Food insecurity access scale and dietary score as proxy indicators of nutritional status among backyard livestock households during COVID-19 pandemic in Southwest Nigeria

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Abstract

Food insecurity and dietary diversity of households are important nutrition outcome which have been found reliable in assessing the dietary intake of a population during a determined period and they have been used as indicators of food security among households. A facility based cross-sectional study design was conducted on 374 households that were involved in backyard livestock production in Southwest Nigeria during COVID-19 pandemic lockdown. Household dietary diversity (HDD) was measured using 12 different foods from which the HDD score was estimated, which is a continuous score ranged from 0 to 12, and was recoded to a three-level ordered categorical variable. Food insecurity was also assessed using household food insecurity access scale (HFIAS) generated from nine items (questions) specific to an experience of food insecurity occurring within the previous four weeks among the households. A probit regression model was specified to determine the variables responsible for increasing the probability of the households being food insecure during the lockdown. Result showed that more than half of households involved in backyard livestock production was within medium dietary diversity category (71.7%) and moderately had access to food (75.4%). State of residence, household size, income generated by members of households, species of livestock raised and purpose of livestock production were major determinants of food insecurity (access) during the COVID-19 pandemic lockdown among the respondents. Thus, there is need to promote sustainable and diversification of livelihood among households through backyard livestock production in a bid to increase and sustain their food security status.

Keywords: Backyard livestock, COVID -19 pandemic, dietary diversity, food security, lockdown

Échelle d'accès à l'insécurité alimentaire et score diététique comme indicateurs indirects de l'état nutritionnel des ménages d'élevage de basse-cour pendant la pandémie de COVID-19 dans le sud-ouest du Nigéria

Résumé

L'insécurité alimentaire et la diversité alimentaire des ménages sont des résultats nutritionnels importants qui se sont avérés fiables pour évaluer l'apport alimentaire d'une population pendant une période déterminée et qui ont été utilisées comme indicateurs de la sécurité alimentaire des ménages. Une conception d'étude transversale basée sur les installations a été menée sur 374 ménages impliqués dans la production de bétail de basse-cour dans le sud-ouest du Nigéria pendant le confinement de la pandémie COVID-19. La diversité alimentaire des ménages (HDD) a été mesurée à l'aide de 12 aliments différents à partir desquels le score HDD a été estimé, qui est un score continu allant de 0 à 12, et a été recodé en une variable catégorielle ordonnée à trois niveaux. L'insécurité alimentaire a

également été évaluée à l'aide de l'échelle d'accès à l'insécurité alimentaire des ménages (HFIAS) générée à partir de neuf éléments (questions) spécifiques à une expérience d'insécurité alimentaire survenue au cours des quatre semaines précédentes parmi les ménages. Un modèle de régression probit a été spécifié pour déterminer les variables responsables de l'augmentation de la probabilité que les ménages soient en situation d'insécurité alimentaire pendant le confinement. Les résultats ont montré que plus de la moitié des ménages impliqués dans la production de bétail de basse-cour appartenaient à la catégorie de diversité alimentaire moyenne (71,7%) et avaient modérément accès à la nourriture (75,4%). L'état de résidence, la taille du ménage, les revenus générés par les membres des ménages, les espèces de bétail élevées et le but de la production animale étaient les principaux déterminants de l'insécurité alimentaire (accès) pendant le confinement de la pandémie COVID-19 parmi les répondants. Ainsi, il est nécessaire de promouvoir la durabilité et la diversification des moyens de subsistance parmi les ménages grâce à la production de bétail de basse-cour dans le but d'augmenter et de maintenir leur niveau de sécurité alimentaire.

