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Original Article

Assessment of community food security: empirical evidence from the adjunct communities of Federal University Dutse, Nigeria

OPEN ACCESS

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ABSTRACT

Community food security (CFS) attempts to bring out the nuances in food security analysis, especially the age-long misconception of equating food availability with food security. Under this new paradigm, food security is achieved only when communities obtain a safe, culturally and socially acceptable, nutritionally adequate diet through a sustainable food system that maximizes community self-reliance and social justice. A four-stage sampling approach was adopted to select respondents in the six communities adjacent to Federal University Dutse, Jigawa State. Data were collected using a questionnaire from 184 households in the communities and analysed using descriptive statistics and the Household Hunger Scale (HHS) and the Household Food Insecurity Access Scale (HFIAS) to determine the food security status of the communities and the Problem Confrontation Index to determine the constraints to CFS. Results showed weak infrastructural support without educational, health, financial, and agricultural support systems. Further, results showed that 59.24 and 24.46% of the respondents experienced moderate and severe hunger, respectively, while 16.30% were without hunger. The prime constraints to sustainable community food security hovered around insufficient farmland (PCI = 273), drought (PCI = 267), lack of agricultural facilities (PCI = 266), and high cost of farming inputs (PCI = 256). Conclusively, the study revealed that food insecurity (hunger) is endemic (83.70%) in the adjunct communities, and concerted efforts should be targeted at improving the infrastructural base of the communities.

K E Y W O R D S : *Anti-hunger strategy, Agricultural support systems, Infrastructure, Hunger scale.*

INTRODUCTION

Since the mid-1970s, the concept of food security has been used to address many elements of food crises at all levels. Food security is defined on five levels: individual, household, national, regional, and global. The conditionality of food security was described as all individuals having constant physical and economic access to adequate and nutritious food to live an active and healthy life (Perez-Escamilla, 2017). However, the aforementioned approach to food security is usually seen as inadequate for addressing the social and environmental challenges associated with food security strategies. Community food security (CFS) has emerged due to activities aimed at supporting policies that account for all aspects (social, cultural, and environmental) within a community's food system that can affect food availability, cost, and quality for individual households or the community as a whole (Anderson & Cook, 1999).

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CFS, which was first proposed in the late 1990s, envisions a future in which all community residents have access to a safe, culturally acceptable, nutritionally adequate diet provided by a sustainable food system that promotes community self-reliance, social justice, and democratic decision-making (Engler-Stringer, 2014; Colleen & Hayes-Conroy, 2015, Slade & Carter 2016). CFS focuses on individual or household food security within a social framework, while implicitly acknowledging the larger food system's vital role in providing food security. Developed as an anti-hunger and community development strategy, Andrée *et al*. (2017) and Kaiser *et al*. (2015) asserted that CFS helps policymakers and other practitioners improve their understanding of the barriers to food security at various levels of analysis, especially among community's low-income households.

The significance of CFS in Nigeria and the global search for food security cannot be overstated. World Health Organisation (2024), statistics cast doubt on the achievement of the food security goal, with 2.33 billion people worldwide experiencing moderate to severe food insecurity. On the home front, Nigeria is classified as a Low-Income Food Deficit (LIFD) country, with a significant prevalence of undernourished persons (Jung, 2023; Wudil *et al*., 2023). These indexes are skewed toward the rural and poor peasant farmers. Achieving the food security objective will remain a mirage unless attention is paid to the communities where food is produced. Thus, boosting community access to food will result in national food security, and the overarching goal of providing safe and unhindered access to food. The necessity to examine CFS to examine the infrastructural supports for food production, and community food security status in Jigawa State has become imperative.

MATERIAL AND METHODS

The study was conducted among the six contiguous communities of the Federal University Dutse, Jigawa State. Dutse which is home to the University is located in the Northwest, Nigeria on Latitude 10^0 42' to 12^0 07' N and Longitude 9^0 20' to $10^0$31' E (Medium Term Sector Strategy, MTSS, 2022). It is bounded in the North by Taura, Birnin Kudu in the south, and eastward by Kiyawa local government areas while the eastern flank is bordered by Kano State. Consequent to the establishment of the University on 9th February 2011 (Federal University Dutse, FUD, 2024), several communities were relocated to pave the way for the University. The affected communities are Maja, Hausawa, Sherifai, Bulori, Kargo and Gurungu. The choice of these communities was borne out of their clearly defined indices: shared sets of values or culture, communities' sense of belonging, commitment and fulfilment of communities' needs rather than mere geographical space. The climate of Dutse is semi-arid type, defined by a long dry season of mostly eight months (October – May). The rainy season falls between June to September with an annual rainfall of 900 to 1000mm while the prevailing temperature ranges between 12.2^0 – 41.7^0c (Barau, 2015, Nura *et al*, 2023). (Fig. 1).

