

Compiling Food Composition Data for Dietary Assessment: The Nigerian Experience Using a SWOT Analysis

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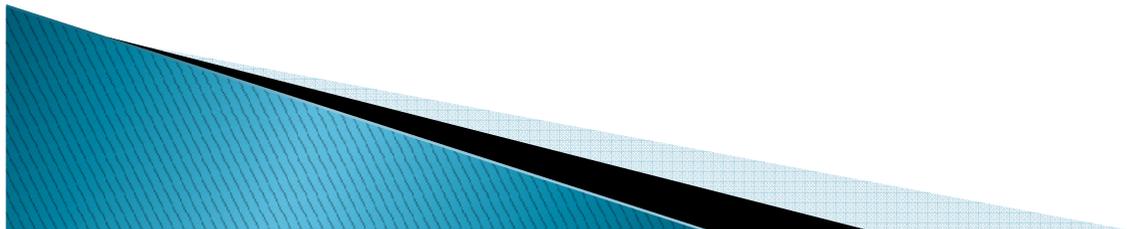
Cross River State, Nigeria

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INTRODUCTION

- ▶ Malnutrition (under- and over nutrition) is a public health problem in developing countries. Chronic malnutrition in Nigeria according to NDHS (2008) is 38%.
- ▶ Malnutrition erodes human capacity, and reduces productivity. It affects survival and health, education and the economy of a nation.
- ▶ The eradication of hunger/malnutrition ranks high among international goals because good nutrition is essential for the health and human capacity needed to achieve so many of the other Millennium Development Goals (MDGs).



Introduction

- ▶ The task of combating malnutrition needs teaching aids and ready reference materials with regard to the nutritive value of foods
- ▶ The nutrient composition of locally available foods/diets are used to estimate the adequacy of dietary intake of population groups; determine diet-disease relationships; health and nutritional status; and for achieving dietary intake goals.
- ▶ Food composition database forms the bedrock for sound nutrition practice
- ▶ Unfortunately, the development of food composition data has been given little research attention in Nigeria and is seldom included in nutrition programmes and intervention



BRIEF HISTORY OF FOOD COMPOSITION ACTIVITIES IN NIGERIA

- There is a growing need by Nigerians to know the composition of the foods they consume, especially with the increasing prevalence of diet related non-communicable chronic diseases (NCCDs).
- In 1968 Oyenuga published the Nigerian Food and Feeding Stuffs. This was an individual effort and the publication was more suited for animal nutrition.
- In 1986, a workshop on “Food Composition Table for Nigeria” was held at the University of Ibadan.

This workshop revealed that:

- few foods were given research attention to the detriment of others.
 - little or no information existed on the nutrient composition of our traditional foods in the raw, prepared and processed forms.
 - few data that existed were scattered.
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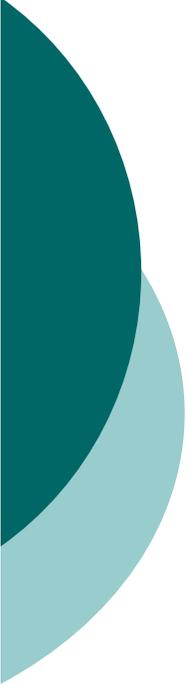
THE EVIDENCE

- In a relatively recent documentation exercise of the Igbo traditional food systems in collaboration with the Center for Indigenous Peoples Nutrition and Environment (CINE), McGill University, Canada, Okeke, Ene-Obong *et al.* (2008) found that of a total of 294 species and over 400 varieties of food items documented, about 217 were missing in the Food Composition Tables (FCT) currently used in Nigeria.
- The Igbos make up just one geo-political zone of the country



Situation now

- It is unfortunate that 25 years after that workshop we still do not have a **comprehensive** Food Composition Database (FCDB) for Nigeria as obtained elsewhere in the world.
- The best we have had is the Food Basket Foundation's publication edited by Oguntona and Akinyele (1995)
- A major challenge facing nutritional epidemiologist in Nigeria is the correct measurement of dietary exposure and this is due to inadequate food database



Why has the situation been so?