Mots clés: Bétail de basse-cour, pandémie COVID -19, diversité alimentaire, sécurité alimentaire, confinement

Introduction

The Coronavirus (COVID-19) pandemic is the global health crisis of this time which is the greatest challenge faced globally since World War II (UNDP, 2020). Since its emergence in Wuhan city, China in 2019 the virus has spread to every continent of the world with rising cases in America, Europe and Africa. According to UNDP (2020), COVID-19 is much more than a health crisis, it has potentials of creating social, economic and political crises. In Nigeria, the first confirmed case of the pandemic was announced on 27th February, 2020, when an Italian citizen in Lagos (one of the Southwestern states in Nigeria) tested positive for the virus. On 9th March, 2020, a second case of the virus was reported in Ewekoro, Ogun state (another Southwestern state), a Nigerian citizen who had contact with the Italian citizen. On 29th March, 2020, Lagos, Abuja and Ogun states were locked down for 14 days under the emergency measures announced by Nigeria's President, Muhammadu Buhari which was extended on 10th April, 2020, in furtherance of the emergency measures and to prevent the spread of the virus. These measures were adopted and implemented

by other states of Federation. Measures to mitigate COVID- 19 outbreaks are already affecting global food supply chains. Border restrictions, lockdowns and other measures are affecting agricultural activities, slowing harvests; many workers are out of their jobs without means of livelihoods, while also constraining transport of food to markets. Meat processing plants and food markets are being forced to close in many locations due to serious COVID-19 outbreaks. As a result, many people in urban centres now struggle to access fresh fruits and vegetables, dairy, meat, fish and other agricultural produce. The restrictions on movements caused consumers to spend primarily on essential goods and services as well as low expectations of income which will generally lead to fall in household consumption. The pandemic is impacting global food systems, disrupting regional agricultural value chains and posing risks to household food security (FAO, 2019). Hundreds of millions of people were already suffering from hunger and malnutrition before the virus hit. Prior to the onset of this pandemic, more than 820 million people were already identified as chronically food insecure (IPC, 2019). Thus, the combined effects of COVID-19

itself, as well as corresponding mitigation measures, and the emerging global disasters could, without large-scale coordinated action, disrupt the functioning of food systems. Such disruption can result in consequences for health and nutrition of a severity and scale unseen. Moreover, the pandemic came at a time when food security and food systems were already under threats due to the effects of conflict, natural disaster, climate change, occurrence of pests and plagues which preceded COVID-19 and were already undermining food security in many contexts. Food insecurity is a condition in which people lack basic food intake necessary to provide them with energy and nutrient required for productivity. Transitory food security occurs when there is a temporary decline in access to adequate food because of instability in food production, food price increase or income shortfalls (Omonona and Agoi, 2007). Campbell (1991) outlined the four essential components of a measure of food security at the individual and household levels as: (i) availability of having sufficient quantity of food, (ii) quality of the available food concerning the food types and the diversity of the diet, (iii) physiological acceptability relating to feelings of food deprivation, restricted food choice, and anxiety about the quantity and quality of food on-hand in the households stores, and (iv) social acceptability of consumption patterns, determined by social norms in respect of meal frequency, composition and way of food acquisition such as being able to purchase foods instead of having to beg, scrounge, or steal food. Food insecurity remains a fundamental challenge in Nigeria as the Food and Agriculture Organization (FAO, 2004) enlists Nigeria among countries faced with serious food insecurity. In Nigeria, there is high level of food insecurity for the past four decades (Otaha, 2013). The National Planning Commission (NPC, 2005; 2010)

