Chapter 1

CORE CONCEPTS

"When I am hungry, I cannot think well."
Professor Oye Ibidapo-Obe FAS, OFR - NAS President

Although it is widely understood that agriculture is the backbone of food security, many factors can intervene to undermine nutrition security and cause malnutrition even when food production is high. Evidence shows that improved food production and diversification cannot eradicate undernutrition if, for example, other limitations such as low water and sanitation coverage or poor market access persist. Indeed, the complexity of nutrition is the biggest challenge, and for this reason it is helpful for policy makers to understand a number of related but distinct core concepts, frameworks and measures (Table 1.1).

CONCEPTS

Food security

Food security can be understood as having four main components: availability, access, utilisation[1] and stability over time[2].

- *Food availability:* sufficient quantities of food available on a consistent basis?
- *Food access:* having sufficient resources to obtain appropriate foods for a nutritious diet.
- *Food utilisation:* appropriate use of food, based on knowledge of basic nutrition and care, as well as adequate water and sanitation.
- *Food stability:* availability and access to adequate food at all times.

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[1] http://www.who.int/trade/glossary/story028/ accessed on 31/03/2011 at 9:15am
[2] Global Forum on Food Security and Nutrition; http://km.fao.org/fsn/resources/glossary0/en/ accessed at 31/03/2011 at 9:20am

Table 1.1 Definition of some key terms

Term or concept	Definition
Food security	Reliable access to food in sufficient quantity and quality to enjoy a healthy and active life. It is a necessary, but not sufficient, condition for nutrition security.
Nutrition security	Secure access to food coupled with a sanitary environment, adequate health services, and knowledgeable care to ensure a healthy life.
Nutritional status	Presence or absence of physical, clinical, biochemical or dietary indicators of poor current or past intake and absorption of nutrients.
Malnutrition	A deficiency or imbalance in the chronic diet that leads to illness and/or reduces optimal development and functioning at all ages.
Undernutrition	Acute/chronic underweight with micronutrient defficiency.
Hunger	The lived experience of undernutrition.
Hidden hunger	Deficiency of "micronutrients", i.e nutrients required in very small quantities but essential for health (important examples are vitamin A, iodine, iron and zinc).
Stunting	Low height for age, defined as within bottom 5% of the range for a group of healthy children of any age; an indicator of chronic undernutrition. A stunted child may look normal but has a low height for age (shortness). Stunting is an indication of chronic/long term malnutrition.
Underweight	Low weight for age, defined as within bottom 5% of the range for a group of healthy children of any age; an indicator of both recent and long-term chronic undernutrition.
Wasting	Low weight for height, defined as within bottom 5% of the range for a group of healthy children of any age; an indicator of chronic undernutrition. A wasted child has low weight for height (thinness). It is an indication of acute or a recent rapid weight loss or a failure to gain weight.
Overweight	In adults, older children and adolescents, a larger weight for a given height that is associated with risk of poor health outcomes and becoming obese (cut-offs vary).
Obesity	In adults, a larger weight for a given height that is associated with risk of poor health outcomes(cut-offs vary).

Members of a family are considered food secure when they do not live in hunger or fear of hunger. Family food security depends on sustained access to adequate supply of nutritious and safe food that meets the need of all family members. Household food security is "having physical and economic access to adequate and acceptable food by all household members all year round."

Food insecurity

Food insecurity is the opposite of food security and is caused by anything that creates lack of availability, access, use or stability of sufficient, safe and nutritious food to meet dietary needs and food preferences for an active and healthy life. Such factors include, but are not limited to: high food prices relative to household budgets, lack of foods in the marketplace, poor food preparation or dietary practices, lack of clean water, sanitation and healthcare, seasonality, economic shocks and climatic crises. In 1986, the World Bank made the following distinctions:

Transitory food insecurity: this occurs when there is a temporary decline in access to adequate food to supply adequate nutrients for all individuals; contributing factors include unstable food production, food price increases, and inflation or income shortfalls.

Chronic food insecurity: this exists when food supplies are persistently insufficient to supply adequate nutrients for all individuals; contributing factors include poverty, gender inequity, political stability, climate change and natural disaster.

Nutrition security

The concept of nutrition security is important because it helps scientists, policy makers and programmes coordinators to understand why malnutrition often persists in many food-secure households. Nutrition security refers to a context in which all individuals in a household are able to maintain optimal nutritional status for supporting current and future health and well being. Nutrition security is achieved when all members of the household secure all of the following:

- access to food;
- sanitary environment, i.e. access to potable water and basic hygiene;
- adequate healthcare services, i.e. maternal and childcare services including ante-natal care and immunisation; and.
- knowledgeable care, i.e. through access to adequate nutrition information (e.g. preparation of nutritious and healthy foods, optimal feeding of infants and toddlers).

INDICATORS

Nutritional status

Nutrition insecurity leads to poor nutritional status of individuals and malnutrition among groups. Nutritional status refers to the values of clinical, biochemical and physical size measurements on individuals that indicate the adequacy of nutrient intake to meet physiological needs. Development experts interpret measures of nutritional status as inputs into the development process because a well nourished, healthy workforce facilitates successful economic and social development. Measures of nutritional status also serve well as indicators of the success or failure of national development processes, i.e. as outcomes, because a poorly nourished, unhealthy workforce undermines economic and social development programmes.

Malnutrition

Malnutrition is a condition of impaired development and function caused by either long-term deficiency or excess of energy and/or nutrient intake. Malnutrition can occur at any age but is often most common among vulnerable groups including infants, young children and women. There are many specific forms of malnutrition linked to different types of nutrient excess or deficiency but all can be classed into either "under" nutrition or "over" nutrition. Forms of both under nutrition and over nutrition now coexist within the same population/individual and this has been described as the "double burden of diseases" (WHO, 2003).

Undernutrition

The terms malnutrition and undernutrition are often interchanged but while malnutrition can be linked to obesity, undernutrition is defined as acute, chronic, underweight and micronutrient deficiency. Inadequate consumption of even one of the 49 nutrients humans need to meet their metabolic needs will result in adverse metabolic disturbances leading to sickness, poor health, impaired development in children, and large economic costs to society[3]. It is significant that no single agricultural crop or animal provides all the 49 nutrients needed to sustain the normal growth and development of a human being. It is proven to reduce physical growth, resistance to infection, work capacity, cognitive development, school performance and physical activity.

Micronutrient deficiency

Deficiencies of "micronutrients" - vitamins and minerals needed in tiny amounts- affect human function in ways that are not immediately visible, but

have serious health and economic consequences. Scientists now understand that micronutrient deficiencies often accompany deficiencies of the "macro-nutrients" that provide energy, protein and minerals. Such micronutrient deficiencies (MND) cause "hidden hunger".

A diverse diet will supply sufficient levels of nutrients to ensure healthy physiological functioning (Box 1.1.). In practice, very poor people have limited stable access to non-staple foods, particularly fruits, vegetables and animal source foods (milk and meat products). Common nutrient deficiencies are micronutrient deficiencies caused by low dietary intake or absorption of vitamin A, iron and iodine. Many women are also deficient in energy, iron and folate and many children are deficient in energy, protein, iron, vitamin A, vitamin B12, zinc and iodine.

Box 1.1. How a diverse diet from many sources meets human nutrient needs for basic biological functions.
Source: Modified after presentation by Dr. Margaret Ottah Atikpo

To avoid micro- and macro-nutrient deficiency, a balanced diet must contain **70 % carbohydrate** (maize, rice, cassava, sweet potatoes, millet, sorghum, root and tubers, bread) **for energy, 15 % protein** (fish, goat, beef, chicken, milk) **for body building**, **15 % fat** (cooking oil, palm oil, margarine) for energy, minerals (meat, salts, milk) **for body health**, **vitamins** (vegetables, fruits, eggs) **to prevent disease** and **water** (sanitary sources) **for transporting minerals and organic compounds**.

[3] Branca F, Ferrari M. 2002. Impact of micronutrient deficiencies on growth; the stunting syndrome. *Annuals of Nutrition and Metabolism* 46, 8-17

CONCEPTUAL FRAMEWORKS

Diverse diets and the "nutrition gap"

The best general indicator of a healthy diet is one containing a diversity of foods that together provide a range of nutrients to meet individual physiological requirements. Although the exact requirements will vary greatly among individuals according to age, sex, size, level of activity, life stage, illness and reproductive status, everyone needs access to foods containing the same set of essential nutrients. It is not necessary to understand all details of the functions of the nutrients required by humans to appreciate the importance of a varied diet in maintaining adequate nutritional status (Box 1.2).

Box 1.2. Underlying causes of malnutrition in women and children

- Inadequate access to safe water and sanitation
- Inadequate access to adequate health care
- Poverty and food insecurity
- Maternal burden of time allocation to work and subsistence
- Gender inequality in land access, food production, earnings, and decision-making.

The concept of a "nutrition gap" between what foods are healthy and what are available is particularly useful in planning for more effective linkage of agriculture to nutrition. Narrowing the nutrition gap between foods currently available and more and better foods potentially produced or purchased, entails in most situations, a number of changes in addition to increasing small scale food production.

Hunger undermines development goals

The concept of hunger is important in development, coordination and analysis of policy because hunger reduction has been prioritised as an integral part of Millennium Development Goal 1. Specifically, a goal set at the World Food Summit in 1996 and the United Nations Millennium Summit in 2000 was to cut hunger in half by 2015. Hunger occurs at the level of the individual and is manifest and measured by the physical and psycho-social discomfort associated with a lack of food[4]. All of the above measures serve as proxies for hunger.

Despite increasing food production, global progress on fighting hunger is alarmingly slow. Recent estimates are that one-sixth of the global population endure hunger today[5]. Globally, out of 79 countries monitored by FAO, only 8 have achieved MDG-1 by reducing the number of undernourished people by at least half between 1990 and 2006[6] and only 8 other nations are on track to meet MDG-1. In contrast, an expected rise in world's population from 6.8 billion today to 9.1 billion by 2050 requires an increasing global food production by about 70 % while also securing a corresponding rise in nutrition security.

The FAO has developed a conceptual model for the key contribution that hunger reduction can make to all the MDGs (Table 1.2). This framework highlights the ways in which hunger stands in the way of the MDGs. It enables nations to assess the extent to which progress on hunger reduction underpins general progress on each of MDGs 2-8. Development economists at organisations such as the World Bank now regard undernutrition and poor health as indicators of failures of development processes to reach vulnerable population groups. Sustainable economic development must lead to improvements in nutrition. Nutritional status is both an outcome indicator of the level of success of the national development process, as well as an input into the development process since a well nourished, healthy workforce is a precondition for successful economic and social development.

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[4] Barret CB. 2010. Measuring food insecurity. *Science.* Vol 327 no 5967 pp 825-828

[5] FAO. 2009. *1.02 Billion People Hungry, One-Sixth of Humanity Undernourished – More than Ever Before. FAO, Geneva.*

[6] These were: Armenia, Azerbaijan, Georgia, Ghana, Guyana, Jamaica, Myanmar, and Nicaragua. Source, FAO

Table 1.2. Why hunger reduction is important for achieving the MDGs
Sources: "Why Hunger Reduction is Important", The State of Food Insecurity in the World (Rome: FAO, 2005); Likelihood of achieving 2015 target: GoK and UNDP, Millennium Development Goals Progress Report for Kenya (2003).

MDGs	WHY HUNGER REDUCTION IS IMPORTANT
1. Eradicate extreme poverty and hunger	Hunger perpetuates poverty by reducing productive capacity of the weak and malnourished
2. Achieve universal primary education	Hunger reduces school attendance and impairs learning capacity; it also reduces school attendance more for girls than for boys
3. Gender equality & empower women	Gender inequality perpetuates the cycle in which mothers, as undernourished children, give birth to low birth-weight children
4. Reduce child mortality	More than half of all child deaths are caused directly or indirectly by hunger and malnutrition
5. Improve maternal health	Under-nourishment and micronutrient deficiencies greatly increase the risk of maternal death
6. Combat HIV/ AIDS, malaria and other diseases	Undernourished children are more than twice as likely to die of malaria, while hunger also spurs risky behaviour that accelerates the spread of HIV/AIDS
7. Ensure environmental sustainability	Hunger leads to unsustainable use of natural resources as people look for means to survive
8. Develop a global partnership for development	Subsidies and tariffs in developed countries hamper hunger-reducing good trade relations agricultural and rural development highlighting the importance of developing

Determinants of nutritional status

A widely adopted conceptual framework developed more than twenty years ago by UNICEF helps us visualise the many reasons why individuals in a food-secure family (or country) may be nutritionally insecure and have poor nutritional status. In the UNICEF model the reasons for poor nutritional status, an indicator of nutrition insecurity, are grouped for assessment, analysis, and action into those operating as immediate, underlying, and basic causes of malnutrition among children (Fig 1.1).

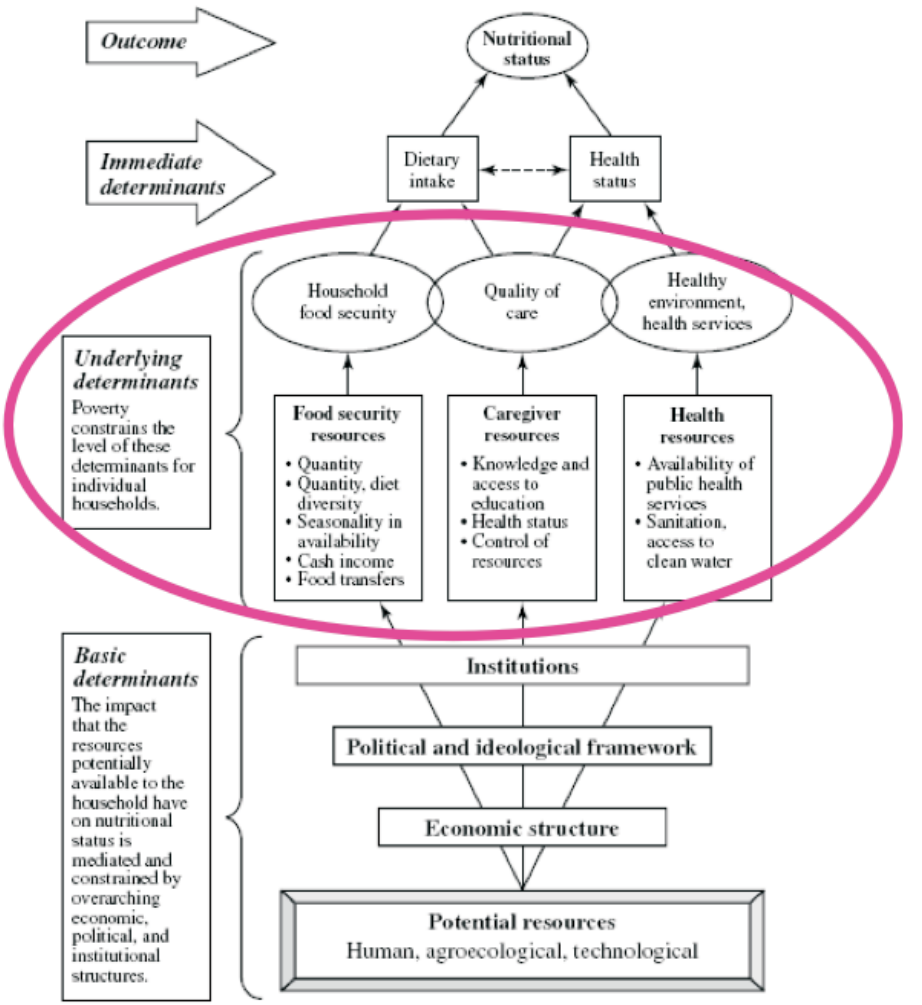

Fig.1.1 Conceptual framework for the determinants of nutritional status

Sources: Adapted from UNICEF (1990), Jonsson (1993), and Smith and Haddad (2000).

Even in net food producing households many residents, often everyone, may eat too few micronutrients because the staple crops produced and eaten do not contain adequate amounts and additional foods are not purchased. Pregnant women and nursing mothers may not afford to buy food and (if producing food at home) must sell more than they need to consume. Non-nutritional factors, such as illness due to communicable diseases and poor health services also deplete bodily nutrient store and reduce appetite and food intake. Early marriage and childbearing also contribute to low birth weight. Immediate causes of malnutrition in children are:

- poor nutritional status of mothers before and during pregnancy
- suboptimal infant and young child feeding practices
- high burden of malarial, diarrhoea, acute respiratory and other diseases

Underlying determinants include a large suite of factors all linked to the constraints imposed on households by poverty (Box 1.3). Poverty is manifest as a lack of cash, savings and assets, and therefore results in weak purchasing power, inadequate household budgets for food and, vulnerability to economic and other shocks and scant access to jobs, land, skills and forms of human, social, financial, economic and social capital that can enhance household productivity and boost nutrition security.

