A system perspective on the choice determinants of vegetable consumption and balanced diets in urban Nigeria

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Abstract: Vegetable consumption is a generally accepted element in a balanced and sufficient diet, yet the determinants of vegetable consumption in an urban African population are poorly understood from a system perspective. The omission in knowledge on the vegetables intake and choice determinants prevents the definition of possibly effective interventions for countervailing the so-called nutrition transition. We examine the determinants of vegetable consumption in urban Nigeria across several socioeconomic classes and types of marketing channels, in order to identify points of intervention in the food and nutrition system. Data is collected among 1200 households in several districts of Lagos and Ibadan. This summary reports on the research design and the anticipated contributions to the scientific discourse on effective food system interventions.

Key words: Vegetable consumption behavior, Food choice motives, nutrition transition

1. Introduction
Vegetable consumption is a commonly recommended element in a balanced diet, yet the choice determinants of vegetable consumption in an urban African population are poorly understood from a system perspective. Reliable data on vegetable intake are also missing. We present a research agenda and empirical strategy around these knowledge gaps for the case of Nigeria, and explain why and how a food system approach is required to respond to these challenges.

2. Vegetable consumption in urban Nigeria under the 'nutrition transition'
Reliable information on dietary intake and determinants of dietary patterns in Nigeria is scarce, hindering an effective orientation for efforts by food system actors towards food-driven improvements in public health. The Nigeria Food Consumption and Nutrition Survey (NFCNS), performed between 2001 and 2003, is the only national representative study conducted on food intake in Nigeria. This study only included consumption frequency of staple and non-staple foods and made a distinction between leafy and non-leafy vegetables. The results reveal that both types of vegetables are not consumed on a daily basis (Maziya-Dixon, 2004). The findings of more recent studies based on small panels are in line with the NCFNS: consumption frequency of vegetables is not daily (Chubike, Okaka, & Okoli, 2013; Hart, Azubuike, Barimalaa, & Achinewhu, 2005). Insights on consumed quantities obtained in a small survey in 2009 (Chubike, Okaka, & Okoli, 2013) suggest that the various traditional meals consumed in South East Nigeria contain amounts of vegetables insufficient to meet the recommendations of the World Health Organization (WHO). Based on this information, the lack of reliable data on vegetable intake it is hard to describe if the actual vegetable consumption contribute to a balanced diet. To maintain or raise vegetable consumption is particularly challenging under the bundle of factors commonly referred to as the 'nutrition transition'. With its large and quickly expanding urban population with rapidly accumulating wealth and undergoing changes in food habits, Nigeria will face new, multiple and different challenges regarding food security and food systems, health burdens and non-communicable diseases (NDS) (Oyewole & Atinmo, 2015; Seto & Ramankutty, 2016). While the nutrition transition is still in an early stage in Nigeria (Abrahams, Mchiza, & Steyn, 2011; Steyn & Mchiza, 2014), in urban areas in Nigeria an increase in the incidence of obesity and related NCDs is already observed (Maiyaki & Garbati, 2014; Steyn & Mchiza, 2014).

3. An operational approach to consumer-driven food system research
The omission in knowledge on the choice determinants an consumer attitudes prevents the definition of possibly effective interventions for countervailing the nutrition transition. We place our exploration of interventions in a food system framework, first with a focus on the food choice environment. The research aims to understand the vegetable choice behavior and motives for urban consumers differentiated for urban poor, middle class and urban rich in Nigeria? The system approach is made operational around several hypotheses, as explained below:

H1: Urban rich and middle class consume more vegetables than the urban poor
H2: Urban rich and middle class consume a greater variety of vegetables.
Intake data for vegetables are scarce and provide very limited insight on dynamics, let alone on differences between social classes. The aggregate analysis in the recent Global Panel report reveals that when a country gets wealthier the consumption of foods that are associated with high quality diets (nutrient-dense products) will increase. Fruit consumption tends to increase from lower to higher income populations, while vegetable consumption declines (Global Panel on Agriculture and Food Systems for Nutrition, 2016). With regarding to the nutrition transition, the urban population is eating more outside and consider this as trendy. Nigerians with limited resources also tend to follow this emerging trend (Maiyaki & Garbati, 2014). So, it can be said that the nutrition transition affects all the different social classes: the poor, the middle class and the rich. Poverty is still widespread, but there is a sizeable and growing middle class and a segment of wealthy consumers as recorded for other parts of Africa (Tschirley, Reardon, Dolislager, & Snyder, 2015). Therefore we hypothesize that the urban rich and middle class consume more vegetables and a wider variety of vegetables.