pointed out that the existence of this problem of food insecurity as at 2004 was more than a third of the population (34.9%) lived in a state of food poverty and worsened over a five year period in 2010 to 38.7% of the Nigerian population. Sustainable livestock production plays an important role in solving food insecurity among farmers' households in Nigeria. The productivity of livestock farmers in Nigeria is still low and this affects their income and household food security. Livestock have the potentials to be transformative by enhancing food security, and providing income to pay for education and other needs, livestock can enable poor children to develop into healthy, well-educated and productive adults (Smith *et al.*, 2013). There are some common livestock species that are raised at backyard within households which are purposively produced to improve household food security. Such livestock species include poultry, small ruminants, pig and mini-livestock species (rabbit, guinea pig, grasscutter). Raising of livestock species such as poultry birds (chicken, turkey, geese, quail, duck), sheep and goats, pig and minilivestocks have been reported to help households in improving their food and nutrition security through increase in animal protein consumption, used to meet immediate cash needs and some other socio-cultural functions (Popoola, 2019). Several indicators have been used to measure household food security as there is no single indicator that measures it. Emphasis on addressing constraints to food security has intensified the search for accurate, rapid, and consistent indicators of food security. Barrett (2010) reported that approaches to measurement follow the four major “pillars” of food security—availability, access, utilization, and risk (that is stability or vulnerability)—which in turn tend to follow different strands of analysis. Food may be available

but not accessible to certain households during a given period of time if they cannot acquire a sufficient quantity or diversity of food through these mechanisms (Fanzo, 2017). This necessitates the development of methodological tools to identify and assess the different dimensions of food insecurity among households particularly during the COVID-19 pandemic. Household Dietary Diversity Score (HDDS) is a qualitative methodology that has been validated in different countries as an approximate measure of food availability and food accessibility aspects of food security (Ruel, 2003; Cordero-Ahiman *et al.*, 2017). According to FAO (2008), dietary diversity scores consist of a simple count of food groups that a household or an individual has consumed over the past 24 hours. The HDDS is used as a proxy measure of the socio-economic level of households (Swindale *et al.*, 2006), it assesses number of different food groups consumed in the household during a defined reference period, such as the last 24 or 48 hours or the last 7 or 14 days (Cordero-Ahiman *et al.*, 2017). HDDS was used to assess number of different food groups consumed in the household during lockdowns. Thus, a diversified diet was linked to the economic ability of a household to access a variety of foods by obtaining a number of different food groups consumed during the lockdowns. In general, conditions of food insecurity are believed to affect all household members, although not necessarily in the same way. Food Insecurity Access Scale (HFIAS) is an adaptation of the approach used to estimate the prevalence of food insecurity in the United States annually (Coates *et al.*, 2007). The household food insecurity access scale (HFIAS) is a measure developed by FANTA to assess food access problems faced by households during a recall period of 30 days. It aims to capture the changes in food consumption patterns and reflect the

severity of food insecurity faced by households due to lack of or limited resources to access food. It is composed of nine questions, and these questions relate to three different domains of the access component of food insecurity: anxiety and uncertainty about household food access, insufficient quality, and insufficient food intake (Swindale *et al.*, 2006). The method is based on the idea that the experience of food insecurity (access) causes predictable reactions and responses that can be captured and quantified through a survey and summarized in a scale. Then, when the HFIAS classifies a household into severely food insecure with under nutrition, it implies that at least some members, or a member, of the household are experiencing under nutrition due to inadequacy of food access, but not all members, because this scale has been found reliable for describing the status of a population. Based on this growing body of evidence, FAO-FANTA (2007) have identified a set of questions that have been used in several countries and appear to distinguish the food secure from the insecure households across different cultural contexts. The information generated by the HFIAS can be used to assess the prevalence of household food insecurity (access) for geographic targeting and to detect changes in the household food insecurity (access) situation of a population over time for monitoring and evaluation (Coates *et al.*, 2007). Thus, assessing food insecurity access and nutritional status among backyard livestock households during COVID-19 Pandemic in Southwest Nigeria makes it particularly relevant given the effects of restrictions and lockdowns on their levels of food security.

