Original Research Article

Impact of public health lecture intervention on consumption behaviour towards indigenous staple carbohydrate foods

Bonaventure Onodu[1]*, Richard Culas[1], Ezekiel U. Nwose[2]

[1]School of Agriculture and Wine Sciences, Charles Sturt University, Orange Australia
[2]School of Community Health, Charles Sturt University, New South Wales, Australia

*Correspondence:
Dr. Bonaventure Onodu,
E-mail: bonodu@csu.edu.au

ABSTRACT

Background: The increase in non-communicable diseases (NCDs) experienced more in the developing countries can be attributed to changes in demography (rural to urban migration) and changes in pattern of food consumption. With the increasing incidences in diabetes globally, dietary restrictions and modifications in consumption behaviors still remains the bedrock in the prevention and management of the disease. Specific education to prevent or manage people's lifestyle in order to combat NCDs such as diabetes are widely available, but assessment of knowledge about dietary fiber and its impact on staple foods consumption is largely unexplored.
Methods: This study utilized nutritional education as an intervention strategy to bring about changes in consumers consumption behaviour, changing their perspective in consumption of root and tuber crops in relation to wheat in the study area. The intervention involved public health lecture on the nutrition values of staple carbohydrate root and tuber crop foods (cassava and yam) with focus on their dietary fibre content, relative to wheat.
Results: The statistical analysis showed that there is a significant difference in the dietary habits in urban and in rural areas. Intervention resulted in shift in consumption behavior towards indigenous staple carbohydrate food crops. The changes in behavior were more obvious in urban dwellers, especially in favour of cassava consumption.
Conclusions: Education or information targeted to correct the consumption behaviour of specific group of individuals stands a chance in impacting and improving their food choices and dietary behaviours.

Keywords: Consumer behaviour, Dietary fibre, Food choices, Indigenous carbohydrate foods, Public health intervention

INTRODUCTION

Nutrition is regarded as the science of food, its association with health has been known and appreciated. Proper nutrition is very vital in optimal functioning of the body, protection of the body against diseases, healing of wounds and psychological well-being.[1] In years past, the burden of non-communicable diseases (NCDs) was regarded as a problem facing only the developed world but the recent data shows that the menace is now affecting developing countries more than their developed counterparts. This increase in the prevalence of NCDs can be attributed to changes in demography (rural to urban migration) and changes in pattern of food consumption.[2] There are significant differences in eating habits between the rural and urban settlements, the urban has increasingly adapted to western food habits, majority of which are rich in fat and sugars while the rural dwellers eat more of traditional foods rich in nutrients and fiber. With the increasing incidences in diabetes globally, dietary restrictions and modifications in consumption behaviors still remains the bedrock in the prevention and

management of the disease.[3] Many of Nigerian staple crops which form majority of the sources of local food are very rich is fiber, yet they are not included in the diet prescribed for type 2 diabetes patients.[4] It has been demonstrated that it is possible to achieve a high intake of dietary fiber with minimal or no adverse effect by consuming locally available unfortified food. These staple crops which are rich in fiber are cheap, palatable and readily available. In Nigeria where it is very expensive for diabetic patients to afford therapeutic drugs, achieving oral hypoglycemic effect with staple functional food rich in fiber, cheap and readily available is an added advantage. The objective of this study is to use education as an intervention strategy to bring about change in consumption behavior of consumers' and also investigate the outcome of the changes in behavior in the study area.

METHODS

This study was conducted in Ndokwa West Local Government Area of Delta State Nigeria. Delta State is located in the Southern part of Nigeria; it is situated in the region known as the Niger Delta. Ndokwa West Local Government Area of Delta State was created in August 1991 with its head quarter in Kwale. It is located within latitude 6.480E and longitude 5.450N. It has an area of 816m2 and a population of one hundred and fifty thousand and twenty-four (150,024) people. 5 This study adopted a multi-stage stratified random sampling procedure. First was a purposive selection of Ndokwa west local government area for the study, the reason was because majority of cassava and yam output in the entire Delta state were produced by them. Secondly was the stratification of cassava, yam and wheat consumers. The third stage was the random selection of 80 consumers (40 in rural vs 40 urban) respectively making a total sample size of 80 respondents for the study. The collection of data used for this study lasted for nine months, from December 2017 to August 2018. Data was collected before and after intervention. Education was used as intervention strategy in form of public health lecture, awareness on the medical nutrition benefits as well as the health values of dietary fiber in root and tuber crops relative to wheat was introduced to the respondents in the urban as well as the rural areas in the local government area. The intervention was conducted for only the consumers in rural and urban areas in order to bring about change in their consumption behavior and then analyze the outcome of the intervention. The sample size for the study was initially forty respondents each for rural and urban participants, after data collection it was 34 participants that answered the questionnaire and returned it for data analysis.

