fourth%20Quarter%202024%20Economic%20Report.pdf>
- [6] CGIAR. (2021). *Climate-smart agriculture in fragile and conflict-affected situations: Evidence and lessons*. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). <https://cgspace.cgiar.org/server/api/core/bitstreams/dd7599c3-84a2-4a40-b7f4-65d749bd82bb/content>
- [7] Chete, & Bukola, O. (2025). Contact Farmers and Extension Personnel Perceptions of Constraints to Effectiveness of Agricultural Extension Services Delivery in Ondo State, Nigeria. *Journal of Extension Systems*, 41(1), 1-11. <https://doi.org/10.48165/jes.2025.41.1.1>
- [8] Coates, J., Swindale, A., & Bilinsky, P. (2007). Household Food Insecurity Access Scale (HFIAS) for measurement of food access: Indicator guide (v.3). FANTA.
https://www.fantaproject.org/sites/default/files/resources/HFIAS_ENG_v3_Aug07.pdf
- [9] Dick, L., Moodie, J., & Greiner, A. L. (2022). Are we ready? Operationalising risk communication and community engagement programming for public health emergencies. *BMJ Global Health*, 7(3), e008486. <https://gh.bmj.com/content/7/3/e008486>
- [10] Eneh, C. A., et al. (2025). A system dynamics analysis of agricultural practices and food security in Nigeria. *Journal of Health, Population and Nutrition*, 44, 285 (2025).
<https://doi.org/10.1186/s41043-025-01037-4>
- [11] Food Security Sector Nigeria. (2025). *Nigeria*. Food Security Cluster. <https://fscluster.org/nigeria>
- [12] Glanz, K., Rimer, B. K., & Viswanath, K. (Eds.). (2015). *Health behavior: Theory, research, and practice* (5th ed.). Jossey-Bass. <https://psycnet.apa.org/record/2015-35837-000>
- [13] Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., & Kyriakidou, O. (2004). Diffusion of innovations in service organizations: Systematic review and recommendations. *The Milbank Quarterly*, 82(4), 581–629. <https://doi.org/10.1111/j.0887-378X.2004.00325.x>
- [14] Igwe, E. F., & Akinnubi, R. T. (2023). The awareness and effectiveness of environmental education among undergraduate students in Nigeria. *Discovery*, 59, e8d1002.
https://discoveryjournals.org/discovery/current_issue/v59/n325/e8d1002.pdf
- [15] IPC Global Partners. (2021). Integrated Food Security Phase Classification Technical Manual Version 3.1. Evidence and Standards for Better Food Security and Nutrition Decisions. Rome.
https://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/manual/IPC_Technical_Manual_3_Final.pdf
- [16] Ioryue, D. A., Jimoh, O. I., & Ejeh, L. (2024). The impact of insecurity on agricultural development in Nigeria: A study of Benue State (2011–2023). *Zamfara Journal of Politics and Development*, 5(3), 169–180.
https://www.researchgate.net/publication/388805517_THE_IMPACT_OF_INSECURITY_ON_AGRICULTURAL_DEVELOPMENT_IN_NIGERIA_A_STUDY_OF_BENUE_STATE_2011-2023
- [17] Jaiyesimi, F. (2025, February 25). Agric sector growth rises by 1.8% in Q4. *BusinessDay*.
<https://businessday.ng/agriculture/article/agric-growth-rises-by-1-8-in-q4/>
- [18] Maxwell, D., Coates, J., & Vaitla, B. (2013). *How do different indicators of household food security compare? Empirical evidence from Tigray*. Feinstein International Center, Tufts

- University. <https://fic.tufts.edu/publication-item/how-do-different-indicators-of-household-food-security-compare/>
- [19] Odunyemi, M. J. (2023). Influence of environmental education on students' environmental literacy in Nigeria. *European Journal of Education Studies*, 10(9), 401–418. <https://oapub.org/edu/index.php/ejes/article/download/4983/7617>
- [20] Ogundari, K. (2017). Categorizing households into different food security states in Nigeria: The role of expenditure and dietary diversity measures. *Social Indicators Research*, 133(2), 445–465. <https://doi.org/10.1186/s40100-017-0076-y>
- [21] Ogundipe, A. A., Obi, S., & Ogundipe, O. M. (2020). Environmental degradation and food security in Nigeria. *International Journal of Energy Economics and Policy*, 10(1), 316–324. <https://www.econjournals.com/index.php/ijeep/article/view/8083>
- [22] Ogunyemi, B. & Ifegbesan, A. (2011). Environmental Literacy Among Preservice Social Studies Teachers: A Review of the Nigerian Experience. *Applied Environmental Education & Communication*. 10. 7–19. <https://doi.org/10.1080/1533015X.2011.549795>.