Methodology

The study was conducted in Southwest Nigeria, being one of the regions mostly affected by COVID-19 pandemic in the country. The region is made up of six States

which are; Ekiti, Lagos, Ogun, Ondo, Osun and Oyo (Fig. 1). The area lies between longitude $2^{\circ} 3'$ and $6^{\circ} 00'$ East and latitude $6^{\circ} 2'$ and $8^{\circ} 37'$ North. It has a total land area of 77,818 km² with 27 511 892 population (NPC, 2006). There are two distinct seasons in a year which are: rainy season (April-October) and dry season (November-March). The temperature zone ranges between 21°C and 28°C with high humidity of 77%. The region is suitable for agricultural activities considering the

weather condition; major crops grown in the region include cassava, maize, cocoa, yam, cocoyam, plantain, oil palm. Livestock animals like cattle, sheep, goat, poultry species, and rabbits are also raised in the region. Besides agriculture, other occupations like civil service jobs, artisan, trading, are also engaged in by the people of the region. The official language is English, while the major informal language for communication in this region is Yoruba, with different dialects.

Table 1: Socio-economic characteristics of respondents

Variables	Frequency	Percentage	Mean
Sex			
Male	222	59.4	
Female	152	40.6	
Age (years)			
< 20	26	7.0	
20-24	46	12.3	
25-29	96	25.7	34.6
30-34	100	26.7	
35-39	34	9.1	
40- 49	62	16.6	
>49	10	2.7	
Marital status			
Single	152	40.6	
Married	222	59.4	
State of residence			
Ekiti	61	16.3	
Lagos	63	16.8	
Ogun	63	16.8	
Ondo	61	16.3	
Osun	61	16.3	
Oyo	65	17.9	
Household size			
1-3	102	27.3	
4-6	214	57.2	5
7-9	44	11.8	
> 9	14	3.7	
Educational level			
Secondary	6	1.6	
Tertiary	368	98.4	
Occupation type/ status			
Self- employed	108	28.9	
Employee	160	42.8	
Unemployed	104	27.8	
Retiree	2	0.5	
Tribe			
Yoruba	348	93.0	
Hausa	12	3.2	
Ibo	14	3.7	
Religion			
Islam	168	44.9	
Christianity	206	55.1	
Monthly income (₦)			
<30,000	184	49.2	
30,000 – 40,000	136	36.4	
40,001 – 50,000	28	7.5	
50,001 – 60,000	2	0.5	45,456.67
>60,000	24	6.4	

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Results of livestock production characteristics of the respondents are presented in Table 2. Results showed that most (48.7%) of the respondents were engaged in chicken production, followed by 39.8% who were raising sheep and goat (small ruminants) while the least livestock raised by respondents was grasscutter (1.9%). Generally, the result revealed that more than half (55.8%) of the respondents were raising poultry species (chicken, duck and guinea fowl), this may be due to the fact that poultry species (particularly backyard poultry system) requires less management in terms of housing, feeding, handling and health compared to other livestock species. The objective of production of more than half of the respondents (61.2%) was for family consumption, followed by those who were raising the animals for sales and consumption (20.6%), this may be due to the fact that the respondents put their animals for sale when there was increase in number of the animals and/or sold the animals to meet immediate cash needs of the family as reported by Popoola (2019). Few

(18.2%) of the respondents raised the animals for the purpose of sales. The result further revealed that more than half (64.4%) of the respondents got animals they were raising from buying, followed by those who started their stock from animals they inherited from their parents (13.6%), this implies that these respondents started their stocks through succession and inheritance; 15.3% of the respondents started their flock when animals were given to them to raise on behalf of someone (neighbor, family and friends), this is a common practice among people in Southwest region of Nigeria; the least were those who started their stocks from animals given to them as gift by their parents, grandparents, friends and other family members. However, there was stock outflow majorly (59%) when the respondents slaughter the animals for consumption, followed by sales (17.6%), when there was mortality (13.9%) and the least was when the animals were given out as gift (9.4%) to family and friends.