- Initial lack of interest among nutrition professionals
- Inadequate funding and coordination of research activities in Nigeria
- Lack of basic research equipment/facilities.
- Nutrition not on the priority list of Government

FCTS USED IN NIGERIA

- The Food Composition Tables (FAO,1968)
- Nigerian Foods, and Feeding Stuffs: their Chemistry and Nutritive Value (3rd Edn) by Oyenuga VA (1968)
- Tables of Representative Values of Foods Commonly used in Tropical Countries (Platts, 1975)
- Nutrient Composition of Commonly Eaten Foods in Nigeria: Raw, Processed and Prepared; A Publication of Food Basket Foundation edited by Oguntona and Akinyele (1995)
- USDA Food Database
- Data available in literature
- FAO/UN (2010) Composition of Selected Foods from West Africa edited by Stadimayr B, Charrondiere UR, Addy P,Burlingame B.
- Others



Limitations of available food composition database

- Some are **obsolete** and do not keep track of compositional changes of foods
- **Lots of missing nutrients:** There are limited information with regard to the contents of nutrients/components (micronutrients, dietary fibre, anti-oxidant nutrients, essential fatty acids, phytochemicals, etc) now found to be beneficial to health.
- **Misleading data:** leading to overestimation or underestimation of intakes
- **Samples drawn for convenience** rather than representativeness; hence data are **not truly national**
- Most importantly, most are **generic** and do not capture the biodiversity of the Nigerian food system.



Based on the above information, the need for a food database that will include the different levels of biodiversity cannot be over-emphasized and is long over due.

The Present Situation and AFROFOOD Plan of Action

- We just concluded the AFROFOOD Coordinators meeting and Workshop on “Food Composition, Biodiversity and Sustainable Diet” which took place between the 9th and 12th September, 2011.
- In that meeting far reaching decisions were taken to promote food composition activities in the region. These include:
 - Establishing AFROFOOD, regional and sub-regional secretariats
 - Identifying national and local coordinators
 - Compiling list of experts

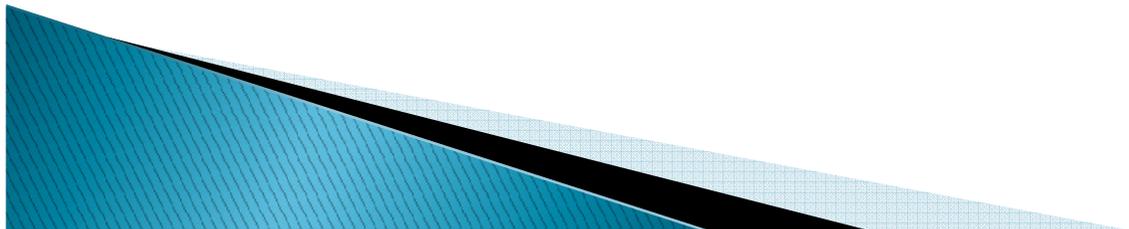


AFROFOOD Plan of Action cont.

- Conduct Institutional Assessment
- Disseminate the latest edition of West African Food Composition table
- Document biodiversity in various location
- Develop and implement advocacy and marketing strategies
- Carry out monitoring and evaluation
- Collect coordinator's report at the end of the year

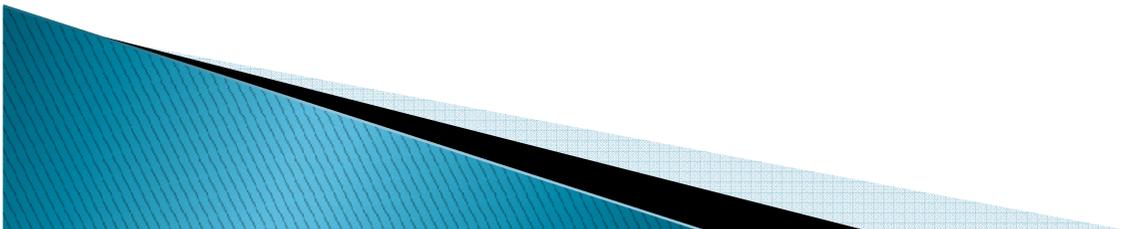
Project Title: Production of Food Composition Database (FCDB) and Computer Software for Assessment of Dietary Intakes of Population groups in Nigeria