Ethics approval

Statistical analysis

This study began with a three-month period of baseline data collection, which was followed by a three-month intervention period and then a three-month post intervention follows up. Statistical comparison included evaluation of changes in consumption behavior after intervention relative to the pre-intervention baseline data. Further comparison was between rural versus urban dwellers. In this statistic, evaluation was limited to consumption, reason of consumption and the main carbohydrate option consumed. That is, data on socioeconomic characteristics were discretionally not included. Based on coded values (Table 1); initial analysis acknowledged the codes in Likert scale were subjective.

Table 1: Codes for the Likert scale.

Question	Likert scale	Consumption	Reason	House-hold main
a	1	Cassava	Cheap	Cassava
b	2	Yam	Health	Yam
c	3	Wheat	Taste	Wheat
d	4	Others	Availability	Cassava and yam
e	5	Cassava and yam	Others	Cassava and yam
f	6		Cheap and availability	Cassava and yam
g	7	-	Cheap and Health and taste	All 3 crops
h	8		Health and availability	None

The analysis investigated hypotheses if average values for consumption will be post-rural less than pre-rural and post-urban less than pre-urban. It is also assumed that averages closer to the Likert scale would mean ≤1.49= cassava consumption; 1.5-2.49 =yam consumption; 2.5-3.49 = wheat consumption.

RESULTS

The descriptive statistics show that before the introduction of intervention, the rural settlement consume more of cassava and yam with few consumptions of wheat, the consumption behavior was still maintained even at post intervention period (Figure 1).

in the urban area, consumption was more of yam and wheat with less of cassava during pre-intervention but after intervention there was a shift in their consumption behavior, the consumption of wheat reduced drastically while the consumption of cassava increased but yam consumption remained neutral. This descriptive statistic does not clearly delineate the impact of the public health

lecture intervention, because it does not portray in detail the actual frequencies at which the various crops consumptions change. This necessitated a further critical analysis. MANOVA shows statistically significant differences between pre-rural and pre-urban, pre-urban and post-urban and post-rural and post-urban but not with pre-rural and post-rural (Table 2).

Table 2: MANOVA output with LSD post-hoc.

| Dependent variable	(I) Groups	(J) Groups	Mean diff'	SE	Sig.	95% Confidence Interval	
						L' bound	U' bound
Consumption	1	2	-0.93*	0.204	0.000	-1.33	-0.53
		3	0.03	0.197	0.896	-0.36	0.41
		4	-0.40	0.204	0.051	-0.81	0.00
	2	1	0.93*	0.204	0.000	0.53	1.33
		3	0.96*	0.211	0.000	0.54	1.37
		4	0.53*	0.218	0.016	0.10	0.96
	3	1	-0.03	0.197	0.896	-0.41	0.36
		2	-0.96*	0.211	0.000	-1.37	-0.54
		4	-0.43*	0.211	0.044	-0.84	-0.01
	4	1	0.40	0.204	0.051	0.00	0.81
		2	-0.53*	0.218	0.016	-.96	-0.10
		3	0.43*	0.211	0.044	0.01	0.84
Reason of consumption	1	2	-0.44	0.358	0.222	-1.15	0.27
		3	-1.23*	0.345	0.000	-1.91	-0.55
		4	-0.44	0.358	0.222	-1.15	0.27
	2	1	0.44	0.358	0.222	-.27	1.15
		3	-0.79*	0.370	0.034	-1.52	-0.06
		4	0.00	0.382	1.000	-0.76	0.76
	3	1	1.23*	0.345	0.000	0.55	1.91
		2	0.79*	0.370	0.034	0.06	1.52
		4	0.79*	0.370	0.034	0.06	1.52
	4	1	0.44	0.358	0.222	-0.27	1.15
		2	0.00	0.382	1.000	-0.76	0.76
		3	-0.79*	0.370	0.034	-1.52	-0.06
Main carbohydrate	1	2	-0.95*	0.361	0.009	-1.66	-0.24
		3	-0.82*	0.347	0.019	-1.51	-0.14
		4	-1.42*	0.361	0.000	-2.13	-0.71
	2	1	0.95*	0.361	0.009	0.24	1.66
		3	0.13	0.372	0.733	-0.61	0.86
		4	-0.47	0.385	0.223	-1.23	0.29
	3	1	0.82*	0.347	0.019	0.14	1.51
		2	-0.13	0.372	0.733	-0.86	0.61
		4	-.60	.372	.110	-1.33	.14
	4	1	1.42*	.361	.000	.71	2.13
		2	.47	.385	.223	-.29	1.23
		3	.60	.372	.110	-.14	1.33