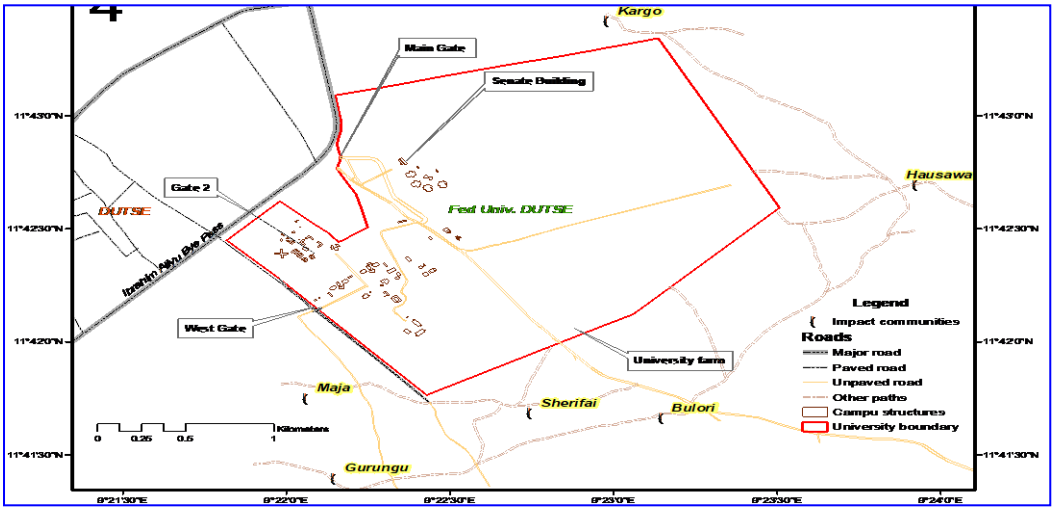

Figure 1. Map of Dutse showing the study area. Source: Olorontoba *et al*. (2015)

Sampling Techniques and Sample Size

A three-stage sample selection technique was utilized to determine the appropriate sample size for the investigation. First, villages adjacent to Federal University Dutse were purposefully selected based on well-defined communal indicators. Second, a census of all households in each selected community was conducted (1,916 households) as presented in Table 1. Third, the probability proportion to size (PPS) sampling technique was used to determine a sample size of 184 households in the communities based on statistical considerations (Yamane's and Bowley's allocation formulae). A confidence level of 95% and an error margin of less than 10%, which is typical in agricultural socio-economic research (Nyariki, 2009) was used for the study.

Yamane's formula is expressed as:

$$n = \frac{N}{1+N(e)^2} \quad (1)$$

Where, n = sample size, N = sample frame, e = precision level (7%).

The Bowley's proportion allocation formula will then be used to select respondents from each community as;

$$ni = n\frac{Ni}{N} \quad (2)$$

Where, n_i = Sample size at ith strata, n = total sample size.

Table 1: Sample Size Selection Matrix

SN	Community	No. of Households (N)	Sample Size (n)
1	Maja	117	11
2	Hausawa	635	61
3	Sherifai	154	15
4	Bulori	163	16
5	Kargo	317	30
6	Gurungu	530	51
	Total	**1,916**	**184**

Source: Field survey, 2024.

Method of Data Analysis

The Statistical Package for the Social Sciences (IBM SPSS 22) and Microsoft Excel office 2019 were used to re-code, arrange, and analyse the raw data from the survey questionnaire. The study area employed descriptive statistics such as frequency counts, arithmetic and weighted mean, and standard deviation to depict the accessibility and availability of infrastructure supporting food production. The Household Hunger Scale (HHS) and Household Food Insecurity Access Scale (HFIAS) were employed to ascertain the food security statuses of the community. The Problem Confrontation Index (PCI) was employed to ascertain the degree of obstacles hindering the achievement of CFS objectives.