- ▶ Host Institution: University of Calabar, Calabar,
▶ Cross River State, Nigeria
- ▶ Host Department: Department of Biochemistry
(Nutrition Unit), University of
Calabar
- Funder: **WORLDBANK/FGN (STEP-B PROJECT)**



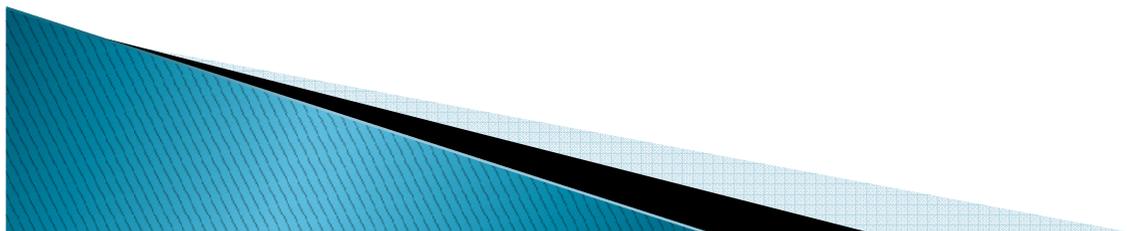
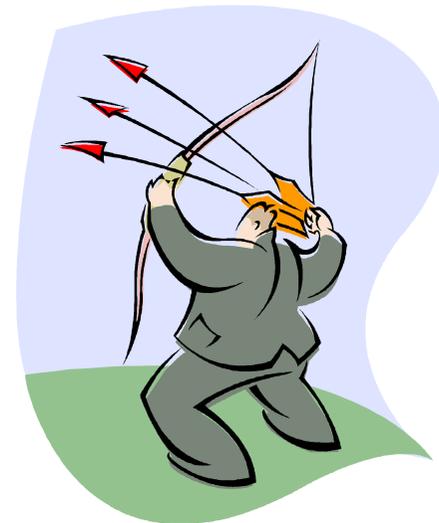
What is STEP-B?

- ▶ It means Science and Technology Education Post-Basic Project
- ▶ It was “developed to encourage seed activities related to science and technology within the Post-basic education sector with the ultimate aim of supporting demand-driven economic growth”



Major objective of STEP-B

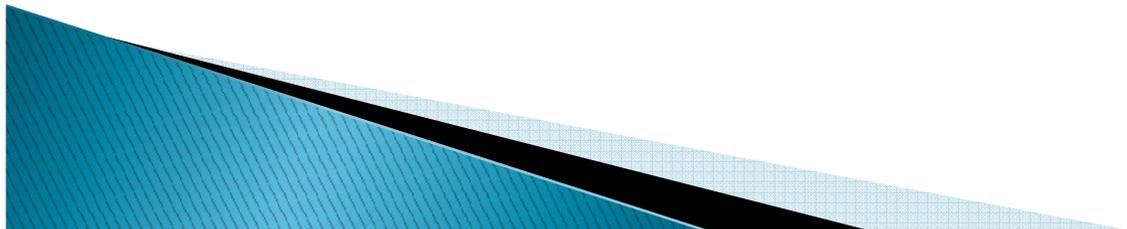
- ▶ For Nigerian Federal Post–basic education and research sub–sector to produce more and better qualified science and technology graduates, and higher quality and more relevant research