Lack of time, education and knowledge also undermine nutrition security. Maternal time constraints are becoming widely recognised as one of the most important of underlying determinants of poor nutritional status in Nigeria and other parts of sub-Saharan Africa. Put simply, whatever other resources they may have, many mothers may have too little time to take care of their young children or themselves adequately. Lack of time is one very common reason why many mothers often feed children under the age of 6 months foods other than breast milk. It is also a reason why caregivers, usually mothers or other women, start introducing complementary solid foods too early or too late and prepare nutritionally inadequate foods to young children.

Some caregivers may have access to healthy foods but may lack access to adequate nutrition knowledge. Common knowledge gaps include how to feed children during and following diarrhoea or fever and agreement that exclusive breastfeeding is the best source of nutrients and the best protection against many infectious and chronic diseases. Together, lack of time, lack of sanitary environment and lack of knowledge may contribute to a caregiver's focus on a narrow range of ingredients for preparing foods.

The concepts of food and nutrition security can be merged to produce a single model that has been applied to the situation in Nigeria[7]. This framework recognises the socioeconomic and political environment at the national and sub-national levels as the principal determinant of food security through its multiple influences on food availability, stability of food supply, and access to food, which in turn influence the amount of food consumed. These many factors determine the nutritional status of an individual when they interact with the health and sanitation environment and with care practices (Figure 1.2.).

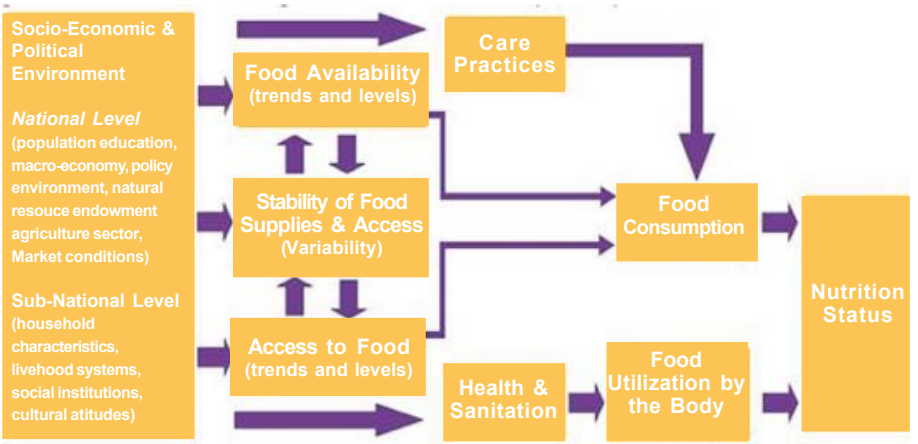

Fig. 1.2. Framework for understanding the causes of low food consumption and poor nutritional status.
Source: Isaac Akinyele (2010) Ensuring Food and Nutrition Security in Rural Nigeria: An Assessment of the Challenges, Information Needs, and Analytical Capacity. NIGERIA STRATEGY SUPPORT PROGRAM Brief No. 18

[7] Akinyele I. 2009. *Ensuring Food and Nutrition Security In Rural Nigeria: An Assessment of the Challenges, Information Needs, and Analytical Capacity.* Nigeria Strategy Support Program (NSSP)- Background paper no NSSP 007. IFPRI

LINKS TO AGRICULTURE

The overwhelming importance of agriculture for nutrition and health for the large majority of human beings today is clear. For many, agriculture provides a primary source of livelihood, income, and economic stability. For everyone, except traditional foragers, agriculture and the associated trade in agricultural produce generally improve food accessibility, food sufficiency and food and nutrition security and ensure quantity and quality is adequate for health. Nutrition provides improved health and health security and, for agricultural workers, improved livelihood returns. Major factors linking agriculture and nutrition include:

- **Limited food production, preservation and distribution capacity**
  Sparse agricultural inputs and investments, high post-harvest losses, poor access to food preservation technology, weak storage and transportation infrastructure, under-developed markets, and disparities in purchase power, productivity, availability and demand for foods.

- **Limited health, education and sanitation**
  Poor access to health services promoting nutrition information, low levels of girl-child and maternal education and poor environmental sanitation, undermine health and nutrition through multiple pathways.

- **Demographic forces**
  High fertility rate, linked unmet need for family planning, high child mortality, poor opportunities for education, non-manual employment and social security and loss of agricultural skills associated with rural urban migration.

- **Climatic changes as a result of global warming**
  There is increasing evidence (though from indirect sources) that increased unpredictability in rainfall and temperatures and other manifestations of climate change are contributing to a rise in global food prices and increased vulnerability of farmers to poor yields, crop losses and destruction of environmental services.

- **Changes in lifestyles**
  A shift to the consumption of salty, fried and non-fortified processed foods and beverages and reduced physical activity involve nutrition insecurity associated with malnutrition causing overweight, cardiovascular disease and diabetes type 2.

SUMMARY

It is essential to define key indicators that can measure the impact of household diet diversification, on nutritional status through integrated approaches. Policy and programming to address undernutrition in Nigeria through agriculture will be most effective when developed with a strong shared understanding of the concepts and measures used to describe and analyse nutritional problems. Policymakers, planners and programme coordinators must appreciate that food security is a necessary but not sufficient condition for nutrition security. Recent scientific advances in measuring food insecurity and nutritional status have moved attention away from production at the national, aggregate level to a focus on the intervening factors that affect food availability, food access and stability of food supply for households and individuals. It is now well-understood why closing the "nutrition gap" food requirements and consumptions is not usually achieved by increasing food production in the absence of other actions to address these intervening factors.

CHAPTER 2

MALNUTRITION AMONG WOMEN AND YOUNG CHILDREN

"Nutritional problems are development problems"
Dr. Davis Omotola, UNICEF, Nigeria

Policy and programming to address malnutrition and nutrition insecurity in Nigeria through agriculture must be developed with good knowledge of the specific needs and challenges. Information on the causes, extent and impact of specifically defined indicators of malnutrition among women and children in Nigeria can be used to establish priorities and to inform and benchmark national strategies and action plans to improve nutrition through agriculture and other interventions.

Measures available

Governments, international agencies, development partners and scientists around the world currently use an established set of nutrition indicators easily measured at the level of individuals and households and clearly associated with health and well being. They include:

a. Physical indicators of nutritional status;
b. Biochemical indicators of nutritional status;
c. Indicators of healthy diet and optimal nutrition practices; and
d. Indicators of micronutrient supplementation among pregnant and post-partum women, infant and young children (less than five years).

A need exists for greater investment in nutrition surveillance to define the nature and extent of malnutrition in Nigeria. Data currently available are limited because they do not cover every year, region, community or household. The FAO of the UN does not currently provide a "nutrition country profile" for Nigeria and experts rely on the NDHS every 5 years (The Nigeria Demographic Health Surveys of 1999, 2003 and 2008), along with some other data collected by UNICEF, Ministry of Health and other organisations. These document the wide distribution and high prevalence and severity of malnutrition and allow

some estimates of the likely very high impact on the national economy, health system, agricultural sector and progress towards MDGs.

Young children

In the 2008 NDHS, 41% of children under the age of 5 are stunted. Overall, 14 percent of children measured were wasted, half of them severely wasted, and 23% were underweight. Almost 1 in 10 of these children was severely underweight, leading to estimates that more than one million under-fives are affected by Severe Acute Malnutrition (SAM). In addition, 10.5% of children aged 0-59 months may be overweight (> +2 SD). Only 20% of babies less than 2 months are exclusively breast-fed, and 87% of infants are not exclusively breastfed from birth to 6 months. Children of complementary feeding age rarely consume animal source foods, fruits and vegetables and deficiencies of four micronutrients- vitamin A, Fe, Zn and iodine- are of great concern. 30% of Nigerian children under 5 years were deficient in vitamin A in 2003, 69% children under 5 years were anaemic (Hb < 11.0 g/dl), and 20% children under 5 years may be zinc deficient (<80 ug/dl).[8]

Women

There are few available data on Nigerian women's nutritional status. In 2008, 43.8% of Nigerian women of childbearing age were living with body proportions beyond the range consistent with the good health outcomes (Table 2.1).

Table. 2.1. Prevalence of malnutrition among women aged 15-49 in Nigeria (%).

Sources: The WHO Global Database on Body Mass Index (BMI); Prof Falusi.

	Underweight	Overweight	Obesity
National	15.2	20.5	5.9
Rural	16.3	16.6	3.6
Urban	13.1	27.7	9.6

[8] Maziya-Dixon et al. 2004. *Nigeria Food Consumption and Nutrition Survey 2001-2003.* International Institute of Tropical Agriculture, Ibadan, Nigeria.

Malnutrition is more pronounced amongst rural uneducated, young (under 30 years) females than their male counterparts. Malnourished women include 15.7% underweight or severely underweight, and 28.1% overweight or obese (i.e. higher than the prevalence of CED). These proportions further break down as follows:

- 12.2% prevalence of moderate underweight indicating CED (BMI<18.5 kg/m^2)
- 3.5% prevalence of severe underweight (BMI<17 kg/m^2)
- 22.1% prevalence of overweight (BMI>25 kg/m^2) in women
- 6% prevalence of obesity (BMI>30 kg/m^2)
- 28% zinc deficiency among mothers
- 44% zinc deficiency among pregnant women

Food supply and hunger

Nigeria is meeting its national food supply needs[9] despite population growth; food balance sheets indicate a per capita calorie supply of 118 percent. However, Nigeria has an exceptionally large proportion of underweight children in comparison to some other countries in Sub-Saharan Africa (Fig. 2.1). While it is among the best food producers, as Ghana and Uganda, adequate food supply at the national level and greater yields are not enough to ensure children are well-nourished or that all households or every household member has access to the food produced within Nigeria.

The few available data indicate that 15% of Nigerians are food insecure and a higher percentage of women than men are food insecure. An FAO 1997 PRA study[10] on household nutrition and food security in Kano showed that about of 1,718 households appraised 80% were found to be food insecure. Forty-six percent of these were temporarily food insecure households while 34% suffered from chronic food insecurity.

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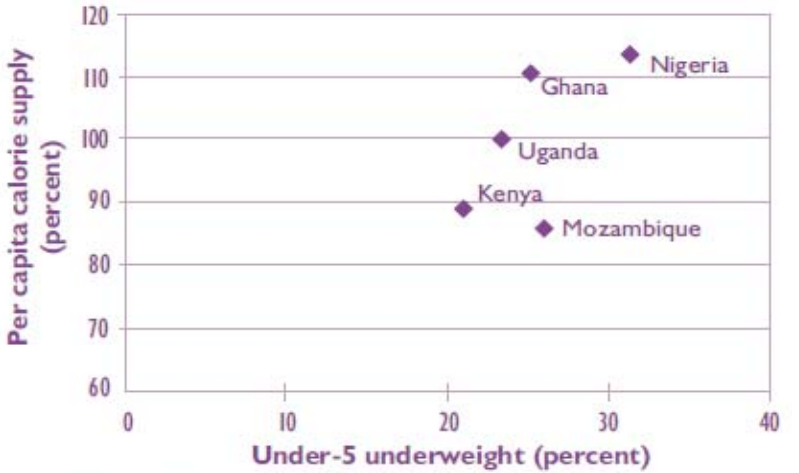
[9] http://www.icrw.org/publications/leadership-strategy-reducing-hunger-and-malnutrition-africa (accessed on June 21, 2011 at 1:32pm)

[10] FAO. Food and Agriculture Organisation. 1997. Participatory rural appraisal on household food security and nutrition, Kano State, Nigeria. *Summary Report,* FAO/TCP/NIR/4555(T), Rome, 1997.



Source: United Nations Food and Agriculture Organization, 2004

Fig 2.1. Estimated caloric supply from national agricultural production of foodstuffs in Nigeria compared with selected other countries.
Sources: International Centre for Research on Women (ICRW). 2005 A Leadership Strategy for Reducing Hunger and Malnutrition in Africa: The Agriculture-Nutrition Advantage project; Dr Maziya-Dixon
Source: United Nations Food and Agriculture Organisation, 2004

The national Global Hunger Index stood at 18.4 in 2008,[11] putting Nigeria at par with several West African neighbours and 50th out of 88 countries ranked on GHI. Nigeria made modest progress in reducing the GHI between 1990 and 2008 but GHI has remained at a "serious" level (10-19.9) since estimates began. Nigeria is in a group of sub-Saharan African countries with stagnant or deteriorating and high levels of childhood stunting.

[11] The Challenge of Hunger 2008; http://www.ifpri.org/sites/default/files/pubs/pubs/cp/ghi08.pdf (accessed on June 21, 2008 at 1:32pm)

Region

Although DHS data do not show regional disparities, other surveys consistently reveal that:

i. Malnutrition is widespread across Nigeria;
ii. Strong regional disparities nevertheless exist; and
iii. Indicators of malnutrition increase to the north of the country (Fig 2.2.).

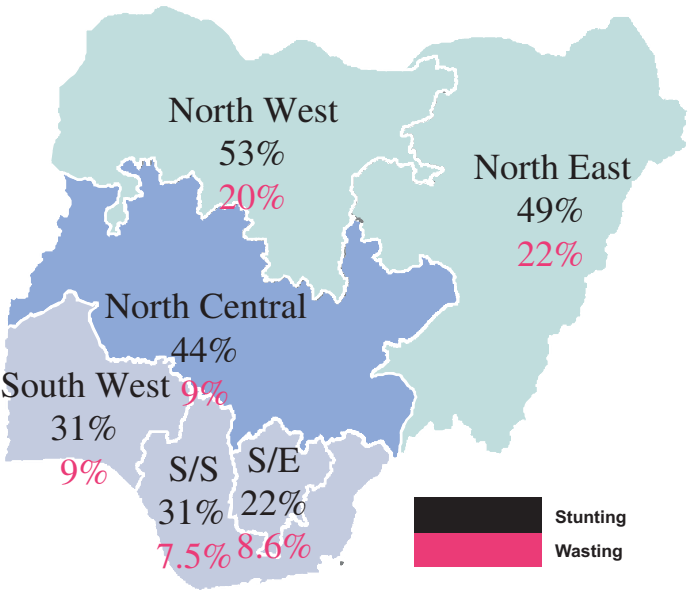


Fig 2.2*Prevalence of stunted and wasted children under 5 years of age in Nigeria, by region.*

Sources: UNICEF 2011; Dr Omotola

A high proportion of young children throughout the country are stunted or wasted, stunting rates are above 30% in all but the southeast region and the prevalence of Severe Acute Malnutrition (SAM) is a major public health problem (i.e. wasting above 2%) in 24 states. Stunting levels of above 50% and up to 84% have been reported in the rural areas of the south west and northern parts of the country, respectively. Estimates of zinc deficiency among young children differ by four-fold between the humid forest areas in the south and the dry savannah areas in the north (Fig. 2.3).

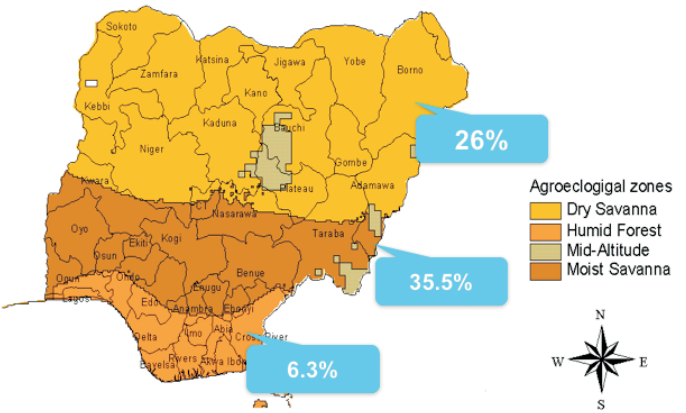


Fig. 2.3 ***Estimated prevalence of zinc deficiency children under 5 years of age in Nigeria, by region.***

Sources: NFCNS 2001; Dr Omotola

Coverage of children targeted by deworming and vitamin A supplement distribution programmes is significantly lower in the three northern regions (Fig. 2.4). UNICEF and the Federal Ministry of Health (FMoH) have identified the large majority of Nigerian states as priority states for health and nutrition interventions, based on a medium or high burden of malnutrition.