The Household Food Insecurity Access Scale (HFIAS) captured household behaviours, signifying insufficient food quality and quantity, and anxiety over insecure access. Household Hunger Scale (HHS) on the other hand built around three generic questions (modified to nine) about perceptions of a household on varying degrees of hunger by the number of times a household has experienced hunger within the past 30 days prior to this survey.

Three scoring options for scoring the response to each question are:

Never (0 times) =0 score (none or light hunger)

Rarely/ Sometimes (1-10 times) = 1 score (moderate hunger)

Often (more than 10 times) =2 scores (severe hunger)

The problem confrontation index (PCI) identified, measured, and ranked the constraints in order of the level of severity using the weighted scores (Alaka, 2023). Mathematically, PCI is expressed in this study as;

$$PCI = P_{nc} * 0 + P_{ls} * 1 + P_s * 2 \quad (3)$$

Where PCI = problem confrontation index, P_{nc} = number of respondents who rated or graded the constraints as no constraint, P_{ls} = number of respondents who rated the constraints as less severe constraint, and P_s = number of respondents who rated or graded the constraints as a severe constraint.

RESULTS AND DISCUSSIONS

Community infrastructural support and Food Systems

The concept of CFS places greater emphasis on community infrastructure because improved infrastructure can greatly enhance food security. Result in Table 2 shows communities' access to Islamic education (MWS = 1.96) and primary school (1.54), while means of transportation were mainly by foot (MWS = 1.81), cart driven (MWS = 1.77), bicycles (MWS = 1.82), motorcycles (MWS = 1.86) and tricycles (MWS = 1.83). Water sources in the communities were personal dug wells (MWS = 1.73), community wells (MWS = 1.89) and boreholes (MWS = 1.73). However, communities' health facilities, financial and agricultural institutions were completely not available. Similarly, the communities have

no access to market facilities except, kiosks. Also, access to secondary and tertiary education in the communities was limited. The consequence is that rural infrastructures are necessary for rural development (Memon *et al*., 2020), and their absence can have a detrimental impact on food security. This result is consistent with the findings of Nyor (2016), Daudu *et al*. (2018), Sari *et al*. (2019), and Adama *et al*. (2022), who all reiterated the considerable effects of rural infrastructures on community food security objectives.

Table 2. Availability and Accessibility of Community Infrastructure (n = 184)

Type	Infrastructure facility	Accessible	Not Accessible	WS	MWS
Schools	Islamiyya	176 (352)	8 (8)	360	1.96
	Primary	100 (200)	84 (84)	248	1.54
	Secondary	80 (160)	104 (104)	264	1.43
	Tertiary	69(138)	115 (115)	253	1.37
Health facility	Community health centre	20 (40)	164 (164)	204	1.11
	Primary health centre	52 (104)	132 (132)	236	1.28
	Secondary health centre	10 (20)	174 (174)	194	1.05
Financial institutions	Micro-finance Bank	5 (10)	179 (179)	189	1.03
	Cooperative society	48 (96)	136 (136)	232	1.26
	Thrift and loan	37 (74)	146 (146)	220	1.19
	Commercial Bank	10 (20)	174 (174)	194	1.05
	Development Bank	0 (0)	184 (184)	184	1.00
Market	Local weekly market	0 (0)	184 (184)	184	1.00
	Daily market	30 (60)	154 (154)	214	1.16
	Shops/kiosks	109 (218)	75 (75)	293	1.59
Agricultural institutions	ADP office	0 (0)	184 (184)	184	1.00
	Agricultural training centre	20 (40)	164 (164)	204	1.11
	Veterinary clinic	0 (0)	184 (184)	184	1.00
	Agricultural processing centre	0 (0)	184 (184)	184	1.00
	Storage facilities	44 (88)	140 (140)	228	1.24
Road network	Footpaths	115 (230)	69 (69)	299	1.62
	Laterite road	69 (138)	115 (115)	253	1.37
	Coal tarred road	78 (156)	106 (106)	256	1.39
Means of Transportation	Foot mainly	150 (300)	34 (34)	334	1.81
	Cart driven	141 (282)	43 (43)	325	1.77
	Bicycle	154 (308)	27 (27)	335	1.82
	Motorcycle	159 (318)	25 (25)	343	1.86
	Tricycle	153 (306)	31 (31)	337	1.83
	Vehicle	70 (140)	114 (114)	254	1.38
Water supply	Stream	0 (0)	184 (184)	368	1.00
	Personal dug well	143 (286)	40 (40)	326	1.77
	Communal well	149 (298)	36 (36)	348	1.89
	Borehole	134 (268)	50 (50)	318	1.73
	Tap water	70 (140)	114 (114)	254	1.38
	Reservoir (Rain water harvesting)	60 (120)	124 (124)	244	1.33
Housing facilities	Mud bricks (thatched)	145 (290)	39 (39)	329	1.79
	Mud bricks (zinc roofs)	140 (280)	47 (47)	327	1.78
	Cement bricks (thatched)	149 (298)	35 (35)	333	1.81
	Cement bricks (zinc roof)	153 (306)	31 (31)	337	1.83