- [23] Okpara, U. T., Stringer, L. C., & Dougill, A. J. (2016). Lake drying and livelihood dynamics in Lake Chad. *Ambio*, 45(7), 781–795. <https://doi.org/10.1007/s13280-016-0805-6>
- [24] Olanrewaju, O., & Balana, B. B. (2023). Conflict-induced shocks and household food security in Nigeria. *Sustainability*, 15(6), 5057. <https://doi.org/10.3390/su15065057>
- [25] Onuoha-Ogwe, I. (2025c, June 23). *Destruction on a loop*. UNICEF. <https://www.unicef.org/nigeria/stories/destruction-loop>
- [26] Osabohien, R., Mordi, A., & Ogundipe, A. (2018). Food security, institutional framework and technology: Examining the nexus in Nigeria using ARDL approach. *International Journal of Civil Engineering and Technology*, 9(10), 1499–1510. https://www.researchgate.net/publication/319174218_Food_Security_Institutional_Framework_and_Technology_Examining_the_Nexus_in_Nigeria_Using_Ardl_Approach
- [27] Rapid Response Brief (2021). [The International Initiative for Impact Evaluation \(3ie\)](#).
- [28] Rosenstock, I. M. (1974). Historical origins of the health belief model. *Health Education Monographs*, 2(4), 328–335. <https://doi.org/10.1177/109019817400200403>
- [29] Shelembe, N., Modi, A., & Ngidi, M. (2025). Relating Household Food Systems to Food Security Indicators: An Overview. *South African Journal of Agricultural Extension (SAJAE)*, 53(3), 160–182. <https://doi.org/10.17159/2413-3221/2025/v53n3a20592>
- [30] Swindale, A., & Bilinsky, P. (2006). Household Dietary Diversity Score (HDDS) for measurement of household food access: Indicator guide (v.2). FANTA. https://www.fantaproject.org/sites/default/files/resources/HDDS_v2_Sep06_0.pdf
- [31] United Nations Institute for Disarmament Research. (2021). *Connecting the dots: Arms control, disarmament and the women, peace and security agenda*. Geneva: UNIDIR. https://unidir.org/files/2020-10/UNIDIR_Connecting%20the%20Dots_Overview%20of%20Findings%20and%20Recommendations.pdf

- [32] UNICEF Nigeria. (2025a, June 17). *Nigeria humanitarian situation report (farmer–herder conflict)*. UNICEF. <https://www.unicef.org/media/171876/file/Nigeria-Humanitarian-SitRep-%28Farmer-Herder%20Conflict%29-17-June-2025.pdf>
- [33] UNICEF Nigeria. (2025b, July 2). *Nigeria humanitarian situation report no. 2 (farmer–herder conflict)*. UNICEF. <https://www.unicef.org/media/172271/file/Nigeria-Humanitarian-SitRep-No.2-%28Farmer-Herder-Conflict%29-02-July-2025.pdf>
- [34] Van den Berg, H., Phillips, S., Poisot, A. S., Dicke, M., & Fredrix, M. (2020). Leading issues in implementation of farmer field schools: a global survey. *The Journal of Agricultural Education and Extension*, 27(3), 341–353. <https://doi.org/10.1080/1389224X.2020.1858891>
- [35] Waddington, H., Snilstveit, B., Hombrados, J., Vojtkova, M., Phillips, D., Davies, P., & White, H. (2014). Farmer field schools for improving farming practices and farmer outcomes: A systematic review. *Campbell Systematic Reviews*, 10(6), i–335. <https://doi.org/10.4073/CSR.2014.6>
- [36] Weldegiargis, A. W., Abebe, H. T., Abraha, H. E., Abrha, M. M., Tesfay, T. B., Belay, R. E., Araya, A. A., Gebregziabher, M. B., Godefay, H., & Mulugeta, A. (2023). Armed conflict and household food insecurity: evidence from war-torn Tigray, Ethiopia. *Conflict and health*, 17(1), 22. <https://doi.org/10.1186/s13031-023-00520-1>
- [37] World Bank. (2020). Third National Fadama Development Project (FADAMA III): Interim Implementation Completion and Results Report (P096572). World Bank. <https://documents1.worldbank.org/curated/en/540261604338534589/pdf/Nigeria-Third-National-Fadama-Development-Project.pdf>
- [38] World Bank; Jedwab, R., Haslop, F., Masaki, T., & Rodríguez-Castelán, C. (2021). *Climate change, rural livelihoods and urbanization: Evidence from the permanent shrinking of Lake Chad*. Washington, DC: World Bank. <https://documents1.worldbank.org/curated/en/486741636441318243/pdf/Technical-Paper-Two-Climate-Change-Rural-Livelihoods-and-Urbanization-Evidence-from-the-Permanent-Shrinking-of-Lake-Chad.pdf>
- [39] World Bank Independent Evaluation Group. (2019). Nigeria—NG: Fadama Development III SIL (FY08): Implementation Completion Report Review. World Bank. <https://documents.worldbank.org/curated/en/565201619098690591/pdf/Nigeria-NG-Fadama-Development-III-SIL-FY08.pdf>