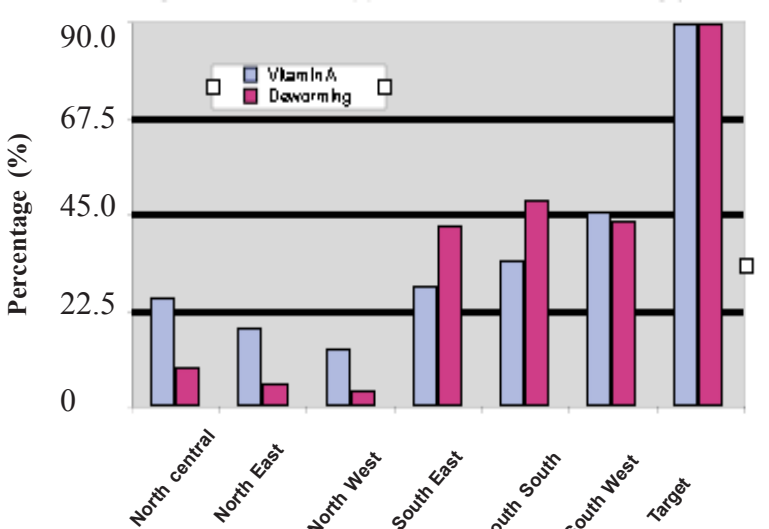


Fig. 2.4 ***Coverage of vitamin A supplementation and deworming in Nigeria, by region.***

Source: DHS 2008;Dr Omotola

Household income

A study in Kano, a relatively prosperous area, estimated that 13% of children under 5 years were malnourished and 23% were at risk of being malnourished (i.e. less than two thirds, were well nourished) Although as expected, 70% of the malnourished children came from poor, food insecure households, it was surprising that 30% of malnourished children came from rich, food secure households. Thus, indications are that malnutrition exists even in wealthier households and wealthier regions. In many homes, relative wealth does not always improve nutrition of women and children; a third of malnourished children are in such homes.

Changes over time

Data on children show an alarming pattern of stagnation in rates of stunting and underweight, which remain above 40% and 25% respectively (Fig 2.5), and an increase in the proportion of both overweight and wasted children in the more recent past (Fig. 2.6).

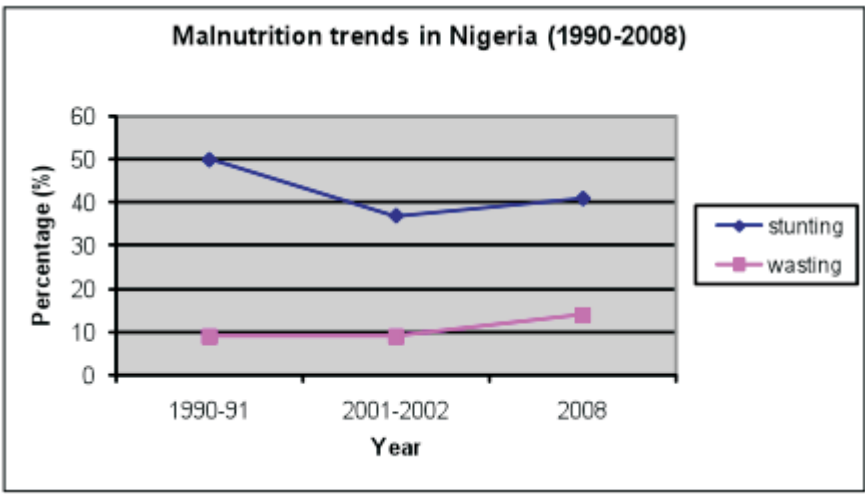


Fig. 2.5 ***Stagnation in progress on reducing child malnutrition in Nigeria over the last 3 decades.***
Sources: Nigeria DHS; Mrs Eluaka

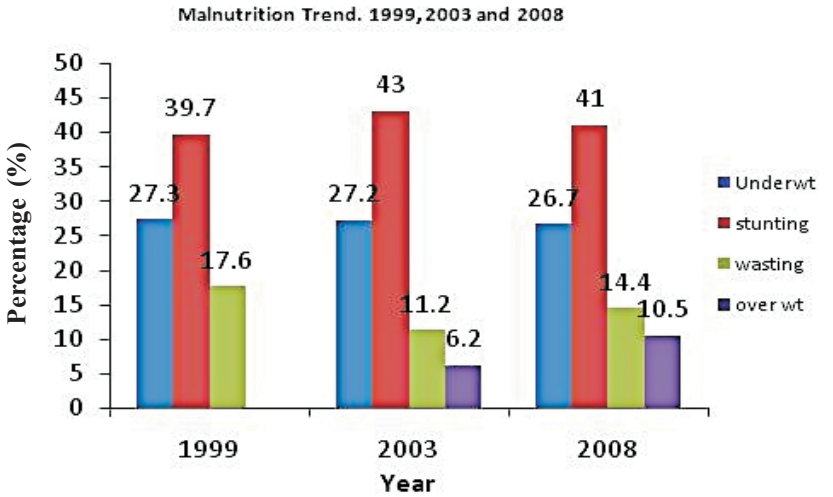


Fig. 2.6 ***Estimated prevalence of underweight, stunting, wasting and overweight among children under 5 years of age in Nigeria since 1999.***
Sources: NFCNS 2001; Dr. Oyewole

Reductions in the numbers of undernourished people (Table 2.2) and the depth of hunger (Table 2.3) over the last 30 years have been modest, in part because annual rates of change in food production have been consistently less than 2 percentage points higher than population growth (Table 2.4). Over-nutrition and the consumption of processed foods with reduced (low) nutritional quality are also increasing.

Table 2.2. Number of Undernourished People in Nigeria since 1990(millions)

Sources: FAO Statistics Division, 2010; Prof. Falusi

1990-1992	1995-1997	2000-2002	2005-2007
16.3	10.9	11.9	9.2

Table 2.3 Food Deficit of Undernourished Population in Nigeria since 1990 (Kilocalories/Person/Day)

Sources: FAO Statistics Division, 2010; Prof. Falusi

1990-1992	1995-1997	2000-2002	2004-2006
220	200	200	190

Table 2.4 Average Annual Rate of Change (%) in (A) food per person, (B) food production and (C) population since 1990.

Sources: FAO Statistics Division, 2010; Prof. Falusi

1990-92 to 1995-97			1995-97 to 2000-02			2000-02 to 2005-07			1990-92 to 2005-07		
A	B	C	A	B	C	A	B	C	A	B	C
1.9	4.4	2.5	-0.2	-2.6	-2.4	1.1	3.5	2.4	1.1	3.5	2.4

BROADER IMPACT

Economic losses

There are few available estimates of the specific economic impact of undernutrition among women and children in Nigeria, and so inference must be drawn from studies in other countries. Iron deficiency is associated with a 17% loss of productivity among manual labourers[12] and undernourished adults earn less than their non-affected counterparts. Weight for height is positively related to wages (an elasticity of between 0.28 and 0.6) and agricultural output. Children well nourished in the first two years of life are more likely to survive, go to school, and earn up to 46% more than their deprived counterparts as adult. The World Bank recently estimated the economic impact of undernutrition at 2-3% reduction in GDP.

Although more research is needed to identify and quantify the specific economic costs of undernutrition of women and children in Nigeria, there is

[12] Martorell. 2008. Effect of a nutrition intervention during early childhood on economic productivity in Guatemalan adults. *The Lancet,* Vol 371, Issue 9610, pages 411-416.

little doubt that it has a powerful effect in reducing foreign earnings and contributes to a negative balance of trade. Women's nutritional status affects their ability to perform family care and nurturing duties as well as to do work and perform the hard physical labour required in household food production activities. In Nigeria, agricultural productivity may be severely compromised as women play a significant role.

Child health

Nigeria is currently the third largest contributor to global stunting, with an estimated 10.3 million stunted children. Estimates are that malnutrition contributes to more than half of child deaths in Nigeria (53%), which is more than any other cause. The leading cause of under-5 deaths in Nigeria are neonatal illness and birth complications (24%), malaria (20%), pneumonia (17%), diarrhoea (13%), measles (11%) and studies in other countries show undernutrition is associated with 50-60% of deaths from these four diseases.

For some years, Nigeria was the world's second largest contributor to Under-five Mortality (U5MR) with estimates of 201 children deaths per 1,000 live births. Infant and under-5 mortality remain very high compared to many other countries in the region (86/1,000 and 138/1,000 live births, respectively). Young child mortality decreased only modestly between 1990 and 2008 (from 230 to 186 deaths per 1,000 live births), in part attributable to weak progress on addressing child undernutrition.

Current policies fail to address malnutrition during the narrow window of opportunity that exists during gestation of and the first 2 years of postnatal life. Stunting and underweight increases with age among surviving infants and toddlers, which means that more of them are falling behind their growth potential and losing any opportunity to ever catch up. Stunting and underweight both peak around 18 months of life and remain high at all other ages (Fig. 2.7.).

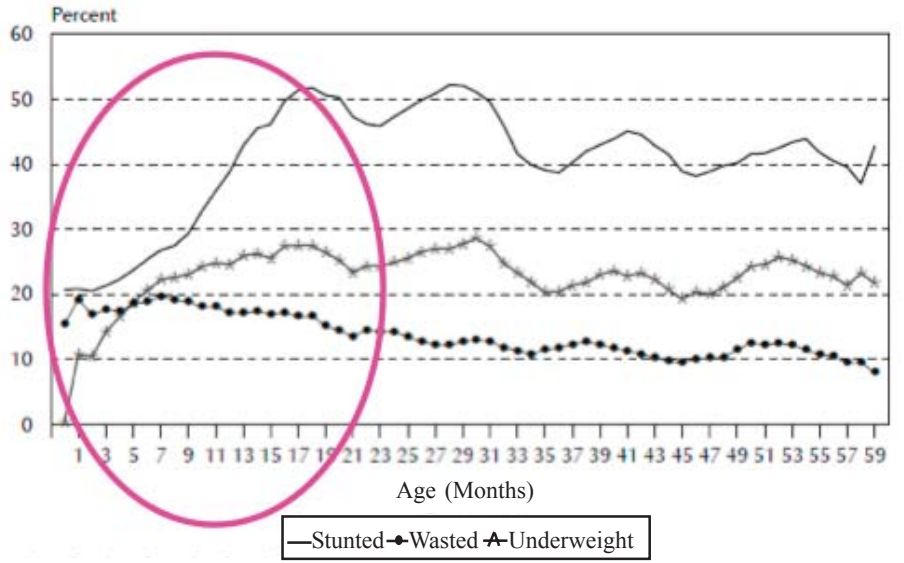


Fig. 2.7 ***Early growth faltering in the window of opportunity to prevent long term deficits among Nigerian children.***
Source: NDHS 2008; Dr Omotola

Women's health

Maternal undernutrition causes insufficient weight gain in pregnancy, intra-uterine growth retardation of the foetus (IUGR) and low birth weight, and increased death risk for the foetus and newborn; maternal anaemia, night blindness, blindness, and increased risk of infection. It also contributes to more than 52,900 maternal deaths which occur annually in Nigeria; everyday 145 women die during childbirth. Nigeria was for some years until recently the world's second largest contributor to Maternal Mortality Ratio (MMR) with estimates of 800 maternal deaths per 100,000 live births. A woman's chance of dying from pregnancy and childbirth in Nigeria is 1 in 13.

Undernutrition among girl-children and women is transmitted from generation to generation. About 50% of babies born below normal birth weight (<2.5kg) in rural areas have suffered slow growth in utero that is attributable to small maternal size at conception (low weight and low stature) and low weight gain during pregnancy. Low birth weight is a risk factor for child stunting and underweight, childhood illness and death as well as for some types of chronic diseases during adulthood (Baker, 1993). Low birth weight (LBW <= 2.5 kg) infants have a higher risk of subsequent growth retardation, morbidity and mortality than do other infants.

Health sector costs

Malnutrition adds to the burden of ill health and increases the demand for health services. High rates of low birth weight babies strain maternity service. Stunting, wasting and underweight in children, and micronutrient deficiencies in children and women of child bearing age, cause an increase in the use of clinics for preventable illness. Overweight/obesity in adults is becoming more of a problem than underweight, and is associated with increasing health demands resulting from rising incidence of non-communicable diseases, particularly cardiovascular diseases, diabetes mellitus and cancer. Although the specific costs are difficult to estimate, malnutrition creates illness that absorbs health system resources and these costs can be avoided with better nutrition. Since Nigeria currently spends only 1.4% of GDP on health, the proportionate costs are large.

Progress towards MDG

The burden of food and nutrition insecurity in Nigeria hampers progress towards multiple economic and development goals. Poor progress in tackling undernutrition is linked to poor progress in meeting the Millennium Development Goals (MGDs) 1, 4, 5 and 6. Consequently, food and nutrition security, health and sanitation are a responsibility of all development sectors. Failure to support good nutrition of women and children today entails economic costs compounded far into the future. Estimates are that returns on investments for improved nutrition may exceed 200-fold in increased productivity and savings averted.

SUMMARY

Malnutrition represents a "silent emergency" of large and growing scale in Nigeria. Every widely-accepted national indicator of malnutrition remains relatively high in Nigeria and regional inequalities in nutritional indicators are much larger than in similar countries. Trends over time include stagnation or worsening of levels of undernutrition in women and children. With continuing population increase this translates into an increasing absolute number of undernourished women and children. The problems of food insecurity, undernutrition and micronutrient deficiency remain entrenched while overweight, obesity and the poor health and productivity with which they are associated are increasing rapidly. Nigeria is one of only two African countries listed among the 20 responsible for 80% of global malnutrition.

Malnutrition contributes to between one-third and one-half of deaths among infants and young children and many common illnesses, and likely hampers economic and all other types of development. Productivity losses affect all sectors, but especially agriculture. Addressing nutrition security to prevent malnutrition will greatly facilitate national development goals by directly reducing mortality, morbidity, loss of human capacity and loss of economic productivity.

Box 2.1. Key facts about nutrition of women, infants and children in Nigeria

1. There are few nutritional data available other than the 5-yearly Demographic and Health Surveys, and this makes it difficult to identify needs for action and evaluate successes.
2. All available nutrition indicators for Nigeria compare unfavourably with other countries.
3. The very high death rate among Nigeria's children is strongly linked to undernutrition, which causes more than half of all child deaths.
4. The economic impact of undernutrition is not well measured in Nigeria but scientific estinates suggest it is enormous.
5. Malnutrition undermines achievement of all national development goals and progress towards the first six MDGs.[13]
6. Progress on reducing very high rates of child stunting is stagnant, wasting is on the increase and there is a continuing decline in indicators of breastfeeding, a proven lifesaver.
7. Nigeria is experiencing the "double burden" of malnutrition, a co-occurrence of undernutrition and overweight in the population that burdens the health system.
8. The six proven actions to prevent nutritional problems are poorly resourced and coordinated in Nigeria.[14]
9. Reducing malnutrition has more impact than any other intervention on improving health and indicators of human development.
10. Nutrition is not yet mainstreamed within health, agriculture or other sectors in Nigeria.

[13] These are: To eradicate extreme poverty and hunger; to achieve universal primary education; to promote gender equality and empower women; to reduce child mortality and improve maternal health
[14] These are: promotion and support for breastfeeding, complementary feeding and nutritional care of sick children and control of vitamin A, iron and iodine deficiency through supplementation

Chapter 3

ADDRESSING NUTRITION SECURITY NEEDS THROUGH AGRICULTURE

"Farmers are doing their best, but remain malnourished"
Dr Rabe Mani, Assistant FAO Rep (Programmes), FAO, Nigeria

Policy and programming to address undernutrition in Nigeria through agriculture will be most effective when developed with good knowledge of the links between agriculture and nutrition.

Agriculture and malnutrition in Nigeria: A paradox

Evidence reviewed in Chapter 3 shows that, at national level, the food supply in Nigeria is high relative to other African countries, but nutritional indices are relatively poor. Increased food production has not translated into improved nutritional indicators. The persistence of high levels of malnutrition in a country that produces more food than its citizens require emerges as a distressing paradox associated with an intolerable human cost. Clearly, agricultural policies, investments, innovations, and growth have not translated quickly into better nutrition for all. This situation demands assessment, analysis and action.

Economic and social importance of agriculture

The agricultural sector is a major contributor to Nigeria's prosperity and accounts for almost one third of GDP (31.9% versus 32.9% industry and 35.2% services). Agriculture employs 65%-70% of the labour force and provides 85% of national food and fibre needs. Agriculture is the main occupation for about 14 million families and 49 percent of Nigerians. Smallholder farming provides food directly for household consumption for a majority of people. Agriculture is a major source of income and livelihood for many poor and nutritionally vulnerable households; 70 percent of people live below the international poverty line.

Nigeria has many climatic, geographic and demographic advantages conducive to agriculture. Climatic and geographic advantages include 79 million

hectares of total arable land (out of a total land area of 92.4 million hectares, of which 32 million hectares is cultivated), very good soil fertility in many regions, adequate sunshine throughout the country, 300 mm to 4000 mm annual rainfall and abundant surface (267.6 m^3) and underground (57.96 m^3) water. Leading agricultural products are cocoa, peanuts, cotton, palm oil, corn, rice, sorghum, millet, cassava (tapioca), yams, rubber; cattle, sheep, goats, pigs; timber; fish. Cocoa and rubber are the main export crops, although the oil sector provides 95% of foreign exchange earnings and about 80% of budgetary revenues. The country is home to thousands of agricultural animal and crop varieties, representing a huge genetic resource. Livestock standing heads are estimated at 16 million cattle, 34 million sheep, 52 million goats, 6.6 million pigs and 140 million poultry.