H3: Food choice motives are different among the social classes.
Consumer food buying behaviour is influenced by a number of economic, cultural, psychological and lifestyle factors. Insights in these factors, the factors that affect food choice in Nigeria or in Sub-Saharan Africa (SSA) is limited. Most research conducted mainly focused on food production in rural areas and not in urban areas (Crush, Frayne, & McLachlan, 2011). Food choices differ regarding income level (Sosa, Cardinal, Contarini, & Hough, 2015). It is found that low income respondents consider sensory appeal less important and costs of the products as more important than a group with a higher income (Steptoe, Pollard, & Wardle, 1995). Next, "brand" is considered as more important by middle income respondents than low income respondents (Sosa et al., 2015). Middle income and urban consumers spend a greater part of diversifying their diet towards more high value products like particular fresh vegetables, eating out and eating more processed and convenience food. Based on the literature, we hypothesize that food choice motives differ among the social classes.

H4: In the dry season the variety in vegetables consumed is lower than in the wet season.
Seasonality in vegetables production drives a variation of vegetable availability in Lagos and Ibadan throughout the year. This also affects the vegetable consumption with the season. Vegetable consumption is higher in the wet season when also many varieties can be found in abundant quantities, but lower in the dry season when the supply is limited (Hart et al., 2005; Oladoja, Akinbil, & Adisa, 2006). Therefore, it must be examined how the food choice environment enables vegetable consumption or provides barriers for different types of consumer households and across the marketing channels that they rely on for their vegetable purchases.

4. Empirical Methods
Study sample: Respondents will be recruited by household. A group of 1,200 respondents will be recruited in urban areas of Lagos (n=800) and Ibadan (n=400). The study will be representative on social class (urban poor, urban middle class or urban rich) or on expenditures. Each social class will be at a minimum of 10% of the sample per location.

Study procedure: The fieldwork is conducted in November and early December 2016, after a pre-test. It takes the form of door-to-door interviews with the person that is responsible for the purchase of vegetables in the household. The questionnaire (approximately 45 minutes) includes questions related to vegetable purchasing behaviour, vegetable consumption, seasonality, subjective knowledge, self-efficacy, attitude towards vegetables, vegetable product attributes, social class, migration and demographics. Data is collected on a mobile device. All the items will be randomized for each of the measures.

Measurement of intake: To estimate consumers' intake of vegetables, a food frequency questionnaire (FFQ) developed and validated by Van Assema, Brug, Ronda, Steenhuis and Oenema (2002) was adapted. Participants indicated their consumption frequency by choosing the number of servings in spoons. The data will be converted in three steps: (1) converting intake levels into meaningful data (into portion sizes), (2) multiplying the intake frequency by portion sizes and (3) adding together the subgroups of vegetables to determine the total vegetable intake. This method is frequently applied in western countries and has been validated with a good correlation with dietary records (Van Assema, Brug, Ronda, Steenhuis, & Oenema, 2002); 1-month and 1-year reproducibility have been found (Bogers, Van Assema, Kester, Westerterp, & Dagnelie, 2004). However, this measurement is to our knowledge not been applied in Nigeria or SSA.

Food choice measurement: The food choices of the urban population in Nigeria will be measured by the scale developed by Steptoe et al., 1995. This measurement tool is applied in different European countries (Januszewska, Pieniak, & Verbeke, 2011), but to our knowledge not in an Nigerian setting. The Food choice Questionnaire contains 36 items, representing health and non-heath related food characteristics (i.e. "The food that I eat on a typical day contains vitamins and minerals". Answering categories are 7 point likert-scales. The FCQ involves nine motivational dimensions are scales: Health, Mood, Convenience, Sensory appeal, Natural content, Price, Weight control, Familiarity, and Ethical concern (Steptoe et al., 1995).

5. Concluding: anticipated results
The study will inform assessments of food intake and be informative for addressing the underlying question, which is to understand what type of "arrangement" between actors in the food system, including consumers and health actors, explains the current volume and composition of the consumption of vegetables in Nigeria. Coupled with new data on the vegetable production and marketing system, this will provide the evidence-base for considering effective interventions and experiments in future continuation of the studies with CGIAR partners under the A4NH Flagship Program Food Systems for Healthier Diets.

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