Principal Investigator/Coordinator

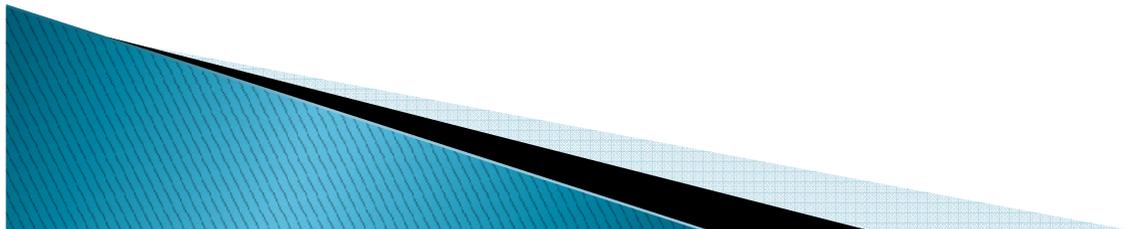
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COLLABORATORS

- ▶ **Dr. R. A. Sanusi**, MD, PhD (Human Nutrition), University of Ibadan
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- ▶ **Ms Elizabeth Udent**, M.Sc. (Nutritionist/Dietician), University of Nigeria,
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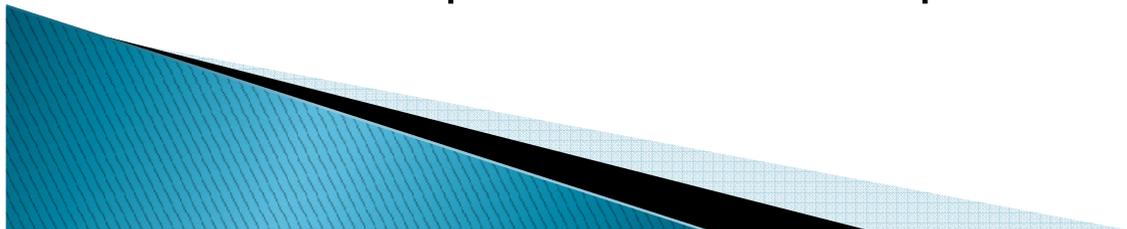
Objectives of the study



- ▶ Document the locally consumed foods in the six geo-political zones in their various forms and recipes used for their preparation.
- ▶ Harmonize and standardize the collected recipes bearing in mind their variations.
- ▶ Collect reliable food composition data from literature.
- ▶ Prepare and analyze/calculate the standardized recipes to determine their nutrient composition.
- ▶ Analyze foods not found in food composition tables and fill up existing gaps in nutrients recently found to ensure adequate nutrition and the maintenance of good health.
- ▶ Compile the values obtained as a database for Nigeria (i.e. a FCDB).
- ▶ With the assistance of a computer programmer, develop computer software that will facilitate the assessment of dietary intakes.

Expected Accomplishments of the project

- ▶ Enhance the quality of teaching and learning in nutrition science, particularly in the area of food composition.
- ▶ Build capacity in various areas of this study.
- ▶ Introduce innovative methods in dietary assessment methodology
- ▶ Product development (computer software) and books produced and commercialized
- ▶ Encourage collaboration with other universities (partnership).
- ▶ The study has the potential of making the host institution and the various sites for this project **Centers of Excellence** for food composition database production for Nigeria





Methodology: Sampling

- For the documentation exercise we adopted the stratified sampling technique.
- Nigeria is made up of six geo-political zones, 36 States, including the Federal Capital Territory (FCT) that differ widely in terms of food production and consumption patterns
- Thus the six geo-political zones formed six strata for this study

CLUSTER FORMATION

- In each of the zones, clusters of states were formed according to cultural similarities and eating patterns
- Some of the states forming a cluster were together before the various state creation in the Nigeria, e.g.,
- Plateau/Nassarawa/Benue formerly Benue-Plateau State
- Edo/Delta formerly Bendel State
- Kaduna/ Katsina formerly Kaduna State

