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## IMPACT OF SOYBEAN PRODUCTION ON NUTRITION OF 0-5 YEARS OLD CHILDREN AND DIETARY DIVERSITIES OF THE HOUSEHOLDS IN KANO STATE, NIGERIA

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### Abstract

The International Institute of Tropical Agriculture and collaborating partners have been introducing and disseminating short season soybean varieties among farm households in the Sudan savannas of Northern Nigeria since 2008. This study estimated the impact of soybean production on nutrition of 0-5 year children and dietary diversities of the households in Kano State, Nigeria of the early maturing soybean. A total of 1133 children (488 girls and 645 boys) across the three LGAs of Bunkure, Shanono and Dawakin Tofa, aged between 0-60 months were surveyed using the variables (WFA) Weight for Age, (HFA) (Height for Age) and WFH (Weight for Height). The anthropometric indices were used to obtain the Z scores of sampled children (age 1-5 years). Results of the anthropometric indices from the study generally showed a low prevalence of malnutrition among the children sampled for all the nutritional variables. Majority of the children fall within the normal Z score values ( $Z > -1$ ). Across the LGAs, malnutrition is noticed only among children of the non-soybean producing households in Shanono LGA. Findings from the study showed that the frequency of the intake of soybean related meals compares favorably with the intake of cereals and other legumes related meals across the 3 LGAs on daily, weekly and monthly basis.

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**Keywords:** Soybean varieties, Child nutrition, Dietary diversity, Household, Kano State

### Introduction

Malnutrition can be defined as a state of nutrition where the weight for age, height for age and weight for height indices are below-2 Z-score of the NCHS reference. It has posed a great economic burden to the developing world (Manyike *et al.*, 2014). Adegbusi and Sule (2011)

anthropometric and biochemical assessment of under 5 children in Kusada LGA, Katsina State Nigeria using the mid-upper-arm circumference (MUAC) anthropometric methodology found that 24% suffered from different grades of under-nutrition with a set point of 13.5cm. Their study further revealed the nutritional status of the children as indicated by weight-for-height (WFH) index that 36% were of different grades of protein energy malnutrition. Thus, improving the nutritional status of children has been the concern of government and other organizations. In particular, the International Institute of Tropical Agriculture and collaborating partners have been introducing and disseminating short season soybean varieties among farm households in the Sudan savannas of Northern Nigeria since 2008 under the Sudan Savanna Task Force (SSTF). The major aim of the Sudan Savanna Task Force (SSTF) in Kano State, Nigeria is to improve the nutrition of the entire members of the farming households by feeding them healthier with different soybean products. Thus, the SSTF has introduced early maturing soybean varieties to the dry savanna of Kano State, Nigeria and also demonstrated to households the processing of soybean products. The SSTF also focuses on how the increment in farming households' income in the study area multiplied their consumptions of various dietary types. The objectives of this were to: (i) analyze the impact of soybean on the nutritional status of children [0-60 months] in the farmers' households of Kano State and, (ii) Assess the dietary diversities of households in the study area.

## **Methodology**

The data for this study were obtained through a household survey that was conducted in January 2015 (Data from 2014 cropping season). Three Local Government Areas (Two Innovation Platform (IP) LGAs: Bunkure and Shanono, and one counterfactual LGA: Dawakin-Tofa) in Kano State were selected for the purpose of data collection. Each IP covers ten villages within a Local Government Area. Ten counterfactual villages were chosen for comparison purposes. 30 farming households were randomly selected per village in the IP villages among the project farmers. 30 farming households were selected per village in the counterfactual villages (All were non project farmers). The total sample size for the study was 900 households. A total of 1133 children (488 girls and 645 boys) were picked across the three LGAs surveyed from the soybean and non soybean producing households. Anthropometric measurements of children were taken at the time of the survey. The variables obtained from the children were (WFA) Weight for Age, (HFA) (Height for Age) and WFH (Weight for Height) (Table 1).

### Method of Data Analysis:

Anthropometric indices to assess the impact of soybean varieties on the nutritional status of children 0 to 5 years (60 months) in the study area was constructed to obtain Z scores weight-for-age (WFA), Height-for-age (HFA) and weight-for-height (WFH). Z scores was calculated to express the extent to which anthropometric measurements of the individual child deviate from the median of the age-specific measures in the reference population. These was obtained using the

standard age-sex specific median from the United States of America National Centre for Health Statistics (NCHS) Population Standard (Latham, 1997).

Based on NCHS growth standard, Z scores was computed as follows:

$$Z_i = \frac{X_i - X_s}{\sigma} \text{-----(1)}$$

Where:  $Z_i$  = Standard score of child  $i^{th}$ ,  $X_i$  = the actual value of the anthropometric measurement of the child (weight or height),  $X_s$  = the sex and age specific of the standard population,  $\sigma$  = Sex and age specific of the standard deviation of the standard population.