Weak links to better nutrition and economic growth

As in other countries, there is a weak link between gains in agricultural production, gains in gross domestic production and gains in nutrition security. Human development indicators remain low in Nigeria; for example, infant mortality is 92.3 deaths/1,000 live births and life expectancy at birth is 47 years (10^{th} and 205^{th} in the world, respectively). Malnutrition persists throughout the country and is found even in the regions of highest agricultural production where staple crop production is high and food availability is good, and in some wealthier households. This pattern in Nigeria is similar to that in other countries such as Ethiopia, Tanzania and Malawi. Larger yields may increase food supply and household incomes, but do not translate to adequate, diverse and quality diets or ensure access to that food for all households and household members.

The reason is that improved national food production is not enough to end malnutrition. There are multiple pathways through which agriculture can narrow the nutrition gap, but many factors intervene to prevent this. Several simple assumptions are often violated in the real world. First, increased food production might increase household food consumption. This assumes the food will not be sold for income. Second, increased sale of agricultural commodities might increase expenditures for a larger, more diverse and nutritious family food basket (production for income). This assumes that new income is not diverted to other uses, such as recovery from economic shocks. Third, empowerment of women agriculturalists and related gains in children's nutrition and welfare may result from increased autonomy, status and income of successful women farmers. This assumes women are positioned to benefit

from agricultural improvements and control the means of production. Fourth, lower real food prices resulting from increased food production bring more foods within reach of the poor. This assumes that production levels are the main determinants of food prices. Fifth, macroeconomic growth arising from agricultural growth will improve markets and affordability of foods for all. This assumes that national growth brings benefits to all and alleviates poverty.

Rapid population growth and modest agricultural growth together result in an increasing absolute number of food insecure and malnourished people. Non-oil sector driven economic growth has been stagnant in Nigeria for years and per capita income has been declining progressively, and high unemployment and underemployment rates persist. With 70% below poverty, Nigerians with an average income have limited economic access to adequate food. Even if incomes increase the reduction in malnutrition may be small because studies in other developing countries show a doubling of GNP per capita in countries reduced child underweight rates by only 9 percent. Higher incomes do improve nutrition outcomes, but at slow rates.

CHALLENGES TO MEETING FOOD AND NUTRITION SECURITY NEEDS

Without innovation and policy changes, agricultural intervention will remain unlikely to improve nutrition security. The causal pathway between agriculture and improved nutrition status of women and children is "long and complicated" (World Bank), but six major challenges are especially powerful and wide-reaching:

Low awareness of nutrition as a cornerstone of development

The nutrition needs of Nigerians would be more effectively addressed if more people were aware of their importance and empowered to advocate for nutrition security measures. Most Nigerian families and communities are unaware that even moderate and mild under-nutrition contributes substantially to death, disease, and low intelligence. Most food and nutrition insecure families are poor and often the least able to leverage attention on their needs. Awareness of nutrition issues and their importance to voters and national development is also low among politicians and other elites that contribute to policy and coordination. If politicians and other decision-makers understood and embraced the potential for effecting changes to improve nutrition security and

nutritional status, a much-needed role of the scientific community in translating nutrition knowledge to the general public and to policy-makers is identified.

Characteristics of agriculture in Nigeria

Agriculture in Nigeria is predominantly rain-fed, conducted on a small scale by a large proportion of the population. Estimates are that small holders produce 90% of agricultural products and less than 2 percent of arable land is under irrigation. Agriculture in Nigeria is largely labour-intensive and weather-dependent. There is limited mechanization or use of improved seed varieties. Weather remains a key factor in agricultural production and nutrition security because smallholder farmers use a bush-fallow system of cultivation with few inputs. Vagaries of weather, and particularly variations in rainfall, account for large spatial, seasonal and temporal variations in yield and output. There are strong, direct relationships between low agricultural productivity, hunger, and poverty; an "agriculture-hunger-poverty" nexus. This contrasts with intensive agricultural production by few workers in high-income economies.

Population growth

Nigeria is currently the most populous nation in Africa, the only African nation ranking in the top ten most populous countries in the world (as the eighth) and may become the fifth most populous country in the world by 2050, with a projected population of 326 million. Continuing population growth is not a direct cause of malnutrition because food production has kept pace and is sufficient to meet demand at national level. However, population growth represents a significant challenge for improving nutrition security in a subsistence agricultural economy because improvements must exceed the rate of growth of the population at risk. Progressive increase in population from 88.9 million in 1991 to 103.3 million in 1996 and around 150 million in 2006, without corresponding increase in food output seems to have worsened the food security situation in Nigeria. Obesity and related chronic diseases have increased with rapid urbanisation.

Climate change

The UN System Standing Committee on Nutrition (UNSCN) predicts that Sub-Saharan Africa will be seriously adversely affected by climate change and that food production and yields will fall without agricultural innovation

and adaptation[15]. Indications are that weather patterns have changed substantially in Nigeria in recent years, including extreme weather such as heavy precipitation, flooding, storms, heat waves and droughts. In the two months before the workshop; Lagos, Ogun and Sokoto States experienced heavy rainfall that resulted in massive flooding that destroyed crops, farms and infrastructure. Most farmers have little access to information about global warming and its local effects and the range of possible responses. Ironically, farming operations are a major contributor to the problems of climate change through production of induced greenhouse gases.

Unpredictable and frequent extreme weather harms food production, food distribution infrastructure, livelihood assets and opportunities in both rural and urban areas. Some argue that smallholders have been experiencing poor harvests because the weather is different from what they are used to and it has become harder to know when the next planting season would start or what the most weather-appropriate crop to cultivate is. Previous patterns of seasonality have shifted to such an extent that subsistence food crops, such as maize, sorghum, beans, taro, yams, cassava, rice and millet, which are staple foods in Nigeria, often appear in the market much later than expected. Climate change is also driving a redistribution of "environmental services" in space and time to which farmers then must adapt. Heavy rains after long droughts are powerful climate phenomena that contribute to soil erosion, which is a major threat to agriculture. Climate change can expose farmers, their crops and their livestock to new pests and diseases and reduce food safety and human health. Insects, diseases, and weeds currently destroy about 35 percent of crop production in Nigeria, and there is a risk that climate change may increase such losses.

Barriers to women in agriculture

Nigeria shares with many other nations a complex gender bias in participation in agriculture and responsibility for nutrition security. Food preparation remains largely a female role and many women are solely responsible for both home food production and household consumption.

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[15] http://www.unscn.org/files/Publications/SCN_News/Supplement_ECOWAS_scnnews38_final.pdf (accessed on 11/06/2011)

Women's work in agriculture extends far beyond production for home consumption, however; they have strong presence in many steps of the agricultural value chain. Nigerian women make up some 60 – 80% of agricultural labour force and grow 60-80% of the nation's food. More women engage in agricultural activities than men, especially in many parts of southern Nigeria and the middle belt region. This gender bias in the agricultural labour force could be a result of the high rural-urban migration of young men seeking paid employment opportunities in urban areas. Also, males in rural areas tend to go into other activities(e.g. motorcycle transport business, trading etc) other than farming.

Whatever the reasons for this bias, it does not translate into gains for women involved in agriculture. Women bear the brunt of food insecurity, hunger, and malnutrition. Many factors limit the nature of their participation and present barriers to attaining food security. Women comprise the majority of the poor, in part because they are less educated and less informed than men. They have more difficulties gaining access to resources such as better income, land, capital, credit, agricultural inputs, education, appropriate technology and services. Women's work in agriculture remains marginalized and poorly supported. Women receive only 5% of agricultural extension services, and past research and extension for agricultural development focused on male-dominated cash crops.

There is a paucity of women in leadership roles that can promote gender-sensitive policy making and program coordination and delivery. Few women hold policy making positions at national level and they are concentrated in ministries like education, health and women affairs. Only rarely do women hold positions in technical ministries like agriculture which would have resulted in significant gains in agricultural productivity and major leaps in promoting food security. In most communities, especially in rural areas, women tend to be less educated and less informed than men and this lowers their access to better earnings. Nutrition security cannot be attained without supporting the role of women. Women's work directly influences theirs and their children's nutrition security, and women's status significantly affects child nutrition in all regions because women with higher status have better nutritional status themselves, are better cared for, and provide higher quality care for their children. Empowering and involving women alongside men in the design and implementation of agricultural and nutrition programs are critical steps to ensuring food and nutrition security in Nigeria.

PAST AGRICULTURAL INTERVENTIONS TO IMPROVE NUTRITION

Policy and programming to address undernutrition in Nigeria through agriculture will be most effective when developed with good knowledge of the best practices, capacity gaps and lessons learned from efforts already made. A number of agricultural projects that have been or are being implemented in Nigeria have included nutrition security and/or nutritional status outcomes in the goals or objectives[16]. The distinction is made between these nutrition-relevant measures and other measures of "food security" restricted to production and yield.

During the colonial period, a number of milestones marked the early development of agricultural research and extension institutions and infrastructure. These include the establishment of botanical research capacity, departments of agriculture and veterinary departments before the first world war; establishments of laboratory and research farm capacity and initiation of agricultural interventions with intensification of research activities, extension and training programmes including some in fisheries between the first and second world wars; and establishments of cattle breeding and research in the period after the second world war.

The early post-1960 period is notable for the drafting and implementation between 1962 and 1968 of Nigeria's first National Development Plan. Among several objectives, it emphasized the introduction of more modern agricultural methods through farm settlements, co-operative (nucleus) plantations, supply of improved farm implements (e.g. hydraulic hand presses for oil palm processing) and a greatly expanded agricultural extension service. A number of specialized development schemes and agricultural development intervention experiments were initiated or implemented during this period to improve food production. The World Bank-funded Agricultural Development Projects (ADPs) represented the first major practical demonstration of the integrated approach to agricultural development in Nigeria.

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[16] Specifically excluded from analysis here are a number of large scale, non-agricultural nutrition programs largely supported by UNICEF and partners, including government. The three highest impact actions are: (i) blanket distribution of vitamin A supplements and de-worming tablets during Child Health Week; (ii) community management of acute malnutrition (CMAM), and (iii) promotion of optimal breastfeeding and appropriate diversified complementary feeding.

A number of key agricultural intervention programmes have been supported by the World Bank and bi-lateral donors since 1974 until the present. Following successful negotiations for multi-state agricultural development projects with the World Bank, the ADP model was modified and taken to scale with the successive Fadama I, II and III Projects (1993-1999, 2004- 2010, and 2009 to date respectively) now covering all the states of the nation including Abuja, the federal capital. A series of ADPs of the Federal Government of Nigeria have been implemented, many under the Federal Ministry of Agriculture and Rural Development (Box 3.1). In addition, a series of Presidential initiatives on cassava, cotton, rice, cocoa, fisheries, tree crops, rubber, livestock, and maize were launched between 1999 and 2007. Only a handful of these have included any nutrition outcomes. The years since the early 1960s have also witnessed the establishment of many national and federal agricultural research institutes and their extension research liaison services (Box 3.2). In addition, two very important international institutes have headquarters or major international centres in Nigeria: The International Institute of Tropical Agriculture (IITA), lbadan and the International Livestock Centre for Africa (ILCA).

Box 3.1. Federal Government of Nigeria Agricultural development programmes (ADPs)

Operation Feed the Nation
Green Revolution Programme
Directorate of Food, Roads and Rural Infrastructure
Special Programme for Food Security (NSPFS)
National Accelerated Food Production Programme
National Accelerated Crops Production Programme
Agriculture and Rural Transformation Programme
Agricultural Development Programme
National Poverty Eradication Programme (NAPEP)
National Food Security Programme
Commercial Agriculture Development Programme
National Grazing Reserves and Pasture Development Programme
National Aquaculture Development Programme
FADAMA III Programme

Box 3.2. Significant national and federal agricultural research and extension institutes

Institute for Agricultural Research, Samaru-Ahmadu Bello University.
Lake Chad Research Institute, Maiduguri
National Cereals Research Institute, Badeggi
Institute for Agricultural Research and Training, Ibadan
National Root Crops Research Institute, Umudike
Cocoa Research Institute of Nigeria, Onigambari
Rubber Research Institute of Nigeria, Iyanomo
Nigerian Institute for Oil Palm Research, Benin City
Forestry Research Institute of Nigeria, Ibadan
National Institute of Horticultural Research, Idi-Ishin
National Animal Production Research Institute, Shika
National Veterinary Research Institute, Vom
National Institute of Trypanosomiasis Research (NITR), Kaduna
Institute for Oceanography and Marine Research, Victoria Island, Lagos
National Institute for Fresh Water Fisheries Research, New Bussa, Kainji
National Agricultural Extension Liaison Services Ahmadu Bello University, Zaria
Nigerian Stored Products Research Institute, Ilorin
Federal Institute of Industrial Research, Oshodi
Projects Development Institute, Enugu
Centre for Genetic Research and Biotechnology, Moor Plantation, Ibadan
National Institute for Chemical Technology, Zaria

Lack of evidence for program impact

It is striking that none of the above major programs in Nigeria had nutrition as a main objective; rather, improvement in productivity, income and rural infrastructure were the most common main objectives, either separately or in combination. It was probably assumed that achievement of the above-stated objectives would automatically lead to improvement in nutrition. Unfortunately, it is not possible to test that assumption scientifically for any of these projects because there is little or no information on the impact of these agricultural development programmes on the nutritional status of women and children.

Three conclusions are drawn. First, it is possible, given that all national indicators of malnutrition have remained high over the periods of these interventions, that they had no positive effect on the nutrition of women and young children in participating communities and households. Second, there is a clear need to develop and incorporate tools that will ensure that ongoing and future agricultural development programs make the required impact on nutrition of women and young children. Third, given the long history and wide scale of previous agricultural interventions lacking any nutrition objectives, training, or expertise, the mainstreaming of nutrition within the existing national and regional agricultural research and extension systems will require significant effort and change in conventional focus and practice. Nevertheless, the agricultural scientific support infrastructure and community is extensive and relatively strong and well-funded, so that implementing change can be rapid and effective if well-coordinated.

Recent and ongoing interventions

Workshop participants were briefed on five current agricultural interventions that do have a focus on improving nutrition and may offer lessons on what types of programs may be effective and why (Box 3.3). Both the Gender Informed Nutrition and Agriculture (GINA) and Home Grown School Feeding and Health (HGSFH) programs are yet to be evaluated. Therefore, it is again not possible to draw any conclusion about their potential impact on nutrition outcomes. It is possible that their impact may be limited. For example, one of the problems with school feeding programs is that without appropriate access to clean water and sanitation, they "feed the worms and not the school-age children". However, based on data from similar projects outside Nigeria, such as GINA-Uganda and school feeding programs in Kenya there is scientific reason to predict some positive effects.

If there are existing data that allow assessment of the impact of agricultural programs on nutrition security and nutritional status, they are not widely known to many experts in the field and therefore not effectively disseminated. There is therefore a dearth of data on nutrition impacts of past and present agricultural programs in Nigeria, and few specific lessons that can be learned from previous agricultural interventions targeting nutrition outcomes in Nigeria.

Box 3.3 Current agricultural interventions to improve nutrition

National Special Programme for Food Security (NSPFS)

Nigeria is one of ten African countries currently implementing a national program in partnership with FAO's Special Programme for Food Security initiative. The Federal Government of Nigeria launched in 2001 a 5 year nationwide National Special Programme for Food Security (NSPFS) with the objective of reaching some 30 000 farming families. It implemented the Phase 1 NSPFS with its own human and financial resources (US$45 million), established a Project Coordination Unit in the Federal Ministry of Agriculture and Rural Development tasked with launching field activities in all 36 Nigerian states and, in 2003 signed a South-South Cooperation agreement with The Government of China under which China provided experts and field technicians in various fields of agriculture and related fields. FAO provides technical and managerial support on demand.

Results of the first phase suggested that it "substantially improved food security and productivity, especially in marginal areas" and contributed to Government's "agricultural policy goals of boosting agricultural production for certain priority crops and commodities such as cassava, millet, rice, sorghum, vegetables and yams". The first two of five objectives of the Phase 2 NSPFS focus on nutrition outcomes (Box 5.7). Despite successes in other areas, evaluation studies of the NPFS program found little impact of women and children's nutrition.