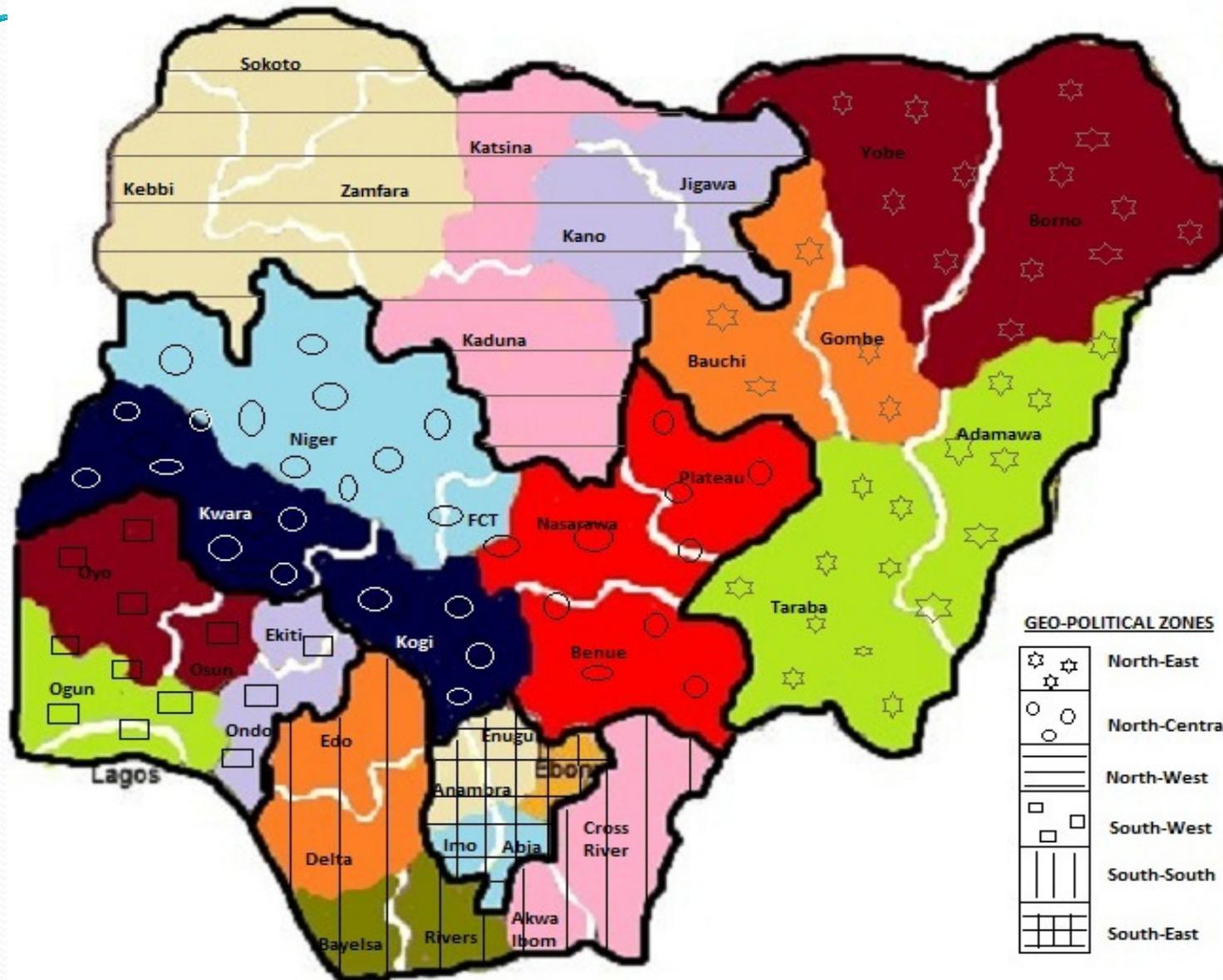


Fig 1: Map of Nigeria showing the States, Geo-Political Zones and clusters



Sampling Contd.