Values in parenthesis represent weighted scores, WS = weight score, MWS = Mean weight score. The threshold = 1.5.
Source: Field survey, 2024

Community Food Security Status

The Household Food Insecurity Access Scale (HFIAS) and Household Hunger Scale (HHS) were jointly used to determine the status of the community's food security status. Results in Table 3 showed that the weighted mean scores, except, responses to questions 3 and 7 were above the threshold of food security (MWS≥2.00). This implies respondents' affirmation to the existence and experience of food insecurity in the communities. The validity of this result is in consonance with the submission of Winne *et al*. (2011) who averred that communities are considered food insecure if the following conditions are true: there are inadequate resources from which people can purchase foods; the available food purchasing resources are not accessible to all community members; the food available through the resources is insufficient in quantity or variety; the food available is not competitively priced and thus is not affordable to all households; there are inadequate food assistance resources.

The nexus of hunger and community food security enhance the understanding of the barriers to food security at different levels of analysis (Gallegos *et al*., 2023). The HHS food insecurity indicators (Table 4) showed that 59.24 and 24.46% of the respondents experienced moderate and severe hunger, respectively. However, 16.30% of the communities' members attested they have never experienced hunger. This result shows that the proportion of communities that experienced food insecurity is about 84%. This result is in harmony with the findings of Sari *et al*. (2019) and Dehrashid *et al*. (2021) where similar distributions were made.

. Table 3: Community Food Insecurity Indicators (n = 184)

S/No	CFS Indicators	Responses			WS	MWS
		Often	Some times	Never		
1	Was there ever no food of any kind to eat in your house because of lack of resources to get food?	57	76	51	374	2.03
2	Did you or any household member go to sleep at night hungry because there was not enough food?	48	98	38	378	2.05
3	Did you or any household member go a whole day and night without eating anything at all because there was not enough food?	13	33	138	243	1.32
4	Did you worry that your household would not have enough food?	54	80	50	372	2.02
5	Were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	77	49	58	387	2.10
6	Did you or any household member have to eat a limited variety of foods due to a lack of resources?	75	62	47	396	2.15
7	Did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	15	52	117	266	1.45
8	Did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	50	84	50	368	2.00
9	Did you or any household member have to eat fewer meals in a day because there was not enough food?	55	77	52	371	2.02

*N=number of responses, WS = weight score, MWS = Mean weight score. The threshold point = 2.00
Source: Field survey, 2024

Factors influencing Community Food Security

Factors influencing community food security are complex and multidimensional. Understanding these is key to solving food security challenges at all levels. The array of the underlying social, economic, environmental and institutional factors that affect the quantity, quality, and affordability of food (Table 5) shows that the community

food security objective is constrained by most factors included in the analysis especially; production factors (insufficient farmland, PCI = 273 and high cost of productive inputs, PCI = 256); social infrastructural factors (lack of agricultural support facilities, PCI = 266 and lack of markets, MWS = 246); environmental factors (drought, PCI = 269 and flooding, PCI = 256); socio-cultural constraints (socially unacceptable foods, PCI = 246 and gender disparity, PCI = 205) as well as socio-political factors (insufficient government support, PCI = 244 and Insufficient support for food production (Govt, NGOs), PCI = 144). The severity of production constraints for instance, implies that sustainable community food security can be achieved with improved land administration regimes and strong agricultural infrastructural support. This result aligns with the finding of Wudil *et al*. (2023) that low agricultural productivity and subsequent food insecurity are as a result of fragmented land holding, over reliance on rainfall, extreme climate events and poor economic base. Also, this result is corroborated by the submission of Wabwoba & Wakhungu (2013) that the CFS objective is constrained by group members' participation, land tenure-related issues, gender disparities, and unstable rainfall regimes.