Fadama III

The Third National Fadama Development Project is funded by World Bank, Federal and State governments with a main objective to increase the incomes of users of rural land and water resources on a sustainable basis. It builds on a previous Fadama project phases and covers the thirty-six States and the Federal Capital Territory (FCT). Fadama components include five activities designed to provide "facilitation for demand - driven investments and empowerment of local community groups and to improve productivity and land quality" (box). In practice, this involves institutional and social development, physical infrastructure for productive use, and transfer and adoption of technology to expand productivity, improve value-added, and conserve land quality. The project supports extension and applied research and provides matching grants to access assets for income-generation and livelihood improvements. Neither the objectives nor the assessment of Fadama III focus on nutrition. It also does not target vulnerable groups such as the food insecure, malnourished or women and children.

Gender Informed Nutrition and Agriculture (GINA)

The overall goal of USAID's GINA project is to use integrated agriculture and health interventions to improve nutritional outcomes of children less than 5 years of age. In Nigeria the goal is to improve the nutritional status of women and children and the focus is on a primary objective to reduce the number of underweight children in GINA communities by 10 percent. GINA-Nigeria project components include: improving agricultural practices, enhancing the care-giving capacity of mothers, building the nutrition-related capacity of local service providers, and sensitizing key local government officials about the importance of nutrition.

Home-Grown School Feeding and Health Program

The main objective of the HGSFH program is to alleviate short-term hunger among school-age children, thus increasing attention spans and capacity to benefit from schooling. The meals provided are designed to contribute to better nutrition and address specific micronutrient deficiencies common in school-age children, especially deficiencies of iron and iodine, that directly affect cognitive development. Additional objectives are to encourage enrolment and improve retention of children into schools at the community level, and to increase community involvement in schools.

National Program for Agriculture and Food Security (NPAFS)

National Program for Agriculture and Food Security in Nigeria is currently implementing a number of community-based programs such as establishment of home and school gardens, and promotion of improved breastfeeding and complementary feeding practices. They work through the Agricultural Development Project (ADP) coordinators. They have also produced a manual which the ADP coordinators use to train local women on local food-fortification methods.

EXPERIENCE OF OTHER AFRICAN COUNTRIES

Kenya

Kenya also has a strong agricultural sector but over 10 million Kenyans suffer from food insecurity and poor nutrition, and between 2 and 4 million people require emergency food assistance. An estimated 16% of adult males suffer from iron deficiency anaemia (KMoH, 2008) but women, especially pregnant women, are most vulnerable to iron deficiency (60% among pregnant woman) and vitamin A deficiency (39%). Nearly 30% of Kenya's children are stunted and children under five years are particularly affected by deficiencies

of vitamin A (84% of children), iron (73.4%), and zinc (51%). There are areas where food production is insufficient to meet local demand, but in many areas food insecurity is driven by problems with access, stability of access and availability.

The Government of Kenya has recognised the important potential contribution of hunger reduction to achieving national MDGs having conducted, with UNDP, a national assessment of the likelihood of achieving each MDG. Limited progress on reducing hunger is recognised as one key reason why the achievement of 2015 targets for MDGs 1, 3, 4, and 5 was deemed unlikely as of 2003, and achievement of MDGs 2, 7, and 8 was deemed only partially or potentially likely.

Kenya does have both a National Food Security and Nutrition Policy (FSNP) and a related set of national strategies. The Government of Kenya has incorporated the scientific conceptual framework for food and nutrition security into policy; it is the policy of the government that "all Kenyans, throughout their life-cycle enjoy at all times safe food in sufficient quantity and quality to satisfy their nutritional needs for optimal health." Several clearly articulated national strategies related to nutrition security now exist.

Nutrition-related agricultural activities are multiplying quickly and include several piloted "food-based" approaches that have enormous potential to effectively address problems of food access, availability and stability but require consistent and persistent education at community, household and individual levels on food production, selection and utilization. Maize has been biofortified to enhance protein value and Vitamin A content. Orange-fleshed sweet potatoes are showing good promise in trials as a feasible tool for alleviating vitamin A deficiency in western Kenya. There have been a number of technical successes in biofortification of legumes (peas and beans) and nuts, already commonly consumed in Kenya and a good protein source, to enrich their mineral content (iron, calcium and zinc). Many of these biofortified crops and improved recipes are now being promoted at community level and tested for adoption by producers and consumption by everyone.

There is rapidly increasing interest in affordable appropriate technologies for improved production and utilization, such as space-saving kitchen gardens, compost-mound home gardens, school gardens, urban agriculture, and school lunch programs. New efforts are being made to sensitize communities, raise awareness, and provide education for the local farmers and pupils on the

nutritional importance of neglected foods and crops and to enhance consumption and production of indigenous vegetables and fruits.[17] Efforts are gathering to mainstream under-utilized crops and create new demand and new markets. Nutritionists are characterizing indigenous dishes to identify those that may be good sources of key nutrients; recipe trials and testing of various recipes to produce dishes that improve intake of iron, carotenoids and zinc. Fruit production is a fast growing industry that offers solutions to micronutrient deficiencies.

Ghana

Ghana has the distinction of being one of only eight countries that reduced the number of undernourished people by at least half between 1990 and 2006. Nevertheless, prevalence of all types of measure of food and nutrition security remains unacceptably low despite a strong agricultural sector. In response, the Government of Ghana has initiated or facilitated a wide range of strategic interventions. A number of these are strongly cross-sectoral in nature and many are developed in partnership with civil society, agri-businesses, and small holders.

Efforts in Ghana are characterized by a holistic strategic approach to addressing food and nutrition security of women and children. One element has been to produce more and better food through improved agriculture. There has been emphasis on linkages to service providers, training of Farmer Based Organizations (FBOs), increased farmer access to credit from financial institutions, and programmes in animal rearing e.g. rabbits, grass cutters, goats, sheep and cattle. Investments introduced to boost agriculture and make food available throughout the year include conventional ones such as combined harvesters and modern machine. Together these have improved agriculture to enhance quantity and quality of food produced, sustainability of farming practices, and increased food availability at community level.

Another element has been the increasing acknowledgement of the role of women in agriculture. There are ongoing efforts aimed at gender mainstreaming in food and nutrition, processing, access to food, access to

[17] Mbithe et al. 2008. Promotion of nutrition education interventions in rural and urban primary schools in Machakos District, Kenya. *Journal of Applied Biosciences,* Vol 6;130-139

and control over natural resources and agricultural support services, as well as policy - and decision-making processes. An example is the FAO Special Programme for Food Security (SPFS) initiated in 1994. There has also been investment in strengthening Agricultural Information Systems and supply of inputs and machinery. In addition to agricultural approaches, there have been other national nutrition interventions, such as salt iodization programmes.

Important in priority setting and coordination have been a review and improvement of food policy, strengthened mechanisms to incorporate policy advice and technical support, and improved collaboration and interaction between the Ministry of Food and Agriculture, agricultural research institutions, research and training institutions such as universities and development partners such as FAO. Important in cross-sectoral integration of nutrition, agriculture and other relevant sectors have been improved linkages between agriculture and industry, efforts on sustainable development of livestock, fisheries and forestry resources, and efforts to scale up school feeding programmes. Many examples can be found of commitments by the private sector, civil society, agriculture associations, agriculture unions, parliament and traditional rulers. Important in strengthening the design and delivery of programs linking nutrition and agriculture in Ghana have been the incorporation of research activities; for example, breeding trials, food fortification and research involving caregivers. Also important is the increasing use of knowledge translation tools, such as training workshops, educational programmes targeting both women and men in new ways, e.g. education of males in care-giving to improve nutritional status of children, and private sector participation.

Experiences in Ghana suggest a number of "best practices" that offer good potential returns on scale-up and mainstreaming that could reduce hunger. These include determined, targeted and sustained crop-focused training of Farmer Based Organizations (FBOs), mainstreaming gender into projects e.g. education of males in caregiving will improve nutritional status of children and nutritional education programmes on radio, TV, and in cinema vans serving rural communities.

SUMMARY

There have been numerous agricultural programmes in Nigeria to date, but remarkably few with nutrition as a specific objective. Most agricultural programmes in Nigeria have been donor-driven, and there is a clear need for

more country-led and community-based approaches that incorporate target beneficiary perspectives on food and nutrition outcomes. The focus of most agricultural programs has been on economic development and poverty reduction, perhaps with nutrition as an implied goal but not an implicit one. Two programs that have included nutrition goals and outcome measures are so recently implemented that they are yet to be evaluated. There is an urgent need to develop, monitor and evaluate innovative agricultural programs specifically designed to improve nutrition based on the success of such programs in other countries.

"In past agricultural programs, it was probably assumed that improvement in productivity, income and rural infrastructure would automatically lead to improvement in nutrition."
PROFESSOR J .O. OLUKOSI, Ahmadu Bello University, Zaria

Chapter 4

AGRICULTURE AND NUTRITION POLICY

"Adequate food and nutrition are human rights that if denied leads to many losses"
Professor J .O. Olukosi, Ahmadu Bello University, Zaria

Policy and programming to address undernutrition in Nigeria through agriculture will be most effective when developed with good knowledge of the specific opportunities, existing strengths, key challenges and critical capacity gaps that have facilitated or hampered such progress to date. This chapter outlines governance and policy issues in planning, coordinating and successfully implementing programs linking agriculture and nutrition.

GOVERNANCE

The National Agricultural Policy (NAP)

There are a number of policies related to agriculture in Nigeria, but the most important is the National Agricultural Policy (NAP). The NAP has a very large number of objectives that include "the achievement of self-sufficiency in basic food supply and the attainment of food security", but do not include any link to nutrition security. Many of the objectives of the NAP are barely resourced; in a recent audit, 3 out of 289 national agricultural programs were found to absorb most government funds and among these, 90% went to projects linked to fertilizers.

Problems with the NAP include a lack of focus, lack of professionalism in policy management, inadequate and unreliable funding and a lack of stakeholder consultation. The management of the national policy on agriculture rests entirely with the Federal Ministry of Agriculture and does not directly involve other relevant stakeholders. There is no permanent funding allocation to support the NAP, so that it has the status of an "unfunded mandate". It has yet to be followed up with a strategic plan that makes specific provisions relating to the regional aspects of Nigerian agriculture. Some policies affecting agriculture originate from outside the sector, such as food import and export controls.

A number of improvements have been suggested in the implementation of national agricultural policy by agricultural development experts and the stakeholder community. First, key stakeholders in the agriculture sector, such as smallholders, and beyond, such as health and nutrition advocates, should greatly expand their capacity for influencing and contributing to the policy agenda. Policies are better fine-tuned to local and regional needs, challenges, and strengths, and are likely to achieve results if individual state governments articulate and implement specific state agricultural policies. Second, implementation of agricultural policies requires adequate long-term funding. Appropriate contributors to such a fund might include governments at all levels and the private sector through taxes. Many other countries earmark at least 5% of the national budget for agriculture. Third, political parties could facilitate debate and consensus on policy development by articulating their agricultural policies and seeking a socio-political consensus on the minimum set of values, beliefs, and philosophy that underlie and define the basic thrust of national agricultural policy efforts.

National nutrition policy framework

Data from the demographic and health surveys show that the nutrition situation has deteriorated between 1994 and, the most recent estimates made in 2008. A paucity of governance initiatives in the area of nutrition during the same period suggests the political profile of nutrition stagnated or declined within government, in marked contrast to the international stage. Food and nutrition-related activities in Nigeria have remained largely sectoral, uncoordinated, and limited in scope. We can identify a "Pre-Policy Era" during which the coordination of food and nutrition activities depended on the decisions and activities of various ministries. The various ministries prepared policies in which nutrition considerations were addressed from their respective mandates.

Responsibility for nutrition was given to the Ministry of Agriculture and Industry between 1984 and 1990, but it was poorly championed in part due to frequent leadership change and a stronger focus on the importance of productivity in agriculture and industry. Following a key conference at Kuru in 1989, the 1990s saw a number of policy coordination milestones and a trend towards more centralized coordination of food and nutrition activities. Between 1994 and the present day, the National Planning Commission (NPC) has remained the focal point for coordination and harmonization of all food and nutrition-related policies and programmes being implemented by various line ministries and agencies. The current Food and Nutrition Policy document

was drafted by the NPC in 1995 and launched by the federal government 7 years later as the National Policy on Food and Nutrition (NPFN). The overall goal of this NPFN document is to provide guidelines to tackle the multi-faceted problems of food and nutrition, using a multi-sectoral and multi-disciplinary programme approach. The NPFN document describes a rich variety of strategies for achieving the policy objectives (Box 4.1.).

Box 4.1 Suggested strategies for achieving food and nutrition policy objectives

Increasing access to food
Improving food distribution
Improving food harvesting, processing and preservation
Improving food preparation and quality
Ensuring national food security
Promoting adequate infant and child nutrition
Caring for the socio-economically disadvantaged and nutritionally vulnerable
Preventing and managing nutrition-related and infectious diseases
Preventing micronutrient deficiencies
Protecting the consumer through improved food quality and safety
Improving capacity to address food and nutrition problems
Providing a conducive macro-economic environment
Raising awareness and understanding of the problems of malnutrition in Nigeria
Promoting healthy lifestyle and dietary habits

National Policy on Food and Nutrition (NPFN)

The federal government of Nigeria launched its National Policy on Food and Nutrition (NPFN) in November 2002 as a national response to malnutrition, and with an overall goal of improving the nutritional status of all Nigerians. The overall goal of the policy is to improve the nutritional status of all Nigerians, with particular emphasis on the most vulnerable groups, i.e. children, women, and the elderly. The two overall policy objectives are: (i) Improvement of the economic situation of Nigeria, with particular emphasis on protecting the welfare of the most vulnerable groups in society and: (ii) Increased investment in the social sector, thereby raising the status of women in our society by increasing their access to and control over productive

resources. The policy document outlines specific goals and objectives (Box 4.2.) to address the problems of food and nutrition across different sectors and levels of the Nigerian society, from the individual, household and communities to the national level. The policy will remain operational for 15 years i.e. till 2016. The framework for implementation of the policy involves sectoral ministries, institutions of higher learning with nutrition-related programmes and the private sector (Box 4.3).

Box 4.2. The National Policy on Food and Nutrition (NPFN)

Goals

Establishment of a viable system for guiding and coordinating food and nutrition activities undertaken in the various sectors and at various levels of the society, from community to the national level;

Incorporation of food and nutrition considerations into development plans and allocation of adequate resources towards solving the problems pertaining to food and nutrition at all levels;

Promote habits and activities that will reduce the level of malnutrition and improve the nutritional status of the population;

Identify sectoral roles and assign responsibilities for the alleviation of malnutrition;

Ensure that nutrition is recognized and used as an important indicator to monitor and evaluate development policies and programmes; and

Promote good, indigenous food cultures and dietary habits of Nigerian people for healthy living and development.

Objectives

To improve food security at the household and aggregate levels to guarantee that families have access to adequate (both quantity and quality) and safe food to meet nutritional requirements for a healthy and active life;

To enhance care-giving capacity within households with respect to child feeding and child care practices, as well as addressing the care and well-being of mothers;

To improve the provision of human services, such as health care, environmental sanitation, education and community development;

To improve capacity within the country to address food and nutrition problems; and

To raise understanding of the problems of malnutrition in Nigeria at all levels of society; especially with respect to its causes and possible solutions.

Box 4.3. Components of Nigeria's Food and Nutrition Policy Coordination Mechanism

National Planning Commission Coordination (NPC)
Established by the Federal Government of Nigeria as the focal point for food and nutrition policy programme planning and coordination in the country. National Plan of Action for Food and Nutrition (NPAFN) Launched in 2004 to guide coordination of the NPFN. The plan details various activities aimed at addressing the basic, underlying, and immediate causes of malnutrition as well as roles and responsibilities of the various sectors while promoting partnerships among all stakeholders. It is yet to be fully implemented in a systematic and coherent manner.
National Committee on Food and Nutrition (NCFN)
Established and located at the NPC in the Presidency with a mandate to provide technical and professional assistance and institutional framework to coordinate and implement the policy guidelines by the committee. Membership is drawn from relevant ministries and representatives of universities. The secretariat is located within the Agriculture and Industry Department of NPC and is responsible to the Honourable Minister of National Planning/Chairperson, NCFN. The National Committee of Food and Nutrition has a and support to the NPC. Specific activities include: to set up and manage a database of nutrition activities and support in the maintenance of ongoing advocacy for food and nutrition issues; formulate appropriate strategies for policy and programme monitoring and evaluation; ensure that representatives of relevant sectors on the committee undertake effective implementation of their various policies and programmes.
State and Local Government Area (LGA) Committees
State and local government committees have also been established to facilitate nutrition coordination. They have remained generally non-functional, however, and it is important to understand why. A major reason is limited understanding of nutrition as a developmental issue by leaders and stakeholders, which in turn has resulted in inadequate funding of nutrition interventions. Another reason is lack of collaboration among sectors that have responsibilities for nutrition. Nutrition focal persons have been identified at the level of the state and local governments. However, they require a clear policy framework, logistic and supervisory support, as well as funding to be able to make an impact in their work.