Table 2: Livestock production enterprise of respondents

Variables	Frequency (N = 374)	Percentage (%)
Livestock species raised		
Chicken	146	48.7
Rabbit	35	9.4
Sheep	64	17.1
Goat	85	22.7
Duck	19	5.1
Guinea fowl	10	2.0
Pig	8	2.7
Grasscutter	7	1.9
Purpose of production		
Consumption	229	61.2
Sales	68	18.2
Sales and Consumption	77	20.6
Sources of stock (inflow)		
Purchase	241	64.4
Gift	36	9.6
Contract raising	46	15.3
Succession and Inherited	51	13.6
Flock outflow		
Sales	66	17.6
Slaughtered for consumption	221	59.0
Gift	35	9.4
Mortality	52	13.9

Distribution of households according to consumption of major food groups is presented in Table 3. As presented in the result, food groups were consumed by respondents in varying percentages. The result revealed that in the previous 24 hours during COVID-19 pandemic lockdown, most of the households consumed all the 12 groups of food - cereals; roots and tubers; vegetables; fruits; meat, poultry, offal; eggs; fish and seafood; pulses, legumes, nuts; milk and milk products; oil/fats; sugar/honey; condiments and spices. Similar result was reported by Hussein *et al.* (2018) on household food insecurity and household dietary diversity of people living with HIV (PLHIV) and nutritional status among PLHIV/AIDS. However, few of the households did not consume the food groups in the previous 24 hours of the lockdown. Diets of the households in the study areas gave a clear idea of the quality of food that households have access to.

Table 4 shows the results on household dietary status of the respondents. The result revealed that 4.8% of the households were within low dietary diversity category (with dietary diversity score of less than or equal 3). More than half (71.7%) of households were within medium dietary diversity category with scores ranging between 4 and 6 points while the rest 23.5% were within the range of high dietary diversity category with the score above 7 points. This implies that about 5% of the households do not have adequate dietary diversification while majority (about 95%) enjoyed good dietary diversification. This also indicates that there was significantly better dietary diversity (a proxy for the quality of diet to which an average household has access) was experienced by the households, thus dietary status of an average household was ranked as to be moderate.

Table 5 shows the household food insecurity access scale generic questions following the procedure of FAO-FANTA (2007). Result revealed that during the

COVID-19 pandemic lockdown, more than half (75.4%) of the households worried that they would not have enough food (75.4%); were not able to eat the kinds of foods they preferred because of lack of resources (63.1%); have to eat a limited variety of food due to lack of resources (69.5%); have to eat some foods that they really did not want to eat because of a lack of resources to obtain other types of food (58.3%); had to eat a smaller meal than they felt they needed because there was no enough food (61.5%); have to eat fewer meals in a day because there was not enough food (59.4%). However, result also showed that more than half of the households had no food to eat of any kind because of lack of resources to get food (67.9%); never went to sleep at night hungry because there was no enough food (88.8%); never went a whole day and night without eating anything because there was not enough food. The result further revealed that most of these households rarely experience these patterns of food access.

The food insecurity (access) of households using HFIAS scores is presented in Table 6. Result showed that more than half of the households (75.4%) moderately have access to food during the lockdown and restrictions; some were less food insecure during the lockdown and few (4.3%) were mostly have access to food during the lockdown. The result showed the nutritional outcomes of the respondents with most households recording moderate nutritional status. The HFIAS index or prevalence represents the condition of household members as a group, and not food insecurity as believed to affect all household members, although the effect may not necessarily be in the same way during the lockdown. Consequently, when the scale measure classifies a household to be moderately food insecure, this implies that during the lockdown, at least some households were experiencing hunger due to insufficiency of resources, but not necessarily all households.

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Table 3: Distribution of households according to consumption of major food groups

Variables	Frequency	Percentage
Cereals and grains		
Yes	366	97.9
No	8	2.1
Roots and tubers		
Yes	310	17.1
No	64	82.9
Vegetables		
Yes	310	82.9
No	64	17.1
Fruits		
Yes	288	77.0
No	86	23.0
Meat, poultry, offal		
Yes	290	
No	84	
Eggs		
Yes	252	67.4
No	122	32.6
Fish and seafood		
Yes	272	72.7
No	102	27.3
Pulses, legumes and nuts		
Yes	268	71.7
No	106	28.3
Milk and milk products		
Yes	246	65.8
No	128	34.2
Oil/fats		
Yes	368	98.4
No	6	1.6
Sugar / Honey /Sweet		
Yes	274	73.3
No	100	26.7
Condiments / Spices		
Yes	328	87.7
No	46	12.3