A critical review was performed to determine the actual frequency (percentage proportion) of respondents in relation to increase or reduction in number of consumers of cassava, yam and wheat after the awareness or intervention. Result of the rural sub-cohort evaluation shows there is 1% increase in both cassava and yam consumptions after intervention: but equal percentage decrease in wheat consumption (Figure 2).

The changes were more obvious in the urban, but only for cassava and wheat while yam remain unchanged. The minimal changes seen in rural data was as a result of six out of 45 pre-intervention respondents withdrawing from further participation hence, percentages of responses have already been utilized in Figure 6.

Further evaluation of relative frequency of wheat consumption in entire participants, comparing pre-awareness vs. post-awareness as well as rural vs. urban show that there are significance reductions in wheat consumption after the intervention in urban as well as in
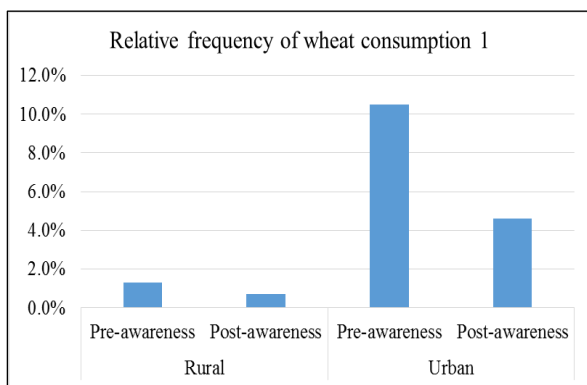
rural areas (Figure 3 and 4), but the changes is more pronounced in the urban than in rural areas.
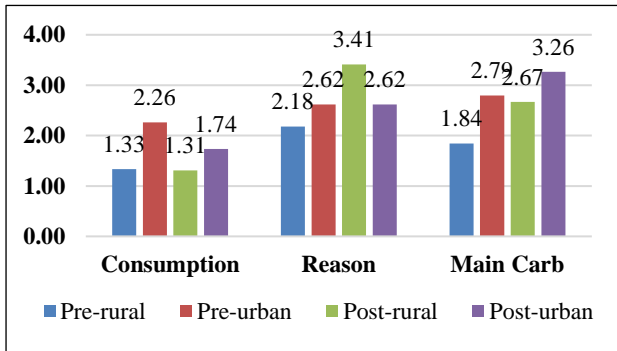
Figure 1: Comparison of the averages of responses on variables.
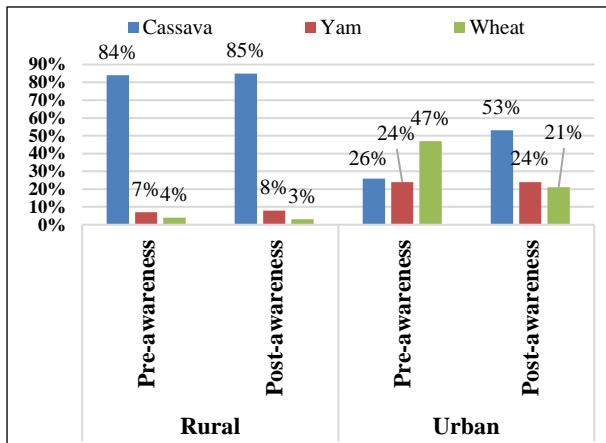

Figure 2: Sub-cohort evaluation.

Figure 3: Relative frequency of wheat consumption comparing rural and urban.