- From each cluster, at least 3LGAs were selected
- From each LGA, two (2) communities were selected
- One LGA was rural and the other urban



Training of Research Assistants (RAs)

- Ten(10) to 12 RAs made up of lecturers, graduate students and
- undergraduates were trained in each of the geo-political zones

- RAs who speak the language of the various locations were chosen/recruited

- This training was conducted to ensure that the RAs become familiar with the objectives and rationale for the project, the research instruments and how to use them.

- It also helped to harmonize the methods to ensure uniformity.

- They were also taught how to carry out the various measurements that were required on the field

Training of Research Assistants (RAs) contd.

Training of RAs started from April 7 to April 30, 2010.

The training took the form of:

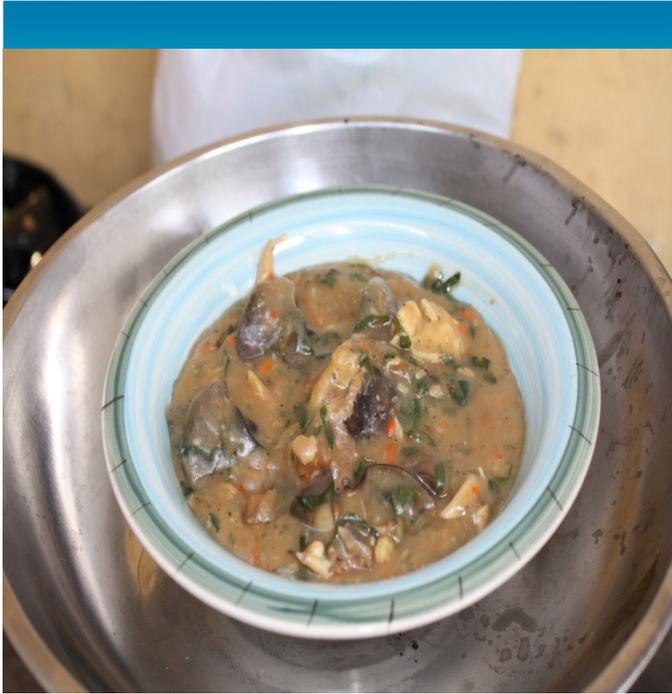
- Lectures
- Discussion sessions
- Demonstrations
- Field experience (Pilot survey)
- Practical training on how to complete the instruments, and carry out various measurements
- A training manual was produced and circulated to the participants





Data Collection Techniques

- Use of camera (for documenting activities, special food items, etc.)
- Key informant interviews
- Focus group discussions (FGDs)
- Community cooking session
- Market surveys





Results: General Observations

- Over 300 recipes have been collected from accross the country. Some of these are related: one food can be called different names in different communities. We are in the process of compiling the various names for specific recipes/foods.
- Our observations showed that food consumption patterns in Nigeria has been dynamic over the years.
- In the past, food consumption pattern were said to be related to the type of food grown or produced in the different areas (Nicol, 1959; Collins *et al.*, 1962)

Key Foods

- Cereals (**Sorghum** and **millet**) are grown in the north and are the major staples or key foods, while in the south, starchy roots, fruits and tubers (**yams, cassava, cocoyam, plantain**) constitute the key foods. Based on our observation **rice and maize** could be regarded as key foods throughout the country. The recipes for these key foods need to be given due priority in any food composition database that would assess dietary intake.



Changing food habits

- **Millet and sorghum** are also finding their way into the flare of population groups in Southern Nigeria.
- This is probably due to the high prevalence of NCCDs. Majority of the middle and high income population groups in the south are replacing yam and cassava based dough (pounded yam and gari/eba) with wheat, sorghum and millet. This is based on the belief that these cereals contain less carbohydrates

Apart from cassava and plantains most of these foods, including legumes, salad fruits and vegetables are produced in middle belt and Northern Nigeria.