CHALLENGES FOR NATIONAL COORDINATION

Effective future coordination of nutrition policy actions will involve addressing two overarching challenges: a lack of knowledge of nutrition among decision-makers and a lack of incentives for collaboration among sectors in competition for funding for nutrition activities. The stagnation of national nutrition indicators and paucity of national interventions aimed at nutrition reflect insufficient attention to nutrition security by decision makers due poor understanding of nutrition as a cornerstone of national development. There is confusion in understanding the expected role of the National Council on Food and Nutrition (NCFN) and the NPC in food and nutrition policy and program coordination and potential for misconception of roles by both government and development partners.

There are so few examples of effective cross-sectoral collaboration on national nutrition policy. The number and cadre of nutrition personnel is inadequate at all levels; effective coordination will require more persons trained in nutrition and cross-sectoral coordination and mobilization. No clear structures exist for monitoring and evaluating sectoral nutrition activities. The formal and practical linkages between the NCFN and the state and LGA committees remain weak. There is a critical lack of collaboration among sectors that have responsibilities for nutrition. Perhaps most important is that nutrition activities have remained donor-driven in Nigeria.

A number of key gaps in innovation and incentives exist. The first gap is found in the existing conceptual frameworks that equate nutrition with food security, sanitation, or behaviour change rather than emphasizing the interaction of food, health, and care as pillars of good nutrition. Experience in other countries indicates that sector-specific homes for nutrition end up favouring one pillar of good nutrition (food, health, or care) at the expense of the others. In Nigeria, a mono-disciplinary approach is fixed in place by a dominant conceptual framework that equates food production with food security. Another gap is found in the lack of political and individual career incentives to develop cross-ministerial policies and programs for food and nutrition security. A third major gap is in the lack of strong advocates and well-trained nutrition experts with the skills to influence, champion and implement nutrition policy.

There is a need for increased sharing of knowledge across sectors. For example, there are food fortification programs in the agricultural sector which those implementing nutrition programs do not know about and therefore cannot

leverage upon in their programs. In order to ensure effective coordination of the Food and Nutrition Policy in Nigeria, there is the urgent need for strengthening the human and institutional capacity of the various government institutions that make decisions affecting food and nutrition in Nigeria. Potentially effective approaches include expanding the capacities of existing agricultural institutions and providing nutrition training programs in schools, universities, and vocational settings. Such investments should be matched with adequate funding through the creation of budget lines for nutrition in sectoral MDAs. There is also a need for closer inter-sectoral collaboration to leverage available resources for "mainstreaming" nutrition in all sectors including agriculture. Clearly, there is a need to intensify efforts to address the problem and this must include strengthening the structures to review, revise and implement policy and achieve coordination of nutrition activities in Nigeria. At present, there is a need and opportunity to review the institutional arrangements for nutrition policy within government and to suggest new arrangements that may strengthen policy development and coordination.

PROPOSAL FOR A NATIONAL NUTRITION COUNCIL (NNC)

One possible and sensible 'home' for a body charged with coordinating nutrition is under the Presidency. On the 22nd of February, 2007, a Stakeholders' Forum on Child Nutrition situation in Nigeria was held at the State House, Abuja. The meeting was presided over by the former President and the Commander-in-Chief of the Armed Forces, Chief Olusegun Obasanjo. At the end of the meeting the President proposed the establishment of a National Nutrition Council to be domiciled in the Presidency and chaired by the President. The Council was established in principle in 2007 by the President and intended to be housed in the Presidency and Chaired by the President. This has not been ratified or constituted. The working Mission Statement of the Proposed NNC is:

> *"To effectively coordinate and harmonize all the efforts of the government in tackling malnutrition in order to maximize the contribution of adequate nutrition to the growth, development and full realization of the human capacity and potential in Nigeria"*

There is opportunity for the current or next administration to place increased emphasis on food and nutrition programmes as they affect national development. The inauguration of the approved National Nutrition Council in the Presidency, with the President as Chairman would increase the visibility of nutrition as a development issue and have the potential to bring about an increased budgetary allocation that will enable programme implementation and monitoring towards the achievement of the MDGs as well as the nutrition goals. The urgent concern of the National Nutrition Council will be to address the child nutrition issues, but terms of reference should pertain to all other areas of nutrition as they affect every Nigerian (Box 4.4).

Box 4.4. Potential terms of reference for a proposed national nutrition council (NNC)

Analyze and ascertain the problem of nutrition in Nigeria
Identify efforts already in place for tackling child malnutrition problems in Nigeria
Review of past strategies and their impacts
Assess further actions to deal with the problems at multiple relevant levels
(Household, community, local, state, national, international and institutional)
Coordination and harmonization of efforts and strategies
Resource mobilization
Advocacy sensitization efforts
Monitoring and evaluation of all nutrition programmes

SUMMARY

Undernutrition in Nigeria is largely viewed as a public health problem and "nutrition" is largely viewed as an independent discipline which is seldom of high priority to planners. The current policy focus in agriculture includes some focus on adequacy of basic food supply and food security in the sense of increasing food. Current policy does not directly address malnutrition, nutrition insecurity and poor nutritional status. Moreover, there are many challenges to policy implementation identified within the agricultural sector,

and cross-sectoral linkages to nutrition stakeholders are historically and institutionally weak and largely unfunded. Nigeria has yet to create a policy environment that prioritizes nutrition security as a cross-sectoral responsibility. Good governance is therefore linked to food and nutrition policy and action, and the nutritional status of vulnerable groups such as women and children is an indicator of the quality and success of governance.

Chapter 5

INTEGRATING NUTRITION INTO AGRICULTURAL RESEARCH

Many activities and processes along the entire agricultural value chain play a vital role in the nutrition security and nutritional status of consumers. These include many specific activities involved in food production, marketing, processing and preservation. Nutritionists in Nigeria and beyond are increasingly working on all of these aspects of the food system and in particular are stepping in to new roles in advanced food production techniques.

Role of nutrition scientists

Nutrition scientists offer a different set of skills than food scientists, who are experts in the preservation and processing of foods, and agricultural scientists (such as animal, crop, and soil scientists, veterinarians, agronomists and many others). Nutritional science aims at understanding the actions, interaction and effects on health and disease of foods and nutrients and the substances they produce. Malnutrition and its causes and means of treatment and prevention are a particular focus of specialists such as nutrition epidemiologists (who track indicators of malnutrition and the effects of different diets in populations), community nutritionists (who work to identify and address nutritional problems at the household and community level) and dieticians (who assist individuals to select diets appropriate to their health needs). These persons are trained to conduct research to identify nutrition problems and the best solutions to them. They can be called on to assist in the design, implementation and monitoring and evaluation of agricultural interventions aimed at raising awareness of nutrition issues, disseminating nutrition information (nutrition education and knowledge translation) and reducing poor nutrition.

NUTRITION RESEARCH RELEVANT TO AGRICULTURE

There are many new opportunities for the integration of nutrition and agricultural research and these can be grouped into the following major areas:

Biofortification

One relatively new and significant area of nutrition research is crop breeding for improved nutritional quality of foods, to meet export quality requirements in foreign markets and to improve resilience of nutritious crops. Once they are developed, widespread promotion of biofortified crops offers a number of advantages over other approaches to reducing undernutriton. Benefits of increased nutrition will reach the malnourished and rural poor including women and children. The approach is potentially cost effective and low cost because it is a one-time investment; once the nutrients are incorporated through breeding, there would be no further cost. It is potentially sustainable; once adopted by growers and consumers, the nutritionally improved varieties will continue to be grown and consumed year after year. There is no behavioural change because there is no need to change the growing, processing or preparation techniques. Since mineral micronutrients make up a tiny fraction of the physical mass of a seed, biofortification usually does not change significantly the appearance, taste, texture, or cooking quality of foods. Last, biofortification does reduce yields of crops.

Biofortification has been applied successfully to the problem of the deficiency of amino acids in staple food crops. For example, varieties of maize with high content of lysine and tryptophan called Quality Protein maize (QPM) have been bred in Mexico by CIMMYT. Such varieties have been released in Ghana as Obatanpa and in Nigeria as Sammaz 17 and 19 by Institute for Agricultural Research (IAR), Zaria. Classical studies at the University of Illinois demonstrated the feasibility of changing the protein content of the maize kernel by selection during conventional crop breeding. In these studies it was shown that protein content could be increased from 10.9 to 26.6 percent in the high-protein (HP) strain after 65 generations of selection. Needed are scale up adoption programmes aimed at farmers and consumers in Nigeria.

Recently, the genetic potential for increasing the concentrations of bioavailable iron, zinc and provitamin A carotenoids (as well as selenium and iodine) in edible portions of several staple food crops commonly grown and consumed in Nigeria (including beans, rice, wheat, maize, sorghum, sweet potato and cassava) has been reviewed. Although genetic variation for increasing micronutrients in maize seems to be limited, the data suggest there is sufficient genetic variability to increase iron and zinc concentrations in common beans by about 80% and 50%, respectively, and to increase iron and zinc concentrations in rice grain by more than three and five-fold,

respectively (Graham et al., 1999; IRRI). Similarly, CIAT studies on yellowroot lines preferred by indigenous farmers in the Amazonian region of Brazil and Colombia indicate there is enough genetic variability within the available cassava germplasm to produce cassava roots that contain enough b-carotene to meet the daily requirements of adults (i.e. 6 mg d±1 b-carotene) if the b-carotene in cassava roots is bioavailable (Chavez et al., 2000; Iglesias et al., 1997). There is an urgent need to translate these estimates into biofortified crops adopted in sustainable agriculture in Nigeria.

In Nigeria, biotechnology and traditional plant breeding are being aimed at improving nutrient quality of agricultural staple foods, such as cassava rich in Vitamin A. Zinc-dense wheat varieties are being developed and tested at the Waite Agricultural Research Institute. Nutritionists assist in the evaluation of new cropping techniques such as irrigating cherry tomatoes with diluted seawater rather than freshwater to increase the level of antioxidants and preserve water supplies. There are multiple opportunities to experiment in Nigeria with nutritionally improved crops developed abroad. In the United States, an iron-efficient soybean has been developed to overcome problems of iron "deficient" soils, the ferritin gene has been isolated and sequenced in plants, including soybean, French bean, pea and maize, opening up opportunities for increasing iron bioavailability in these food crops. Cadmium levels in durum wheat have been reduced through plant breeding to meet quality standards in countries importing US wheat.

Although food fortification with micronutrients is an effective strategy for narrowing the nutrition gap, the conditions of the poorest and most vulnerable women and children mean that their micronutrient deficiencies cannot always be addressed by fortified products. Many are poor subsistence farmers with restricted access to fortified food whose main food supplies come directly from the land. They often have low purchasing power and multiple micronutrient deficiencies that can be better addressed through food-based approaches linked directly to agriculture than by fortified foods.

Food diversification

Another area of nutrition research focuses on working with smallholders and other farmers to experiment with new crops and livelihood strategies aimed at broadening the range of foods produced and consumed both in the household and in the marketplace. Such strategies are intended to address

both a need to develop markets and spread risks for producers and to increase the availability of micronutrient-rich foods for all. In Nigeria, cultivation of indigenous plants (e.g. breadfruit, amaranth, okra etc), development of vegetable gardens and fruit crops, rearing of small livestock, development of backyard fish ponds, and agro-forestry are being supported through extension to increase the food base and supplement staple foods. The focus of evaluation of these efforts is expanding from income generation, sustainability and livelihood development to include evaluation of diet diversity.

Improved home horticulture offers one pathway to increasing availability and to a stable supply of fruits and vegetables. Vegetable production in the tropics is highly seasonal and severely constrained by low yields and quality due to high temperatures, excessive or insufficient moisture, heavy disease and insect pressure, and poor post-harvest handling. In Sub-Saharan Africa, per capita vegetable supplies are only 43% of what is needed (the minimum recommended is 73 kg/person/year). In Nigeria, research is needed to improve breeding, production and preservation of fruits and vegetables such as tomato, peppers, onion, cabbage, cucumber, okra, melons, egg plants, citrus, pawpaw, mango, cashew, and banana. For example, Nigeria could adopt a model established by The World Vegetable Centre (AVRDC), which conducts research on multiple strategies to alleviate micronutrient deficiencies including development of technologies to increase vegetable production and availability, enriching nutrient density through plant breeding and promotion of nutrient-rich underutilized indigenous vegetables, and enhancing nutrient bioavailability through optimum food preparation.

Post-harvest food processing

Nutrition research in Nigeria is focusing on testing, support and promotion of appropriate and sustainable technologies to preserve food, reduce post-harvest losses, and extend availability of food products over a longer period. Such technologies have the potential to reduce the "hunger gap" between the harvest period and the lean period when food prices rise steeply and put many people at nutritional risk. Food safety is a relatively neglected area in Nigeria. Investment in processing infrastructure and research to improve the safety of street foods, raw meat, milk, and vegetable and locally processed products has great potential to improve food safety. In particular annual wastage of fruits and vegetables due to seasonal gluts could be prevented through better processing and storage.

Post-harvest food processing is also used to improve the nutritional value, separate the components and alter the characteristics of foods. Examples are techniques for mechanized gari manufacture, powdered ogi, pounded yam flour, and bottled palm wine. Locally-appropriate cassava processing equipment developed in Nigeria is being adopted by cassava processors in DRC Congo, Tanzania, Ghana, Cameroon and Cote d'Ivoire. Nigeria is also seeing increased adoption by smallholders and small scale producers of post-harvest food processing equipment developed abroad, often in other African countries. This includes flash dryers used to process flour, starch, etc., the Tchonkor improved fish smoking kiln (developed in Ghana) and the Barlett Steamer for the manufacture of instant cereal-based baby and adult food. Solar drying is also a relatively under-utilized potential technique for preserving fruits, vegetables and animal source foods.

Food processing is a powerful approach to improving the protein spectrum of widely consumed cereal grains. The specific processing techniques include lime cooking, fortification, fermentation and supplementation. For example, many efforts have been made to improve the nutritional quality of maize and particularly that of its protein through post harvest addition of amino acids or protein sources rich in the limiting amino acids. Another approach is to intensify and improve on the production techniques, preservation and distribution of conventional sources of protein e.g. legumes to make them available and affordable to the vulnerable groups. Yields of soyabean, cowpea and less common legumes have also been significantly improved.

Further research has the potential to identify value chain pathways for improvement in the efficiency of production and distribution of non-plant sources of proteins and micronutrients such as meat, fish, milk and eggs through biotechnology and mass production to make them more available and affordable. There is also relatively unexplored potential for utilization of nonconventional sources of animal source foods such as snails, toads, locust etc and development of new sources of protein.

Food handling, sale and distribution

The Nigerian food industry is characterized by a high dependence on local transportation of agricultural produce, mainly by road. Therefore, food distribution and marketing are prone to vagaries in the local or national transport networks. Currently, there are no special trucks and transport services for

distributing specific food or beverage product. Significant losses and food contamination occur at accident or breakdown sites. The collapse of the cold chain industry is adversely affecting storage and availability of animal based products.

There is great potential for on-farm and small-holder and third party product development, particularly in the areas of centrally fortified staple products, improved supply, distribution and use of animal source foods and utilization of improved traditional recipes, indigenous crops and unconventional sources of food rich in protein and micronutrients.

Social mobilization, education, farmer participation and equity

There are large and unrealized opportunities for nutritionists to assist with research on gender issues, farmer mobilization, agricultural education and extension, and with participatory approaches to integration of nutrition considerations into the agricultural research agenda. Examples include evaluating different strategies to increase women's involvement in and satisfaction with agricultural extension programmes, or to strengthen research-extension-farmer linkages. There is need to incorporate nutrition perspectives in gendered, participatory rural appraisal (PRA). A direct approach to partnering with farmer communities to reduce malnutrition is to mainstream nutrition outcomes in client-oriented, demand-driven research to involve major stakeholders (farmers, policy-makers, researchers, extensionists) in the planning and implementation of agricultural research. Knowledge to identify and address malnutrition can be incorporated into training and re-training of producers, processors and food handlers. A focus on nutrition problems and outcomes can inform and strengthen the relevance and quality of assistance and incentives to educated farmers. Increased involvement of nutritionists in systems research management will inform strategies for addressing malnutrition through agriculture.

Response to climate change

It is important to distinguish, scientifically, the separate effects on agriculture of climate change due to external influences and environmental degradation caused locally by unsustainable land use practices. In particular, a high rate of soil erosion in some areas of the country is as threatening to sustained levels of food production as projected changes in climate. Whereas

ongoing environmental degradation can be stopped and even reversed, the only response to climate change is adaptation of farming strategies and techniques. In fact, many innovations have the potential both to increase sustainability and help farmers adapt to climate change.