This is supporting an earlier research which confirmed that many Nigerians have poor knowledge on diabetes management which influences their attitude and food consumption practices despite their education background, suggesting that education is the most effective way to lessen the complications of diabetes and its management. A graphical evaluation of the change in behaviour in terms of absolute numbers of respondents

for cassava, yam and wheat consumption among urban dwellers is as shown in Venn diagram (Figure 5).
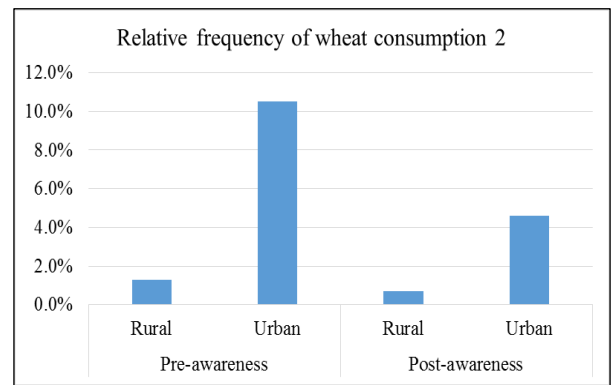
**Figure 4: Relative frequency of wheat consumption comparing pre and post intervention.**

The diagram shows that before the introduction of the intervention strategy, educating the participants on the medical nutrition benefits of root and tuber crops relative to wheat. Majority of the participants were eating more of wheat but less of root and tuber crops in the urban location. Among the 34 respondents, 18 were consuming wheat as their only source of carbohydrate, 8 persons were consuming only cassava and 8 was consuming only yam while only 1 person was consuming the three crops.
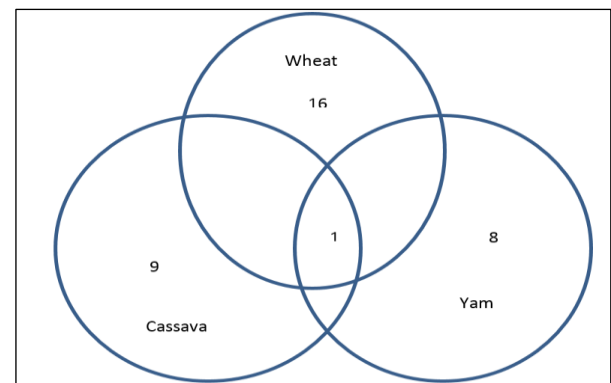
Figure 5: Absolute numbers of respondents' consumption before intervention urban dwellers.

After the intervention (public health education) to promote healthy eating habits (medical nutrition benefits of root and tuber crops), there was a great shift in consumption behavior of many of the respondents in form of cassava and wheat consumption in rural and in urban participants but more significant in urban participants (Figure 6).

The consumption of cassava was doubled from 9 persons consuming it initially before intervention to 18 people after the intervention relative to equivalent decrease in wheat consumption from 16 before intervention down to 7 after intervention, while yam consumption remained neutral.
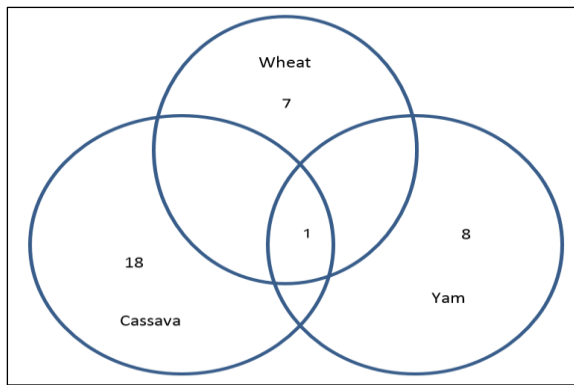
Figure 6: Venn diagram showing change in consumption behaviour among urban dwellers.

DISCUSSION

A lot of interventions targeted to influence changes in dietary consumption in the industrialized countries have produced effective and successful results in decreasing the prevalence of non-communicable diseases, but these intervention programs have been rare in developing countries.[6] Education programs which are centered on nutrition are designed to improve consumers' nutrition knowledge, aiming at supporting sound dietary intake either within the community or a specific target population. Specific education to prevent or manage people lifestyle in order to combat non-communicable diseases such as diabetes and cancer are widely available, but few studies have taken time to investigate the impact of nutrition knowledge in the general community or other specific group making nutrition knowledge on dietary intake largely unexplored.[7] An understanding of the link between nutrition knowledge and dietary intake is very important as much evidence has shown a relationship between low health literacy, poor management of chronic diseases and increased health cost.[7] Diet plays an important role in health and diseases, the food choice authors make could assist in preventing us against diseases and increasing quality of life. As indicated in chapter three (methodology), the intervention involved public health lecture on the medical nutrition therapy value of staple carbohydrate root and tuber crop foods (cassava and yam) with focus on their dietary fiber content, relative to wheat. The focus of this study is not on the association between diet and chronic diseases, but rather the science of dietary behavior changes and how decreased intake of wheat and increased root and tuber crops consumption are best achieved.