Table 4: Household dietary diversity status of the respondents

Dietary diversity	Cut-off values	Frequency	Percentage
Low dietary diversity		18	4.8
Medium dietary diversity	(HDDS 4-6)	268	71.7
High dietary diversity	(HDDS 7-12)	44	23.5

Table 5. Household food insecurity access scale generic questions

Occurrence questions	Yes		No		Rarely		Sometimes		Often	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
During the COVID 19 pandemics lockdown did you worry that your household would not have enough food ☐	282	75.4	92	24.6						
How often did this (worry) happen ☐					158	56.0	104	36.9	20	7.1
During the COVID 19 pandemics lockdown, were you or any household member not able to eat the kinds of foods you preferred because of lack of resources ☐	236	63.1	138	36.9						
How often did this happen ☐					100	42.4	92	39.0	44	18.6
During the lockdown, did you or any household member have to eat a limited variety of food due to lack of resources ☐	260	69.5	114	30.5						
How often did this happen ☐					120	46.2	80	30.8	60	23.0
During the lockdown 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 ☐	218	58.3	156	41.7						
How often did this happen ☐					98	45.0	62	28.4	58	26.6
During the lockdown did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food ☐	230	61.5	144	38.5						
How often did this happen ☐					110	47.9	78	32.1	46	20.0
During the lockdown did you or any household member have to eat fewer meals in a day because there was not enough food ☐	222	59.4	152	40.6						
How often did this happen ☐							190	85.6	32	14.4
During the lockdown was there ever no food to eat of any kind in your household because of lack of resources to get food ☐	120	32.1	254	67.9						
How often did this happen ☐					52	43.3	38	31.7	30	25.0
During the lockdown did you or any household member go to sleep at night hungry because there was no enough food ☐	72	19.3	302	80.7						
How often did this happen ☐					30	41.7	22	30.6	20	27.7
During the lockdown did you or any household member go a whole day and night without eating anything because there was not enough food ☐	42	11.2	332	88.8						
How often did this happen ☐					20	47.6	14	33.3	8	19.1

Table 6: Food insecurity (access) of households using HFIAS index

Food insecurity	Cut-off value	Frequency	Percentage
Less food insecurity (access)	0-11	76	20.3
Moderately food insecurity (access)	12-16	282	75.4
More food insecurity (access)	>17	16	4.3

Table 7 shows the determinants of household food insecurity (access) in Southwest Nigeria during COVID-19 lockdown. The result revealed that as regards the goodness of fit of the model, 76.58% estimated coefficients of the model explained variations in observations of the food insecurity index. The explanatory variables were statistically significant since 20.94 was obtained for the likelihood statistic with p-value of 0.0734. Result further revealed that state of residence of households in Southwest Nigeria ($p<0.01$), household size in these regions of the country ($p<0.01$), income earned by members of households ($p<0.01$), species of livestock raised by the households ($p<0.01$) and purpose of livestock production by the households ($p<0.01$) had propensity of being significant determinants of the households being food insecure during the period of COVID-19 lockdown. The result showed that one more increase in household member increases the probability of being classified as more food insecure. This implies that more children with limited income sources could lead to allocation of the already meager household resources over wider range of competing needs; among these are investment on children education and health with more mouths to feed, which in turn, could lead to large negative effect on per capita income growth of the households thereby resulting to less food access. Jones *et al.* (2014) reported similar result with HDDS; the authors reported that increased household member will lead to increased HDDS. Otunaiya and Ibidunni, (2014) also reported