Soil erosion rates can be reduced significantly when soil and water conservation practices are adopted, and crop yields increased by 2 to 15 percent. Irrigation could substitute for reduced rainfall. However, successful irrigation depends on availability of abundant water and energy resources and solving current problems of salinization and water-logging of soil. These factors are likely to limit the use of irrigation, even in the face of water shortages for agriculture. Some recently developed improved crop varieties have greater tolerance for moisture stress than current dominant crops and could be tested as substitutes for commonly used varieties. Crop rotations are sound agricultural practices that should be widely used in agriculture. A return to crop rotation would substantially reduce soil erosion and water runoffs and improve the control of insects, diseases, and weeds. Investments in biotechnology could be used to develop new crop varieties that require slightly less water. Organic farming has the potential to reduce greenhouse gas (GHG) emissions and sequester carbon and reduce costs of agricultural inputs, but capacity to meet quality controls for foreign markets for organic crops is very limited.

A number of recent cases of unforeseen catastrophic losses of livestock, such as in intensive poultry facilities highlight the powerful adverse effects of climate change on livestock production. Available livestock interventions that may prove protective include improving nutrition for ruminant livestock, more efficient management of livestock waste, increasing feed and residue yields from crops grown on arable lands, reducing losses from disease and parasites and improving the genetic potential for milk and meat yields. Raising cattle for beef organically on grass, in contrast to fattening confined cattle on concentrated feed, may emit 40% less GHGs and consume 85% less energy than conventionally produced beef.

Increased use of appropriate technologies such as prudent application of pesticides and increased use of non-chemical pest controls would reduce crop losses due to pests and diseases and increase crop yields. Effective use of climate data and forecasts, through early warning systems, can assist in analyzing the impacts of climate change on agricultural production and the entire food chain.

CONSTRAINTS ON INTEGRATED RESEARCH IN NUTRITION AND AGRICULTURE IN NIGERIA

The potential for all of the above types of research to improve nutrition in Nigeria is limited by poor funding and over reliance on foreign donor and public funds with negligible participation from the private sector. Specific ways in which poor funding undermine the relevance, quality and impact of such research include inadequate staffing and obsolete, poorly maintained or inadequate facilities and infrastructure. Also important are deficiencies in research management and coordination that result from an absence of coordination mechanism for setting priorities, ill-defined priorities and poor communication among researchers and research institutes, between researchers and policy makers and between researchers and the public.

SUMMARY

There is a need to incorporate policies on the support and coordination of the types of integrated research outlined above into the development of agricultural and other policies to address the food security situation of the poor and undernourished; as in any area of endeavour, but particularly because research programs usually take some years to complete, there is a concomitant need for consistent government policies and implementations. Coordination is a key need because in fact there are many influential and effective individual agencies, institutes and bodies active or established in Nigeria that either conduct or review research in either or both agriculture and nutrition. These include international agencies such as FAO, WHO, UNICEF, UNIDO, IITA; research institutes such as FIIRO, IAR&T, IAR, NCRI, NRCRI, universities and other tertiary institutions; professional bodies such as NIFST and C:AVA (Cassava: Adding Value for Africa) project; as well as numerous government ministries and agencies. There are also a number of models of successfully applied integrated research, such as the Shonghai Business Model, which aims at new products and services, are designed to make rural communities and villages more economically viable. In this model, products and services are created to meet the needs of the rural people, experts assist with development of the traditional and rural markets and rural end-users develop applications of sustainable technologies.

Chapter 6

THE WAY FORWARD IN NIGERIA

"Including nutrition strategies into agricultural and community development initiatives does not necessarily mean designing new programmes."
Dr Rabe Mani Brian Thompson and Juliet Aphane, FAO, Nigeria/Rome

STRENGTHENING LINKS BETWEEN AGRICULTURE WITH NUTRITION

In developing effective policy and programming to address hunger in Nigeria, stakeholders can agree on a strong scientific, humanitarian, economic and development rationale for strengthening links between agriculture and nutrition security. Many opportunities exist for improving nutrition through agriculture, latent capacity is significant and there is great potential for improving nutrition outcomes for women and children. Several international agencies have developed frameworks for advocacy and action in the agricultural sector to improve nutrition outcomes that provide one source of direction for action planning in Nigeria.

The World Bank Scaling Up Nutrition (SUN) Framework

This links nutrition security to income as a main driver of food consumption, particularly non-staple foods, and distinguishes "nutrition-specific" interventions such as de-worming, vitamin A supplementation and breastfeeding promotion from "nutrition-sensitive" efforts focused on strategies and outcomes to improve nutrition outcomes in sectors like agriculture (Box 5.1). Nutrition-sensitive approaches require; (i) sensitising leaders who design agriculture projects; (ii) increasing awareness among senior officials in government and international organisations; and (iii) augmenting the evidence base on the links between agriculture and nutrition, so that it is comparable to that which exists for direct nutrition interventions. Applying a broader, multi-sectoral perspective, "nutrition sensitive" agriculture programs are also likely

to be "pro-poor" by investing in human capital, livelihoods and smallholders risk-management.

Box 5.1. Common characteristics of "nutrition sensitive" agriculture projects

- improving dietary quality and diversity as well as increasing caloric intake
- production of micronutrient foods
- counselling to encourage awareness and consumption of micronutrient rich foods
- non-discriminatory food distribution within families
- control of infectious diseases through improved hygiene and access to health services
- capacity building to support positive care and feeding practices
- enabling and empowering women
- the importance of local context and cultural norms
- behaviour change communication
- investing in human capital
- expanding the livelihood base of rural communities
- providing risk-management strategies and support to smallholders vulnerable to market-based and environmental shocks

The UN-FAO roadmap

FAO advocates for moving beyond staple crop production to focus on food based approaches and dietary diversity and bases its strategy on four points: 80% of Africans rely on agriculture for livelihood; improving nutrition of women and children is a priority; increases in agricultural production by themselves are not enough; and narrowing the "nutrition gap" between what foods are healthy and what are available should be a goal of agricultural development.

LEVERAGING EXISTING KNOWLEDGE AND CAPACITY

Key approaches to linking agriculture with nutrition in Nigeria are to develop and strengthen research and training and build on existing agricultural extension platforms.

Nutrition-sensitive agricultural research and training

Nigeria has an impressive range of research centres, institutions and organisations that are well-positioned to facilitate better nutrition outcomes from agriculture through research, extension and training. It is possible and strategic to include nutrition as one of the main objectives in all research efforts in agriculture. Priorities for Nigeria are research on:

a. Biofortification (biofortified crop development, adoption by farmers and consumers)
b. Diet diversification (improved energy, protein intake and micronutrient bio-availability)
c. Post-harvest food processing (product development, nutrient enhancement/enrichment)
d. Food handling and distribution (value addition, loss reduction)
e. Social mobilization and education (policy makers, farmers and consumers)

All of these types of research can generate information and lessons on how nutrition-sensitive agriculture can narrow the nutrition gap between what foods are available and what foods are needed by women and young children. The most direct approach is to increase access to and intake of nutrient-rich staple foods and test technical and social innovations aimed at increasing the bio-availability of vitamin A, iron, and zinc in the diet of all Nigerians. New emphasis on under-utilized foods rich in nutrients, improved techniques to produce fruit, vegetables, livestock and fish, and value chain addition can complement conventional research on high yield crop varieties and production packages to increase production, yield and income.

The curricula of Agriculture and Nutrition programmes in Colleges/Higher Institutions can be reviewed and revised to ensure that students in both disciplines will possess adequate knowledge on the interconnectedness between the two fields. Adequate financing of the research sector is key. However, research institutes and universities need commitments of adequate funding to acquire high-tech equipment and facilities, replace obsolete ones, and conduct high quality research to develop agriculture in ways that improve nutrition and to train and retrain leaders in agriculture and nutrition. Mechanisms for coordinating applied research across institutions, harnessing their differing strengths and locations, in line with national strategies, are needed.

Nutrition and gender-sensitive extension

Previous investments in agricultural extension have put in place a strong platform that could be greatly expanded from crop and animal production to include a nutrition-related focus on delivery of nutrition knowledge and technical assistance. There is opportunity and need to maintain and strengthen extension delivery to create awareness of new ideas, techniques, varieties and research findings. Investment in training could meet a need for agricultural extension officers who are trained on nutrition and can provide nutrition education to communities. Inputs that are serviced by governments, donor agencies, NGO, and private sectors could all be provided through nutrition security extension workers.

It is essential to support and promote the production and diversification of food crops normally grown by women, who must be fully involved in nutrition-relevant agricultural extension. Nutrition sensitive agriculture can be supported by policies that ensure gender objectives are incorporated in all aspects of the food supply chain from production, processing, storage, access to and consumption by the consumer. Agricultural extension, strategies such as food crop diversification, cultivation of indigenous plants, development of vegetable gardens and fruit crops, rearing of small livestock, development of backyard fish ponds, and agro-forestry can be employed to increase the food base and supplement staple foods.

There is a huge potential to extend awareness of biofortified crops already developed for use in Nigeria and on the use of fruit and vegetables as an important component of the diet and promote preparation methods that increase bio-availability of Vitamin A, iodine, iron and zinc micronutrients. Agricultural extension can also promote technologies to increase vegetable productivity and facilitate year-round vegetable production. Effective extension services cannot rely exclusively on the government. There is potential benefit for both NGOs and the private sector to take a larger role. The civil society is already providing livelihood and gender-sensitive support for poverty alleviation, and the private sector is already selling improved seeds, processing and packaging fortified foods, and advertising. Ample opportunity remains to facilitate more public-private-research interactions to improve collaboration between these sectors.

Policy development and coordination

Improved agriculture to address malnutrition depends on sustained government commitment. Advocacy from farmers, civil society, scientists and development experts is needed to encourage Nigerian policy makers to place food and nutrition security much higher in the national development agenda. There is renewed international pressure for action in linking nutrition and agriculture, and the role of development partners is shifting beyond response to government to include advocacy for nutrition sensitive agricultural policies. Development partners will use their combined resources of analysis, advocacy, and capacity-building to encourage and influence government to move nutrition security higher on the agricultural agenda. Scientists will be called upon to translate research into policy.

Despite some current policy focus there remains wide scope for nutrition security to be recognised and addressed within national development policy. Evidence from other countries is that coordinated policies have the best potential to address the root causes of malnutrition in the longer term. First steps are recognising nutrition security as a cornerstone of national development, the cross-sectoral nature of the problem of malnutrition and its solution. Existing policies and strategies require the practical support of many stakeholders. For example, it is clear why the policy objectives of the Food and Nutrition Policy are desirable, but implementing the strategies to achieve them requires the active involvement and leadership of farmers, CBO, local governments, agricultural extension workers and scientists.

Empowering policy makers and programme designers

A history of limited ratification and weak integration and coordination of existing and draft nutrition policies suggested a role for a new body with power to promote and coordinate all nutrition-related policy and strategy. A Nigerian Commission for Nutrition (NCN) could be positioned to champion the nutrition agenda of the national development plan with direct reference to the MDGs, Vision 20:2020, NEEDS 2, NEPAD, Beijing Platform for Action, 7-point Agenda and National Food and Nutrition Policy. It should represent all relevant stakeholders. A first step is to set up a special committee to develop a proposal for the establishment of the commission, comprising representatives of stakeholders and chaired by a nutritionist with experience in agriculture and government.

Strengthening nutrition within the agriculture sector

Agriculture has excellent potential to improve nutrition in Nigeria because of: (i) unused potential for better integration of the many ongoing programmes under the Federal Ministry of Agriculture and Rural Development, (ii) a rich and diverse existing network of agricultural research institutes, and (iii) significant climatic, geographic and demographic advantages. Four major challenges are: (i) low current smallholder productivity of food crops; (ii) weak linkages between research and extension, (iii) limited investment in agriculture and (iv) gender disparity. These challenges are inter-related, and each derives in turn from multiple underlying challenges that must be addressed specifically but in a coordinated way. They can be addressed through multiple strategies to strengthen existing synergies (Box 5.2).

Box 5.2. Strengthening existing synergies

Governance:

Bottom-up and high-level advocacy.

Garnering political will and government commitment to support the linkages between agriculture and nutrition sectors.

Mainstreaming Nutrition in Agricultural policy formulation.

Social mobilization:

Involvement of NGOs and CBOs in grassroots mobilization and sensitization .

Seminars and workshops involving professionals (Agriculturists, Food Technologists, Nutritionists and Health Personnel).

Research collaboration:

Multi-disciplinary approaches developed with shared inputs of communities, smallholders, agriculturists, food technologists, nutritionists and health personnel.

Greater commitment of individual scientists to the linkages between agriculture and nutrition.

Resource allocation:

Enhanced agricultural extension capacity through funding and training on nutrition security.

Increased Access to low-cost appropriate technologies.

Improved funding for basic transport, storage and processing infrastructure.

Addressing the nutrition security needs of vulnerable groups

Resourcing for economic and social empowerment can be achieved through investment in cooperative societies, value addition, farm gate level processing, micro credit facilities for women, and involvement of NGO's in the dissemination of information. Enabling environments can be achieved through provision of improved infrastructural facilities: water, electricity, waste disposal; and also through identification and application of relevant cutting edge technologies- food fortification and supplementation and enrichment. Enforcement of nutrition policy coordination can be achieved through placement of human nutritionists as focal persons at the local government level. Participants identified eight specific needs which can be prioritized to meet the nutrition needs of vulnerable groups through agriculture. The consensus was:

i Education / knowledge translation at all levels;
ii Extension services to grass roots farmers;
iii Economic and social empowerment;
iv Policy implementation including training;
v Enabling environment through improved infrastructural facilities;
vi Integrated primary health care, family planning and food and nutrition education;
vii School feeding programmes; and
viii Enforcement of nutrition policy coordination.

PRIORITIZED LIST OF ACTIONS

The workshop was not designed to develop recommendations. Rather, a number of key messages emerged that can be synthesized into a set of suggested "priorities" (Box 5.3). Overall, it was suggested that the benefits of linking nutrition and agriculture could be large enough to warrant a financial allocation of 10% of budget for nutrition activities in the country at all levels of governments, including constituency projects.

Box 5.3. Prioritized list of actions to address malnutrition through agriculture

1. Recognize that food security requires more than increased production and supply
2. Recognize the cross sectoral nature of the problem
3. Promote and coordinate cross sectoral ownership of nutrition within government
4. Align nutrition research and extension with agriculture research and extension
5. Develop stronger national monitoring and implementation science capacity
6. Address gender in agriculture
7. Leverage existing capacity in research and extension
8. Move beyond staple crop production
9. Focus on narrowing the nutrition gap
10. Focus on food based approaches and dietary diversity

Appendix A

LIST OF ACRONYMS

ACF	Accion Contre la Faim/Action Against Hunger
AED	Academy for Educational Development, Washington D.C.
AHSPR	Annual Health Sector Performance Report
ARI	Acute Respiratory Infections
ASADI	African Science Academy Development Initiative
BASICS	Basic Support for Institutionalizing Child Survival
BCC	Behavior Change Communication
BMI	Body Mass Index, defined as weight divided by height squared (Kg/m2)
CAP	Community Action Plans
CAADP	Comprehensive African Agriculture Development Program
CBGMP	Child Behavior and Growth Monitoring Program
CDC	Center for Disease Control and Prevention
CCW	Community Care Worker
CED	Chronic Energy Deficiency, defined as BMI less than
CMAM	Community-based Management of Acute Malnutrition
CRS	Catholic Relief Services
DHO	District Health Office
DSIP	Development Strategy and Investment Plan (Agriculture Sector, Nigeria)
EBF	Exclusive Breastfeeding
EU	European Union
FANTA2	Food and Nutrition Technical Assistance II

FAO	Food and Agricultural Organization
UNFAO	United Nations Food and Agriculture Organization
FFI	Feed the Future Initiative of the US Government
GAIN	Global Alliance for Improved Nutrition
GAM	Global Acute Malnutrition
GINA	Gender Informed Nutrition Agriculture
GMO	Genetically Modified Organism
GMP	Growth Monitoring Program
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
HSSP	Health Sector Strategic Plan
IFPRI	International Food Policy Research Institute
IMAM	Integrated Management of Acute Malnutrition
IMR	Infant Mortality Rate
IYCF	Infant and Young Child Feeding
JCRC	Joint Clinical Research Centre
KARI	Kawanda Agricultural Research Institute
MMR	Maternal Mortality Ratio
MND	Micronutrient Deficiency
MoAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MoGLSD	Ministry of Gender, Labour and Social Development
MoH	Ministry of Health
MRC	Medical Research Council
NCFN	National Committee on Food and Nutrition (Nigeria)
NCHS	National Centre of Health Statistics
NECDP	Nutrition and Early Childhood Development Program