The reason for the increase in the consumption of cassava in the urban area was due to the correction of the controversies surrounding the contribution of starchy foods to the incidence of diabetes. A lot of Nigerians believe that the consumption of starchy foods exposes them to diabetes, this is because most of their information are from unreliable sources.[8] The reason why there was no significance between pre-rural and post-rural was because the diet of the rural communities were more of traditional high carbohydrate, low protein and low fat, also, the no significance could be explained by the misconception in Nigeria among many people that diabetes results from the consumption of carbohydrates foods hence, with the view that people with diabetes should avoid the consumption of carbohydrates completely or take minimal quantities of carbohydrates which is mainly practiced in the urban than rural areas.[9] The current general recommendation is that carbohydrate should provide between 45%-65% of daily intake while fat and protein should provide 25%-35% and 15%-20% respectively of total daily calories. The guidelines recommended starting pharmacotherapy only after first making nutritional and physical activity lifestyle changes but these recommendations is not always followed especially in Nigeria where many or most of the physicians lack in the knowledge of nutritional intervention.[10]

The shift in urban consumption behavior can be attributed to the benefit of education and communication which has the capacity to change consumers' knowledge, shaping their attitude and redirecting their decision making, including food choices and dietary behavior.[11] This shift can translate into conducting a value chain analysis in order to ascertain how this increase in consumption in root and tuber crops can be maintained, production improved and their supply maintained, thereby improving food security as well as income of root and tuber crops value chain actors in the study area.

Implications for health economics: agricultural economics-health economic nexus

Communication and information targeted to a specific participant needs, interests and motives is very likely to being attended and processed by the participants thereby influencing their food choices and dietary behaviors. Consumers seem to require information to enable them to make informed choices regarding to achieving better diet, to avoid certain allergies or know the origin and environmental, ethical and technological conditions under which the food they intend to consume has been produced and processed.[11] Furnishing consumers' with free, transparent, informed and safe food choices as well as promoting a healthier diet could go a long way in reducing the prevalence of NCDs. There are many controversies facing the contribution of root and tuber crops such as yam, cassava and cocoyam to the incidence of non-communicable diseases, this stigma is making consumers to abandon completely the consumption of these staple crops. The current general recommendation is that carbohydrates should form between 45%-65% of the daily calorie's intake, fat and protein should contribute 25%-35% and 15%-20% respectively.[10]

This study investigated the reason for the stigma in the consumption of root and tuber crops in preference to wheat in urban and rural areas of Ndokwa West Local

Government of Delta State, Nigeria. An earlier investigation carried out on the nutritional contents of processed components of root and tuber crops relative to wheat, it was discovered that cassava and yam have more fiber and less fat while wheat has less fiber and more fat. 12 The statistical analysis shows that rural areas eat more of root and tuber crops and less of wheat, the reason may be because majority of them are farmers, while urban participants eat more of wheat and less cassava and yam, since processed wheat is less in dietary fiber, it is regarded as unhealthy food containing more fat and less fiber. Dietary fiber is not digestible by the small intestine but have beneficial effect on glucose control and circulating lipid levels possibly through delayed gastric emptying, altered transit time in the small intestine, insulating of carbohydrates from enzymes.[4]

Dietary fiber is readily available in Nigerian staple and local food sources such as cassava and yam but they are not included in the diet prescribed by diabetes patients when evidence has shown that it is possible to achieve high intake of dietary fiber by consuming locally available unfortified food. Although Nigeria is leading the world in terms of cassava and yam production, its participation in global trade is nothing interesting due to its uncompetitive nature of their production and processing systems.[13] Many of farmers in Nigeria regard agriculture as hubby rather than a business, lack or absence of business oriented agricultural production system, limited or no access to market facilities results in smallholder farmers not participating in adding value to their products. A well-functioning value chain provides the means to effectively link farmers' production activities to market. There is need to conduct a value chain analysis for root and tuber crops in the study area to create additional market for the producers and generate income for them.