Table 4: Community Food Security Status (n = 184)

HHS Indicators	**Responses**		**Food Security Status**
	Frequency	%	
Never (0 times)	30	16.30	No hunger
Sometimes (1 – 10 times)	109	59.24	Moderate hunger
Often (more than 10 times)	45	24.46	Severe hunger

Source: Field survey, 2024

Table 5: Constraints to Community Food Security System (n = 184)

Constraints	**Factor/Indicators**	**Severe**	**Less severe**	**Not a constraint**	**PCI**	**Rank**
Production constraints	Limited livelihood options	24 (48)	45 (45)	115 (0)	93	25
	Insufficient farmlands	104 (208)	65 (65)	15 (0)	273	1
	High cost of productive inputs	89 (178)	78 (78)	17 (0)	256	4
	Labour unavailability/cost high cost	67 (134)	43 (43)	74 (0)	177	21
Social infrastructure	Unavailability of Schools	59 (118)	63 (63)	62 (0)	181	20
	Markets facilities	91 (182)	64 (64)	29 (0)	246	7
	Lack of agricultural support facilities (e.g. training centres, storage facilities etc)	102 (204)	62 (62)	20 (0)	266	3
	Lack of health facilities	76 (152)	83 (83)	25 (0)	235	11
	Lack of financial institutions	68 (136)	79 (79)	37 (0)	147	22
	Poor road network	58 (116)	72 (72)	54 (0)	188	17
	Poor transportation facilities	53 (106)	94 (94)	37 (0)	200	14.5
	Poor water supply system	84 (168)	76 (76)	24 (0)	244	8.5
Environmental factors	Drought	106 (212)	57 (57)	21 (0)	269	2
	Flooding	97 (194)	62 (62)	25 (0)	256	5
	Desertification/desert encroachment	72 (144)	54 (54)	58 (0)	198	16
	Soil erosion	63 (126)	58 (58)	63 (0)	184	18
	Loss of biodiversity	32 (64)	81 (81)	71 (0)	145	23
	Erratic rainfall regime	76 (154)	63 (63)	45 (0)	217	12
Cultural/social constraints	Availability of culturally/socially unacceptable foods	85 (170)	76 (76)	23 (0)	246	7
	Gender disparity in agriculture	62 (124)	81 (81)	41 (0)	205	13
Socio-Political constraints	Lack of food assistance/aid	64 (128)	54 (54)	66 (0)	182	19
	Insufficient support for food production (Govt, NGOs)	81 (162)	75 (75)	28 (0)	237	10
	Poor food policy framework	64 (128)	72 (72)	48 (0)	200	14.5
	Inadequate support from the government	90 (180)	64 (64)	34 (0)	244	8.5
	Lack of community social networks	30 (60)	84 (84)	70 (0)	144	24

*cut-off point MWS ≥2.00. Values in parenthesis represent (mean scores)

CONCLUSIONS AND RECOMMENDATION

Community food security as global efforts is aimed at promoting strategies to address social, cultural and environmental factors, capable of influencing food availability, cost and quality of food within a community's food system. Findings from this study attest that food insecurity (hunger) is endemic among the communities surrounding Federal University Dutse which are characterised by weak rural infrastructural base and inadequate agricultural and food support systems. The study recommends that for the communities to improve food security, community projects targeted at addressing the myriad of production and infrastructural systems are essential to support the communities' food systems for improved and sustainable food security.

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Authors' Contributions

Author GTA managed the conceptualisation and design of the research, development of data collection instrument, analysis and interpretation, and revision of the manuscript. Author ENG managed the literature review, data collection, and interpretation of data and wrote the first draft. Author MOO managed the development of research methodology, data entry and coding, interpretation of data, and review and editing of the first draft. All authors read and approved the final manuscript.

Ethical Statement

Not applicable

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