To compare the anthropometric indices o each child in the study area, the following formula was used:

1. Weight-for-age ( $Z_{WFA}$ )

$$Z_{WFA} = \frac{\text{Weight-Median } (Z_{WFA})}{1SD_{WFA}} \text{-----(2)}$$

2. Height-for-age ( $Z_{HFA}$ )

$$Z_{HFA} = \frac{\text{Height-Median } (Z_{HFA})}{1SD_{HFA}} \text{-----(3)}$$

3. Weight-for- height( $Z_{WFH}$ )

$$Z_{WFH} = \frac{\text{Weight-Median } (Z_{WFH})}{1SD_{WFH}} \text{-----(4)}$$

The result obtained of the Z-score value was then compared with the standard WHO/NCHS nutritional standards as follows:

$Z > 2$  is recognized as above normal,  $Z > -1$ : normal;  $-1.00 > Z > -2.00$ : mild nutrition;  $-2.00 > Z > -3.00$ : moderate nutrition;  $Z < -3.00$ : severe nutrition.

**Source:** Sanginga *et al.* (2002).

## Results and Discussion

The anthropometric indices generally showed a low prevalence of malnutrition among the children sampled for all the nutritional variables (Table 1). Majority of the children fall within the normal Z score values ( $Z > -1$ ). Across the LGAs, malnutrition is noticed among children of the non-soybean producing households in Shanono LGA. The incidence is more common among the youngest girls 0-12 months in Bunkure and Shanono and medium aged (25-28 months) girls in Shanono that are either underweight (wasted) ( $Z_{WFA}$ ) or stunted ( $Z_{HFA}$ ). The result indicates that children aged 13-24 months and 49-60 months are better in terms of nutrition than those within

the ages of 0-12 months, 25-36 months and 37-48 months. Malnutrition incidence among the boys shows that the youngest in Shanono are wasted (ZWFA) and stunted (ZHFA). Comparatively, the nutritional status by gender revealed that boys are much better than girls and children of soybean producing households are better than those of the non-soybean growers.

Malnutrition is generally low in the study area because farmers, apart from soybean, grow other crops like cowpea, maize and sorghum for sale and local consumption. These crops are equally nutritious. Empirical data from the research showed that the soybean producing households in the 3 LGAs have more farm income than the non soybean producing households. This together with intake of diverse soybean meals may explain the incidence of malnutrition noticeable in non soybean producing households. Malnutrition is more among the 0-12 months old children maybe because of their fragile nature.

#### Dietary Diversities of the Farming Households:

Dietary diversities of farming households were assessed in terms of food consumption pattern and the forms in which soybean is consumed by households. The results on these two measures of dietary are presented and discussed below.

#### Food Consumption Pattern

The results on household food consumption pattern are presented in Table 2. Consumption of soybean related meals is comparable to consumption of cereals related meals and other legumes related meals (Table2). Over 90% of the households in the 3 LGAs consume soybean related meals as much as cereal related meals. This shows the importance of these two groups of meals in the diets of the households in the study area. The frequency of the intake of soybean related meals compares favorably with the intake of cereals and other legumes related meals across the 3 LGAs on daily, weekly and monthly basis. This implies that soybean has been accepted as one the major food crops of the dry savanna of Kano State.

#### Distribution of Soybean producing Households According to Form in which Soybean is Consumed

Soybean is consumed by over 90% of the households' study across the 3 LGAs as *awara* (fried soybean cake) (Table 3). Fried soybean cakes (*awara*), a snack made from soybean, was the most popular soybean meal in the area. Soybean is consumed also in form of *soy-dadawa*, *soy-kunun*, soy-milk and soy-flour across the 3 LGAs. Soybean *dadawa* the fermented bean flavoring is a substitute for locust beans in daily cooking. It was used by up to 66% of the farming households in Shanono LGA but less use in the other two LGAs. Processing of soybean into soy-bread, soy-meat and soy-cheese is not widespread in the 3 LGAs yet.

#### **Conclusion**

The study concludes that there was no malnutrition among the children of the soybean producing households in all the three LGAs due to the frequency of the intake of soybean related meals, and

consumption of other food crops like cowpea, maize, groundnut and sorghum grown. The intake of soybean related meals by soybean farming households contributed much to non malnutrition status of children (0-60 months) in the study area. The soybean cake (*awara*) is the most predominant form in which soybean is consumed in the study area. Soy milk, soy cheese and soy bread are also highly nutritious, but with low consumption by households because of complication in processing them. The study recommends the partnership of government with IITA to make the improved early maturing soybean seeds available to the farmers in the study area to sustain the soybean production. IITA should continue teaching the various soybean processing methods to the women in the study area.