CONCLUSION

Consumers' require information to assist them derive more pleasure from food or to achieve a better diet. However, more information does not necessarily mean better informed consumers', this is because information is likely to be effective only when it addresses specific information needs and can be adequately processed and used by its target recipient. In order for an intervention to be effective, it should be consumers' driven. The intervention should be tailored down to consumers' experiences, values and needs so that it could be understood and accepted. The degree to which an intervention is accepted by consumers' affects both the effectiveness and the implementation of the intervention.

Recommendations

It was recommended that there is need to integrate Nigerian traditional functional foods within local research and innovation system in accordance with local needs, food habits and priorities. This will go a long way in bridging the wide gap between rural and urban prevalence in diabetes mellitus in Nigeria and the entire globe at large.

REFERENCES

1. Awosan KJ, Ibrahim MT, Essien E, Yusuf AA, Okolo AC. Dietary pattern, lifestyle, nutrition status and prevalence of hypertension among traders in Sokoto Central market, Sokoto, Nigeria. Inter J Nutr Metab. 2014;6(1):9-17.
2. Maiyaki MB, Garbati MA. The burden of non-communicable diseases in Nigeria; in the context of globalization. Annal African Med. 2014;13(1):1-0.
3. Jimoh AK, Adediran SO, Adebisi SA, Akande AA, Olarinoye JK, Okesina AB. Glycaemic response to different preparations of yam in diabetic and non-diabetic Nigerians. Mera: Diab Inter. 2008;19.
4. Ikem RT, Kolawole BA, Ojofeitimi EO, Salawu A, Ajose OA, Abiose S, et al. A controlled comparison of the effect of a high fiber diet on the glycemic and lipid profile of Nigerian clinic patients with type 2 diabetes. Pakistan J Nutr. 2007;6:111-6.
5. NPC. National Population Commission. NPC (2006). Federal Republic of Nigeria Official Gazette. 2006;96(2):11-7.
6. Odenigbo M, Inya-Osuu J. Knowledge, attitudes and practices of people with type 2 diabetes mellitus in a tertiary health care centre, Umuahia, Nigeria. J Diab Metab. 2012;3(3):187-91.
7. Mohammadifard N, Kelishadi R, Safavi M, Sarrafzadegan N, Sajadi F, Sadri GH, et al. Effect of a community-based intervention on nutritional behaviour in a developing country setting: the Isfahan Healthy Heart Programme. Pub Health Nutri. 2009;12(9):1422-30.
8. Spronk I, Kullen C, Burdon C, O'Connor H. Relationship between nutrition knowledge and dietary intake. Bri J Nutri. 2014;111(10):1713-26.
9. Kahan S, Manson JE. Nutrition counseling in clinical practice: how clinicians can do better. Jama. 2017;318(12):1101-2.
10. Sabir AA, Isezuo SA, Ohwovoriole AE, Fasanmade OA, Abubakar SA, Iwuala S, et al. Rural-urban difference in plasma lipid levels and prevalence of dyslipidemia in Hausa-Fulani of north-western Nigeria. Ethnicity Dis. 2013;23(3):374-8.
11. Udogadi NS, Onyenibe NS, Abdullahi MK. Dietary Management of Diabetes Mellitus with Focus on Nigeria. Int J Diab Res. 2019;2(1):26-32.
12. Verbeke W. Impact of communication on consumers' food choices: Plenary lecture. Proceed Nutr Soci. 2008;67(3):281-8.
13. Onodu BC, Culas RJ, Nwose EU. Health values of cassava compared to wheat and yam: A critical

review of carbohydrate/fibre and fat/fibre ratios. In: Logotheti A, Babu GA, Seo D, eds. 6th ed. International Conference on Research in Chemical, Agricultural and Biological Sciences; 2017:180-182.

14. PIND. cassava value chain analysis in Niger Delta. Foundation for partnership initiatives in Niger Delta (PIND), 1st floor St James Building, 167 Ademola Adetokumbo Crescent, Wuse II, Abuja, Nigeria. 2011. Available at: https://pindfoundation.org/ project/cassava-value-chain-project/. Accessed 2 May 2012.