Sorghum and millet

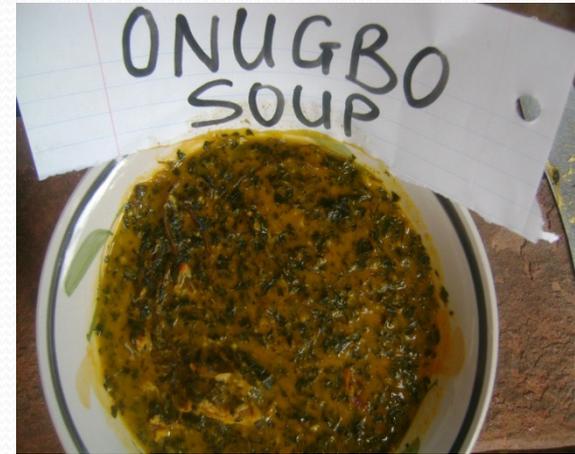


Dietary Pattern



- One common feature OF the dietary pattern of Nigerians is the consumption of semi solid dough made from cereals or starchy roots or tubers or a combination of these.
- These are eaten with soups/sauces. Soups constitute the major source of macro- and micronutrients thus their accurate description is very necessary for any food database.
- Soups range from very simple ones with few ingredients to very complex ones with many ingredients.
- Apart from meat and dry fish, major sources of proteins in soups in Northern Nigeria are cowpeas and groundnuts, which also act as thickeners, whereas in the south soups are thickened with wide variety of food items ranging from yam, cocoyam, nuts and seeds.
- This introduces a lot of variation in nutrient composition (particularly fat intake) when a generic food is used to calculate intakes. This practice also has health implications.

Some Nigerian soups



Nigerian soups







Variation in the semi solid dough

- The semi solid dough can be made in a variety of ways and all can be called “tuwo masara”, if made with corn:
 - Maize meal + water+ filtrate from wood ash
 - Maize meal + water
 - Maize meal + cassava flour + water
-
- These form part of habitual diets , and therefore errors in their description will lead to over - or under estimation of nutrients

Use of wood ash



- The use of filtrate from wood ash or potash/trona is very common in Northern Nigeria. It is a common soup ingredient.
- In the south trona is used by some to reduce the cooking time of hard-to-cook legumes and for a local salad dish
- The implication of the use of these chemical is not fully understood, but Edijala (1980) showed that the use of trona in cooking cowpea led to losses of thiamin and riboflavin.
- This use of filtrate from wood ash may have implication for micro- and macronutrient intakes and needs to be investigated

Variation in Soups



- The use of dry vegetables (okra and baobab leaves) in the preparation of soups was also found to be common in the north.
- In the south, the use of fresh vegetables is more common. There are however wide variations in the use of vegetables in this zone.
- For example, in the South-south zone, populations in Akwa Ibom and Cross River consume a lot of fresh vegetable soups, while those from Edo and Delta consume soups with little or no vegetables.



Variations in soups



- Okro soup could be with dry or fresh okro; with or without fresh vegetables; with or without groundnut paste or dikanut (*irvingia gabonensis*); with or without potash/trona; with or without oil, etc.
- We also observed that soups in the north are prepared with little or no oil. All these variations have dietary intake and health implications and need to be taken care of in compiling FCDB.





Food Biodiversity

- Nigeria is richly blessed with a wide varieties of foods compared to other African countries.
- Unfortunately only few are captured in current food composition data bases.
- Using legumes as example, only cowpea (black-eyed and brown beans) is eaten all across the nation.
- They are used in a variety of ways. One of its recipes that has a lot of variation in nutrient composition is *moi moi* (dehulled, cowpea paste pudding). This can be cooked with palm oil or vegetable oil; fish/eggs/minced meat/beef, crayfish, melon seed, etc. It could be cooked just with salt, onion, pepper, boullion cubes and oil



Food Biodiversity

- There are other legumes available in Nigeria. During the FGDs, apart from cowpeas and soybean, these other legumes were only mentioned when the participants were probed on the availability and consumption of other legumes.
- This is contrary to the survey in Bangladesh in which more than 80% of house holds were able to identify rice by cultivar and 38 different cultivars were named.
- Some other cowpea varieties were not mentioned without probing. These still do not have scientific identifications
- These other legumes include; pigeon pea (*Cajanus cajan*, African Yambean (*Sphenostylis stenocarpa*)), Kidney bean, bambara groundnuts(*Vigna subterranea*)