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## Abbreviations and Acronyms

AEZs	<b>Agro-ecological zone</b>
BL	Baseline
DF	Degrees of Freedom
IAR4D	Integrated Agricultural Research for Development
IITA	International Institute for Tropical Agriculture
IPs	Innovation Platforms
KKM	Kano–Katsina–Maradi
SS	Sudan Savanna
SSTF	Sudan Savanna Task Force
KNARDA	Kano Agricultural and Rural Development Authority
<b>LGAs</b>	Local government areas
SSA-CP	Sub-Saharan Africa Challenge Program
TFs	Task Forces: ZMM Zimbabwe–Malawi–Mozambique
FARA	Forum for Agricultural Research in Africa

**Table 1:** Mean Z Score Values of the nutritional status variables of children [0–60 months] by sex and age group.

Age Group [months]	Soybean Growing Households														
	Non Soybean Growing Households						Soybean Growing Households								
	Girls			Boys			Girls			Boys					
	ZWFA	ZHFA	ZWFH	ZWFA	ZHFA	ZWFH	ZWFA	ZHFA	ZWFH	ZWFA	ZHFA	ZWFH	ZWFA	ZHFA	ZWFH
<b>Bunkure</b>															
0-12	2.459	-0.493**	9.524	0.568	-0.003	1.182	0.994	-0.297	2.417	0.167	-0.243	1.485			
13-24	0.511	-0.064	0.667	0.238	-0.207	1.534	0.054	-0.314	2.046	0.050	-0.196	1.348			
25-36	-0.145	-0.209	0.418	-0.281	-0.183	0.157	0.166	-0.282	1.877	-0.100	-0.203	0.689			
37-48	0.115	-0.311	2.593	-0.244	-0.350	0.841	-0.069	-0.393	2.390	0.049	-0.341	1.557			
49-60	-0.201	-0.284	0.845	0.534	-0.298	2.102	0.293	-0.439	4.422	0.015	-0.365	1.539			
<b>Shanonno</b>															
0-12	-	-	-	-0.790**	-0.455	0.651	0.000	-0.147	0.474	-0.226	-0.229	1.097			
13-24	-0.383	-0.410	0.698	-	-	-	-0.362	-0.335	0.759	-0.037	-0.280	0.957			
25-36	-0.554**	-0.238	-0.078	-	-	-	-0.328	-0.291	0.461	-0.131	-0.244	0.436			
37-48	-0.714**	-0.494**	0.440	-0.419	-0.337	0.321	-0.036	-0.221	0.659	-0.061	-0.180	0.283			
49-60	-0.304	-0.169	-0.063	-0.444	-0.127	-0.128	0.057	-0.168	1.229	-0.131	-0.170	0.265			
<b>Dawakin Tofa</b>															
0-12	0.676	-0.427	3.095	-0.296	-0.326	1.321	0.838	0.172	0.500	-0.027	-0.175	0.849			
13-24	0.331	-0.035	0.489	0.738	-0.205	3.204	0.411	0.015	0.385	-0.133	-0.180	0.293			
25-36	-0.152	-0.221	0.347	0.163	-0.173	0.583	0.087	-0.023	0.303	0.041	-0.036	0.137			
37-48	0.085	-0.187	1.162	0.100	-0.143	0.619	0.162	0.041	0.087	0.043	-0.142	0.479			
49-60	-0.077	-0.086	0.010	-0.236	-0.200	0.230	-0.101	-0.125	0.111	0.118	-0.249	1.093			

\*\* = Sign/Indication of Malnutrition.

**Table 2: Distribution of farmers according to food consumption patterns**

	<b>Bunkure %</b>	<b>Shanono %</b>	<b>Dawakin Tofa %</b>
Consumption of Soybean related meals	95.3	97.0	92.7
Cereal related meals (maize, millet and sorghum)	97.3	98.0	95.7
Cowpea/ groundnut Related Meals	94.3	96.7	94.0
<b>Frequency of soybean related meals intake (Daily, weekly and monthly)</b>			
Once Daily	58.4	90.6	34.3
Two or more times daily	41.6	9.4	65.7
Once weekly	30.7	35.6	25.9
Two or more times a week	69.3	64.4	74.1
Once monthly	26.3	73.8	60.8
Two or more times a month	73.7	26.2	39.2
<b>Frequency of Cereal related meals intake (Daily, weekly and monthly)</b>			
Once Daily	10.6	83.0	8.7
Two or more times a daily	89.4	17.0	91.3
Once weekly	23.5	75.7	23.7
Two or more times a week	76.5	34.3	86.3
Once monthly	12.2	95.2	66.7
Two or more times a month	87.8	4.8	33.3
<b>Frequency of Cowpea/ groundnut related meals intake (Daily, weekly and monthly)</b>			
Once Daily	58.8	84.5	45.5
Two or more times daily	41.2	15.5	54.5
Once weekly	18.2	50.3	15.8
Two or more times a week	81.8	49.7	74.2
Once monthly	15.4	78.6	88.9
Two or more times a month	64.6	21.4	11.1



**Table 3:** Distribution of households according to form in which soybean is consumed

<b>Form</b>	<b>Bunkure</b>	<b>Shanono</b>	<b>Dawakin Tofa</b>
Soybean cake (Fried soybean cake) (awara)	92.3	95.0	92.3
Soy flour	13.3	10.3	8.3
Soy tum-brown	4.7	3.7	1.3
Soy milk	13.7	8.3	10.0
Soy cheese	1.0	2.3	0.7
Soy meat	1.3	4.3	2.0
Soy dadawa	36.0	66.0	27.0
Soy bread	2.3	6.7	2.7
Soy kunun	28.0	7.3	20.0