NEEDS	National Economic Empowerment and Development Strategy (Nigeria)
NEPAD	New Partnership for African Development
NPC	National Planning Commission
NRC	National Research Council
PEAP	Poverty Eradication Action Plan (Nigeria)
PEM	Protein Energy Malnutrition
PMA	Plan for the Modernization of Agriculture (Nigeria)
SAM	Severe Acute Malnutrition
TANA	The Agriculture Nutrition Advantage Project
UBOS	Nigeria Bureau of Statistics
UDHS	Nigeria Demographic and Health Survey
UFNC	Nigeria Food and Nutrition Council
UFNS	Nigeria Food and Nutrition Strategy
UFSI	Nigeria Food Security Initiative
UN	United Nations
NNAS	Nigeria National Academy of Sciences
NNCST	Nigeria National Council for Science, and Technology
UNICEF	United Nations Children‘s Fund
NPHOLD	Nigeria Program for Human and Holistic Development
NPRS	Nigeria Poverty Reduction Strategy
USAID	United States Agency for International Development
WFP	World Food Programme
WHO	World Health Organization

Appendix B

WORKSHOP AGENDA

Day 1: 30th November 2010	
7.30-9.00am	**Arrival and Registration**
Opening Ceremony	
9.00-9.05am	**Opening Remarks: NAS President** Prof Oye Ibidapo-Obe FAS, OFR
9.05-9.25am 9.25-9.30am 9.30-9.50am	**Address(es) by the Guest(s) of Honour** Minister of National Planning Minister of Health Minister of Agriculture Minister of Science and Technology
9.50-10.10am	**Introduction to workshop aims and objectives** Prof Folorunso Adu FAS *(Co-Chair WorkshopExpert Planning Committee)* **Keynote remarks/address** Dr David Nabarro - *Special Rep. of the UN Secretary General, United Nations, USA* **Goodwill speech - Linking agriculture and nutrition** Ms. Juliet Aphane - *Nutrition Specialist, FAO, Italy*
10.10-10.30am	**Tea break**
Session 1: Malnutrition; Women and Young Children	**Purpose:** To review the causes and impact of malnutrition on women and children **Moderator:** Prof Folorunso Adu FAS
10.30-10.50am	**Overview of nutritional status of women and young children** Dr Davis Omotola *UNICEF, Nigeria*

10.50-11.10am	**Causes and impact of malnutrition in women and young children** Prof Henrietta Ene-Obong *University of Calabar, Nigeria*
11.10-11.30am	**Challenges of meeting food and nutrition security in Nigeria** Dr O Oyewole *University of Ibadan, Nigeria*
	Discussion
Session 2: Food Intervention Programme: The Journey so far	**Purpose:** To review past and present agricultural interventions and their impact on the nutritional status of women and children. **Moderator:** Professor Vincent A Tenebe - *National Open University of Nigeria.*
11.30-11.50am	**A review of past agricultural intervention programmes in Nigeria and their impact on promoting nutrition of women and young children** Prof James Olukosi - *Ahmadu Bello University, Nigeria*
11.50-12.10pm	**Current agriculture and food security programmes in Nigeria: Implications on the nutrition of women and young children** Prof Biodun Falusi - *University of Ibadan, Nigeria*
12.10-12.30pm 12.30-12.50pm	**Challenges for achieving effective food intervention programmes for improved nutrition outcomes** Dr Bussie Maziya-Dixon - *International Institute of Tropical Agriculture, Nigeria*
	Discussion

12.50-1.50pm	**Lunch**
Session 3: National Agriculture, Food and Nutrition Policy	**Purpose:** to discuss government policies addressing nutrition (within the MDGs) the prospects and problems **Moderator :** Professor Grace Longe FAS
1.50-2.10pm	**Food and nutrition policy in Nigeria: Governance and developmental issues** Prof Tola Atinmo - *University of Ibadan, Nigeria*
2.10-2.30pm	**Agricultural policies in Nigeria: Implications for food and nutrition security** Professor Olusegun Osinowo - *Institute of Food security, Environmental Resources & Agricultural Research*
2.30-2.50pm	**Food and nutrition policy coordination in Nigeria: Prospects and problems** Mrs. Beatrice Eluaka - *Federal Ministry of Health, Nigeria*
2.50-3.10pm	**Discussion**
Session 4: Cross cutting Issues in Food and Nutrition	**Purpose:** To highlight cross-cutting issues that affect agriculture/nutrition in Nigeria **Moderator:** Prof Judith Kimiywe - Kenyatta University, Nairobi, Kenya
3.10-3.30pm	**Integrating nutrition into agriculture-food research** Prof Adebayo Adeyemi - *President, Agricultural Research Council*
3.30-3.50pm	**The effect of climate change on food production and nutrition** Prof Anthony Ologhobo - *University of Ibadan*
3.50-4.10pm	**Gender Issues in Food and Nutrition Security in Nigeria** Senator Iyabo Obasanjo-Bello - *Chair, Senate Committee on Health*

4:10-4:30pm	**Discussion**
4.30-4.50pm	**Tea break**
Session 5: Country Experiences	**Purpose:** Examine models linking nutrition and agriculture in other countries within Africa and lessons learned. **Moderator:** Professor Tola Atinmo - *co-Chair Workshop Planning Committee*
4.50-5.00pm	**Ethiopia** Dr Asrat Womdimu - *Ethiopian Health and Nutrition Research Institute*
5.00-5.10pm	**Uganda** Professor John Tuhe Kakitahi - *Ugandan National Academy of Sciences*
5.10-5.20pm	**Ghana** Dr (Mrs) Margaret Atikpo - *Council for Scientific and Industrial Research*
5.20-5.30pm	**Kenya** Professor Judith Kimiywe - *Kenyatta University, Nairobi, Kenya*
5.30-5.50pm	**Open panel discussion with speakers**
6.00-7.00pm	**RECEPTION**
Day 2: 1st December 2010	
9.00-9.30am	**Welcome remarks and recap of Day 1** Prof Tola Atinmo - *Co chair Expert Planning Committee*
9.30-10.00am	**Opening Keynote Lecture: Achieving national nutrition security** Dr Dinesh Nair - *Senior Health Specialist, World Bank, Nigeria*
10:00-10:20am	**Approaches to linking agriculture and nutrition** Prof I.U. Abubakar - *Agricultural Society of Nigeria*

10.20-10.40am	**Discussion**
10:40-11:00am	**Tea break**
11:00-11:10am	**Preparation of breakout sessions: elaboration and clarification of tasks for the groups** Prof Folorunso Adu FAS
Session 6: Breakout group discussion 11.10-12.40pm	**Purpose:** To discuss ways and ideas in more detail on solutions to improving nutrition through agriculture **Moderator:** Prof Efiom Ene-Obong FAS - *Cross Rivers University of Technology*
Group 1 **Professor John Tuhe Kakitahi**	How can policy makers and program designers be empowered to operationalise and monitor nutrition in the National Development Plan and other interventions?
Group 2 **Professor Vincent Tenebe**	What are the opportunities and challenges facing the Tenebeagricultural sector to embrace nutrition and how can synergies between these sectors be strengthened?
Group 3 **Professor Tola Atinmo**	What ways can the information presented at this workshop be put to use to bring about improved nutritional outcomes in the women and children in Nigeria?
Group 4 **Professor Adebayo Adeyemi**	In what ways can resources be appropriately allocated in order to meet the various needs of the vulnerable groups in the nutrition sector?
12:40-1:00pm	Organise presentations by groups
1.00-2.00pm	**Lunch**
2.00-3.00pm	Group presentations by group chairmen **Moderator:** Professor Folorunso Adu FAS
3.00-3.20pm	**Summary and the future** Prof Tola Atinmo
3.20-3.30pm	**Closing Remarks** Prof Oye Ibidapo-Obe FAS,OFR

Appendix C
List of Participants

S/N	NAME	ADDRESS OF ORGANIZATION
1.	Thomas Friday	Nicon Insurance Plc, Abuja
2.	Saweda Liverpool-Tasie	Post Doc. Fellow, IFPRI
3.	Soga Sofola FAS	NAS
4.	Akinbinu Adeyinka	PAS Federal Ministry of Agric
5.	Mrs Udosen	ACAO Federal Ministry of Agric &Rural Dev.
6.	Usman Galadima	Nigerian Medical Association
7.	Iboro Idiong	TRUSS Inc
8.	Z.O. Towobola	AD/Nutrition
9.	A.O. Adenugba	AD (National Productivity Centre, Abuja)
10.	R.O. Irefo	Chords of Hope Network, Abuja (NGO)
11.	Olade Adegoke	Sustainable Environment & Fisheries Foundation (SEFFA)
12.	F.N. Okeke FAS	Dept. of Physics and Astronomy U.N.N.
13.	P.N. Momah	Federal Ministry of Health, Abuja
14.	O. Olubajo	NPHCDA
15.	Joanna Nwosu	Public Health Consultant
16.	Msheliza Fatima A.	NPAFS Abuja
17.	Judith Kimiywe	Professor, Kenyatta University, Kenya
18.	Busie Maziya Dixon	Crop Utilization Scientist, IITA, Ibadan
19.	Lauren Alexander	US National Academy of Sciences
20.	Christian Acemah	US National Academy of Sciences
21.	Olaitan Soyannwo FAS	Fellow, Nigerian Academy of Science
22.	Biola Adewole	Triple Resources

23.	Datti Aliyu Y.	Animal production technologist
24.	Oyebiodun G. Longe FAS	Professor of Agriculture/ Fellow, Nigerian Academy of Science Fellow
25.	Odunowo Adebayo	Toad Global Ventures Lagos
26.	E. Efiom Ene-Obong FAS	Fellow Nigerian Academy of Science
27.	Isaac Butswat	National Open University of Nigeria
28.	I.A. Adeyemi	Vice Chancellor, Bells University of Technology, Otta
29.	Chuks Idiaye	University of Ibadan
30.	Rabe Mani	Assistant FAO Rep (Programes) FAO, Abuja
31.	Ngozi Nnam	Professor, University of Nigeria, Nsukka
32.	Ekeledo Esther	Institute of Root Crop Research, Umudike
33.	Anyasi Tonna A.	University of Ibadan
34.	I. F. Adu FAS	National Open University of Nigeria/Fellow, The Nigerian Academy of Science
35.	Oyewole Oyediran	University of Ibadan. Nigeria
36.	M. B. Buga	Technical Assistant to the Honourable Minister of Science and Technology, Nigeria
37.	Afolasade Akanbi	DA/NASS to Senator Iyabo Obasanjo Bello
38.	Chioma Emme-Nwachukwu	Scientific and External Affairs Manager, Nestle Nutrition Institute Africa
39.	Maureen Gallagher	Technical Coordinator/Nutrition Specialist Action Against Hunger International, Abuja
40.	Beatrice N. Eluaka	Head of Nutrition, Federal Ministry of Health
41.	James Olukosi	Ahmadu Bello University, Zaria
42.	Etta Jeanette Nneka	Assist Chief Scientific Officer, Federal Ministry of Health
43.	Kennedy Muhe	African University of Science and Technology
44.	Yusuf A. Yusuf	Nigerian Institute of Pharmaceutical Research & Development, Abuja
45.	Lamidi O.S.	Nigeria Society for Animal Production

46.	Oye Ibidapo-Obe FAS	President Nigerian Academy of Science
47.	Tunde Oguntona	University of Agriculture Abeokuta (UNAAB)
48.	Akinoso Oluwaseun	Strategic Buyer (Nestle Nigeria Plc)
49.	Malahmi Ibrahim	WTS Press
50.	Oreh Dorothy N.	Nursing Society and Midwifery Council of Nigeria
51.	Joseph Solomon Gbenga	Federal Ministry of Health
52.	Akinola Salau	Dept. of Physics, Obafemi Awolowo University. Ile-Ife
53.	Victor Adegboye Togun	MD, LAUTECH Agric Services Ltd; Sec. Gen. Agric Society of Nigeria
54.	J.S. Udosen	Federal Ministry of Agric & Rural Development
55.	Anyanwu Christian	Society for family health
56.	O.O. Amund	Dean of Students Affairs, University of Lagos, Lagos
57.	Zaam Ssali Academy of Sciences	Programme Officer,Uganda National
58.	Mohammed Olaniyi	Programme Officer/CSAPR
59.	I.U. Abubakar	President, Agric. Society of Nigeria
60.	Adeleke Ehita E.	University of Ilorin
61.	S.A. Bwala FAS	Fellow, Nigerian Academy of Science/National Hospital, Abuja
62.	Joseph I. Okogun FAS	Vice President, Nigerian Academy of Science
63.	Daniel Sellen	University of Toronto
64.	Maria Ewa	First Pure Investment
65.	O. Soyannwo	Wemimak & Co Nig. Ltd
66.	H.N. Ene-Obong	University of Calabar, Cross River State
67.	Margaret Ottah Atikpo	CSIR-Food Research Institute Ghana

68.	E.C. Okeke	University of Nigeria, Nsukka
69.	O.O. Osinowo	Institute of Food Security, Environmental Resources and Agricultural Research; University of Agriculture, Abeokuta
70.	B.D. Omotola	UNICEF
71.	C.A. Afolami	University of Agriculture, Abeokuta
72.	Tola Atinmo	University of Ibadan, Nigeria
73.	I.O. Olayiwola	University of Agriculture, Abeokuta
74.	B.I.C. Brai	Nutrition Society of Nigeria
75.	Oluwatoyin Ogundipe	UNILAG/ Dean, SPGS
76.	Ibeaiako, Uchenna	Federal Ministry of Agriculture
77.	Femi Agboola	NASSRDA, University of Lagos.
78.	Ekwebelem N.F.	Federal Ministry of Agriculture
79.	Durosinmi Etti	Presidency, Federal Republic of Nigeria
80.	Aderemi Abioye	Assistant Director of Fisheries, Federal Ministry of Agriculture & Rural Development
81.	Abubakar Adamu L.	Fisheries officer II, Federal Ministry of Agriculture
82.	Agoro O. A.	Federal Ministry of Science & Technology
83.	Okwesilieze Amaka	Frieslandcampino, WAMCO
84.	Okobiah K.B.	Chief Scientific Officer, Ministry of Defence
85.	Mr. Adekunle Akanbi	Capital Works Vantage
86.	Abah Philip	Agric & Rural Department, Ministry of Agriculture
87.	Dewis Compassion	Applied Tech
88.	Ibrahim I. Jib	NYRI VON
89.	Adesola Adebayo	Director, Safe Forte Company
90.	S.I. Ojo	National Planning Commission
91.	Charles Ejiofor	University of Abuja
92.	Adewale Ilesanmi	Federal Ministry of Agriculture
93.	Olatunde Olabode	University of Abuja

94.	Lugard Okonobo	Food and Agricultural News Magazine, Abuja
95.	A.D. Ologhobo	University of Ibadan
96.	Uloma Mbanaso	Federal Ministry of Health
97.	I.C. Ibeh	Federal Ministry of Health
98.	H.A. Kazza	Chairman PPG Enterprises
99.	Oluchukwu Opara	Insurance personnel, Nicon Insurance Plc, Abuja
100.	Onovwiona John	Director of Fisheries
101.	Dennis A. Musango	University of Abuja Teaching Hospital
102.	Elizabeth O. Iybo	Federal Dept. of Livestock, Ministry of Agriculture
103.	Elizabeth Walter	Global Safehaven Organization
104.	Akingbade Onadejo	National Productivity Center
105.	Abimbola Williams	Save the Children UK

Appendix D

WORKSHOP PLANNING COMMITTEE

The Nigerian Academy of Science formed a multi-disciplinary Workshop Planning Committee to develop the workshop agenda. Members consisted of experts in the areas of Agriculture, Nutrition, Food Science and Technology, Public Health, Agricultural Economics, Gender and Policy. Working collaboratively with the US National Academies, and with support from the Bill and Melinda Gates Foundation, the following planning committee members and workshop programme staff organized the workshop:

Prof. Israel F. Adu FAS - *Co-chair*
Prof. Tola Atinmo - *Co-chair*
Prof. S.A.N.D. Chidebelu - *University of Nigeria, Nsukka*
Prof. Bayo Adeyemi - *Agricultural Research Council of Nigeria*
Dr. Adewale Ilesanmi - *Federal Ministry of Agriculture*
Dr. M. Oladoyin Odubanjo - *Acting Executive Secretary, NAS*
Mrs. Mnenna Lan - *Programme Officer, NAS*
Dr. Kike Ogunsulire - *Project Officer, NAS*

NAS staff were supported by the following individuals:
Dr. Lauren Alexander Augustine, *Country Director, ASADI (US National Academies)*
Dr. Patricia Cuff, *Program Officer (US National Academies)*
Mr. Christian Acemah, *Senior Program Associate (US National Academies)*