Pigeon pea



Bambara groundnuts



African Yambean



Cowpea varieties



Food Biodiversity

- It is interesting to note that these other legumes are consumed to a very large extent in the South east, particularly the Enugu area of the South east zone
- Analyses of some of these legumes show that they vary both in proximate composition and essential amino acid profile. For example, the essential amino acid profile of the African yambean is better than that of soybean and cowpeas (Ene-Obong and Carnovale, 1992). Some research activities are on now to explore some of the potentials of the African yambean
- These legumes can form the base of sustainable diets in the country



Problems associated with the use of available FCDB

- Chemical analyses of nutrients in foods are very expensive.
- There are various methods of estimating nutrient values, one of which is the use of analytical data obtained from literature or other food composition data bases.
- The use of data in the literature have a lot of limitations.



Problems with Data from literature

- Very high coefficient of variation in nutrient content of similar foods
- Poor food description
- Where nutrient values of cooked dishes are given, some do not include recipes
- Values not adequately reported for inclusion in food composition database.
- Poor handling of the moisture content of food, leading to overestimation of the nutrient content and dietary intakes.
- Use of obsolete analytical methods



STRENGTH OF THE PROJECT

- The project has a national outlook and in-built biodiversity concept
- Researchers interested in food composition work identified in each zone
- Has developed a framework that can be adopted by the country
- Some basic equipment for analyses are being purchased now for the host institution by the Sponsors of the project. These are expected to arrive before the end of the year.
- The fact that the baseline study is being co-sponsored by a Federal government agency and the World bank, it has the potential of making government more interested and committed to food composition activities in the country.

Strength contd.

- Cooperation and understanding among the collaborating institutions and the Collaborators; members of the communities visited and goodwill messages received.
- Availability of some compilation of Nigerian foods:
 - Better life for Rural Women Programme
 - Compilation by Home Economics Teachers Association
 - Recipes of commonly consumed foods in Nigeria by the Federal Ministry of Agriculture.



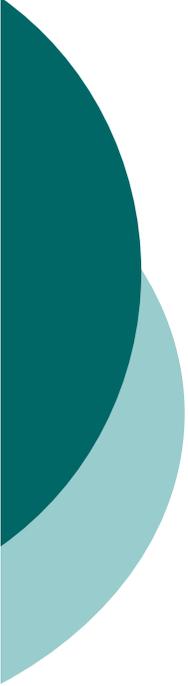
Weakness of the project

- Inadequate research facilities in some of the collaborating institution.
- The major weakness was our underestimation of the cost of this project and the distances to be covered by the research assistants
- The lag phase between writing a proposal, getting it approved and having the funds released also affected the cost of the project due to inflation.
- Not meeting regularly due to lack of funds



Opportunities

- Opened up new areas of research and interest
- Local/international collaboration and partnership in research
- Have a country-specific food composition data and join in the global discussions on these issues
- Building capacity in different areas of food composition compilation
- Develop research facilities in some, if not all the collaborating institutions
- Creating awareness on the importance of food composition base



Threat to the project

- The greatest threat to this project is funding.
- Incessant power failure is a serious challenge to researchers in the country
- The quality of analysts in the country.
- Policy makers and government do not fully understand the magnitude of work involved in the project.
- Very few reliable data in literature. Thus will entail analyzing very large number of foods.



CONCLUSION

The need for a country-specific food composition database for Nigeria cannot be overemphasized. Nigeria is the most populated country in Africa with over 250 ethnic groups and distinct cultural diversity. Thus, any food composition database that does not reflect this diversity will either be under- or overestimating dietary intakes of the population. It is our hope that this effort will yield some degree of success and become a valuable tool for programmes and interventions



Acknowledgement

- On behalf of the research team I acknowledge the support of the World/FGN STEP-B Project for supporting this baseline study.

Thank You for Listening