household size as significant determinants of food security among farming households. States of residence of households in Southwest Nigeria were major determinants of food insecurity during the COVID-19 pandemic lockdown. The severity of food insecurity varies in different states of Southwestern Nigeria. This was due to the fact that some states were under total lockdown, lockdown in some states was partial while movements were not restricted in few states of the region. Lagos state was under strict lockdown and restrictions because it is epicenter of the pandemic in Nigeria and Ogun state was also under strict lockdown because it is the closest state to Lagos state. Other states like Osun, Ondo and Ekiti were not under total lockdown while Oyo state was neither under lockdown nor movement was restricted. Thus, it can be concluded that lack of access to food stores, local markets, health centers, farms and other essential facilities might intensify the vulnerability to food insecurity across different states in this part of the country. The severity of access to food varies from one state to another because of different levels of lockdown and restrictions in these states. Income of household members was also a determining factor for food security, and was significantly related to food security, with relevant decrease in food insecurity in households as income generated increase. This implies that income generated by household heads during the lockdown increases the access to food and other resources needed by the households. Households that are involved in backyard livestock production tend to be food secured during the pandemic as some of these livestock species like chicken, duck, pig, rabbit, sheep and goat can be slaughtered and consumed by these households during the restrictions when it was difficult to get meat at the market because food markets were not fully in operation during the lockdown. Also these households can easily sell their stocks to meet their immediate cash needs within their neighbourhood if it was difficult for them to get to market. In a study conducted by Popoola *et al.*, (2017) on backyard poultry production among households, the authors reported that the purpose of production was found to be significant determinants of food security.

Table 7: Probit regression of determinant of food insecurity among households involved in backyard livestock production in Southwest Nigeria during COVID-19 lockdown

Variables	Estimated coefficient (β)	Standard error	t-ratio
Sex	-0.046	0.074	-0.618
Age	-0.036	0.021	-1.1718
Marital status	0.071	0.084	0.843
State of residence	0.039**	0.018	-2.136
Household size	0.108**	0.051	-2.104
Educational level	-0.663	0.294	-2.251
Occupational status	-0.058	0.049	-1.188
Tribe	0.072	0.089	0.809
Religion	-0.035	0.073	-0.480
Income	0.400**	0.036	-1.109
Livestock species raised	0.256**	0.016	-1.237
Purpose of production	0.231**	0.023	-1.177
Livestock inflow	0.045	0.093	0.461
Livestock outflow	-0.367	0.087	-0.623
Log likelihood Function	-90.672		
scale factor	0.34233		
% correctly predicted	76.58		
Chow R-squared	0.11478		
Cragg- uhler R-squared	0.15393		
Likelihood ratio statistics	20.9366		
p χ^2 chi squared	0.0734		
F	0.11751		

Sample size (N) = 374, ** sig at 0.01, df =10

Conclusion

The study showed that Food Insecurity Access Scale was a sensitive proxy indicator as compared to Household dietary diversity scale, but Household dietary diversity scale is specific as compared to Food Insecurity Access Scale, this is due to the recall period of 30 days for Food Insecurity Access Scale and 24 hours scale for Household dietary diversity scale. While Household dietary diversity scale focus on the dietary intake of household, Food Insecurity Access Scale tools combine both dietary intake and food access items used to estimate food insecurity of the households in the study areas. In assessing food security levels especially in limited resource setting particularly during the COVID-19 lockdown and restrictions, both Food Insecurity Access Scale and Household dietary diversity scale score were found valid and reliable proxy

indicator for measuring nutritional status among the backyard livestock households in the study areas. Conclusively, the lockdown and restrictions during the COVID-19 pandemic affected an average backyard livestock household access to food commodities. Food insecurity was prevalent transiting from states with total lockdown than those with partial lockdown; larger backyard livestock households were significantly more food insecure than smaller households, backyard livestock production have potentials of improving food security among the households. There is need to promote sustainable and diversification of livelihood among households through backyard livestock production in a bid to increase and sustain their food security status as well as need establish the use of frequent food security monitoring systems to provide up-to-date information on the impacts of the outbreak

on food security among households.

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