



Are the Homestead Gardens a Possible Solution to Combating Malnutrition in Nigeria?

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Authors' contributions

This work was carried out in collaboration between both authors. Author PKN designed the study, performed literature search, wrote the protocol and wrote the first draft of the manuscript. Author VOC ensured relevance of all papers under review and adherence to protocol. Both authors read and approved the final manuscript.

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ABSTRACT

Nigeria has the highest number of stunted children in Sub-Sahara Africa and the second largest number of malnourished children in the world and the figures are not dropping significantly. This is despite the various nutrition interventions in the country which are mainly focused on food fortification and supplementation with very little attention given to agricultural interventions such as integrated homestead gardens. It is established that one of the two immediate causes of malnutrition is poor diet which in Nigeria is largely caused by food insecurity. Integrated homestead garden could serve as an approach to achieving household food security. This is a kind of farming where both crops and livestock are kept in a properly managed manner, within the homestead, to ensure year round access to farm produce with minimal resource input. Fruits, vegetables, legumes and other staples grown in the household as well as meat and eggs can serve as year round supply of nutritious food and homemade beverages and snacks. The major benefits of integrated homestead garden as a nutrition sensitive intervention is that it gets to the most vulnerable; the rural poor, women and children. For successful implementation of homestead gardens for nutrition intervention, the government needs to move from political commitments to action by implementing policies, committing funds, and promoting nutrition education.

Keywords: Nutrition; homestead gardens; malnutrition; agriculture; food security.

1. INTRODUCTION

Nigeria has the highest number of stunted children in Sub-Saharan Africa [1]. The country also has the second largest number of malnourished children in the world with 37% of children under age 5 stunted, 18% wasted, and 29 percent underweight [2]. The same report showed that infant and under-5 mortality rates remain high at 69 and 128 deaths per 1,000 live births, respectively. 60% of these deaths are attributed to under-nutrition with about 200,000 of the children dying due to protein energy malnutrition and 80,000 dying due to Vitamin A deficiency, annually [3].

Nigeria is now experiencing double burden of malnutrition with 11% of women of child bearing age undernourished with BMI <18.5 while 25% were overweight or obese with BMI \geq 25.0 [2]. Another National Nutrition and Health Survey found that under-nutrition among women of reproductive age has worsened from 5.5% malnourished and 2.5% chronically malnourished to 7.4% malnourished and 3.7% chronically malnourished none withstanding the nutritional interventions in the country [4]. These results imply that nutritional status of Nigerians has not improved significantly over the years despite various interventions that have been applied to ameliorate the situation.

2. NUTRITION INTERVENTIONS IN NIGERIA

Nutrition interventions in Nigeria are spear-headed by the Federal Ministry of Health in collaboration with myriad international donor organisations such as UNICEF, USAID, DFID, World Food Programme, Save the Children etc as well as National NGOs such as Dangote Foundation. The Nutrition Department of the National Planning Commission is in charge of coordinating national nutrition activities within the country. Since the country's joining of the Scaling-Up-Nutrition (SUN) movement in 2011, there has been significant attention to the level the country's nutritional issues while bringing in more and more donor support.

Particularly, nutrition interventions in Nigeria by the government and donor partners have concentrated on nutrition-specific interventions such as food fortification, iron and folic acid supplementation in pregnancy, promotion of any initiation and exclusive breastfeeding, support of nutrient dense complementary foods, Vitamin A

supplementation for under five children, promotion of micro-nutrient powders and treatment of severe and acute malnutrition with ready-to-use therapeutic foods [5,6]. These vital nutrition specific interventions can only reduce stunting rate by 20 when not combined with other nutrition sensitive interventions such as food security, income generation activities, water and sanitation, health care, social safety net programmes etc [7]. To optimize the nutrition status of mothers and children, four key factors has to be in place; food security which means availability of diverse and affordable nutrient dense foods, appropriate care practices and good health care services and a healthy environment [1].

3. FOOD SECURITY

Food security is most crucial to reducing the level of malnutrition as it determines whether people will either go to bed hungry or not. A country is said to be food secure when all people at all times have physical and economic access to wholesome and nutritious food to satisfy their bodies need and food preferences to lead an active and healthy life [8]. Nigeria suffers from high food insecurity. According to the 2016 Global Hunger Index (GHI), 1 in 15 of the more than 180 million Nigerians goes to bed hungry. The country has a GHI score of 25.5 which indicates serious level of hunger [9].

About 70% of Nigerians engage in agriculture yet it is highly a food deficit country that depends highly on imports [10]. Even though Nigeria is the highest producer of cassava, yam, cowpea and sorghum, it depends on imports for tomato paste, wheat, rice, poultry, fish, etc. Most of the country's food is produced by the rural poor who engage in the subsistence farming. About 70% of Nigerians live on less than \$1.5 per day [11]. Also, about 86% of the country's poor live in the rural areas and these rural dwellers are mostly predominantly farmers [2]. 75% of the little income they generate is spent in the purchase of foods such as rice and meat [12]. Fortified foods such as bread, vegetable oil, milk, and nutrient dense fortified complementary foods are beyond the poor households' purchasing power.

There exists great opportunity in the country to improve the nutrition sensitivity of the entire food system thereby transforming the nutrition situation of the country. One of the opportunities to address this problem is to promote

establishment and maintenance of integrated homestead gardens.

4. INTEGRATED HOMESTEAD GARDENS

Homestead gardens are also called kitchen gardens, backyard gardens, compound gardens, rooftop gardens is a type of agriculture that has been in practice since the beginning of the agricultural system. It is a garden not far from the home that is owned and maintained by the household and kept mainly for household food supply [13,14]. Integrated homestead garden is a household farming system where both livestock and crops are grown in a properly managed manner to ensure year round access to farm produce with minimal resource input.

Traditional gardens contain a wide variety of annual, perennial and semi-perennial crops, shrubs and trees that have been properly adapted to micro-climatic variations and maintained with little purchased farm inputs [15]. Sometimes, crops are also kept together with small livestock such as poultry, goat, sheep and pig [16,17,18]. The average size of homestead garden is less than that of the arable land kept by the household. Cropping field is usually about 0.2 to 0.5 hectares. The practice of keeping home garden is an age old practice all over the world yet of all the agricultural practices, it receives the least attention and is one of the least understood [13].

In Nigeria, home gardens are culturally kept for the purpose of food security, medicinal uses and income generation [18]. There are diverse types of homestead farming systems traditionally practiced in Nigeria. In the Southern part of the country, it is an age-old practice to have fruit trees growing with crops such as maize, yam, pumpkin and beans [19]. This system of mixing of herbaceous plants with tree crops is rightly believed by the Yorubas to be a means of making proper use of scarce land as well as conserving soil nutrients. It is also very common practice in Nigeria to have gardens with tree crops, shrubs and plants as well as livestock all in the same homestead managed by family labour [20].

Common crops seen in a typical Nigeria home garden include cassava, maize, yam, fluted pumpkin, bitter leaves, water leaves, beans, curry, scent leaves, banana, and plantain, as well as mango, guava, orange, pawpaw, palm trees etc. It is a garden where a little of everything

ranging from crops to medicinal herbs can be found. Also, small animals such as poultry, goats, sheep, and pigs can be found in these homes.

Traditional farms in Nigeria have been adapted by some locals to provide foods all year round. In eastern Nigeria, the Igbos traditionally maintain compound gardens which serve as the major source of the family's diet all year round even during the lean periods of March, April and May [21]. Because many of these homestead garden crops are higher in basic amino acids than the basic food stuff, they don't only provide food during the lean periods but also are responsible for supplying people in this region with some of their protein, vitamins and minerals need [21].

However, as common as traditional gardens used to be their nutritional benefits to Nigerian households are not common knowledge and its popularity is dwindling. These gardens are not seen by growers and policy makers as a means to alleviate the burden of malnutrition in the country [20]. It is very common for homes with homestead gardens to pay only very little attention to their gardens at home while they dedicate most of their time to the larger farms for the production of cash crops. Also, due to lack of proper nutrition information, some rural households do not eat the small livestock they rear but sell them at the markets for income. Due to lack of proper attention to the development of homestead gardens in Nigeria, they have largely remained traditional thus not serving optimum nutritional needs [19].

Integrated garden is the most sustainable kind of garden practice and has been preached over the years by FAO and other researchers [22,23]. This is a kind of garden where both crops and livestock are kept in a properly managed manner to ensure year round access to farm produce with minimal resource input. In integrated gardening, crops and animal enjoy a symbiotic relationship where animal wastes serve as manure and/humus to improve soil health and nutrient density of crops while food scraps and crops residue are converted to animal feed.

Properly managed integrated homestead garden produces diverse foods all year round. Dark leafy green vegetables such as fluted pumpkin, *Amaratus* species, water leaves, bitter leaves, etc are grown in such gardens. Also, other vegetables such as okro, carrot, cucumber, cabbage, melon, green beans, tomatoes and

peppers could be cultivated. To enrich the household's protein needs, legumes such as black eyed peas, guinea beans, bambara nut (*okpa*), groundnut can be grown. Also important in this garden are bio-fortified crops. Since Nigeria is a country with high rate of vitamin A is implicated for the deaths of over 80,000 children per annum, orange fleshed sweet potatoes, vitamin A maize and yellow fleshed cassava are promoted instead of the regular ones that are less nutrient dense [3]. Also present in this kind of garden are fruit trees like papaw, mango, orange, citrus grape, and banana as well as other fruits such as water-melon and pineapple which could be used as garden fence.

It is highly encouraged that small livestock be reared in the homestead to boost household's consumption of animal protein as well as increase intake of foods rich in B vitamins, iron and zinc which Nigeria has high malnutrition rates of these nutrients [3]. Livestock such as pigs and poultry, especially layers, are encouraged because of their fast growth rate, low input in terms of feeds, continues supply of meat and eggs and high income generating ability. Other livestock such as goats, sheep, and rabbits can also be kept. Fishery which is beginning to get prominence in Nigeria as well as snail, and grass cutters could also be reared in the homestead.

5. IMPORTANCE OF HOMESTEAD GARDENS TO HOUSEHOLD NUTRITION

As a means of dietary diversification, homestead gardens could be used to enrich diets in Nigeria. Most Nigerians, across the different wealth groups, generally consume starchy diets with very little fruits and vegetables but the richer households consume more meat fish, and eggs [24]. More so, the poorest households, who are also rural subsistence farmers with the highest burden of malnutrition, devote more than 75% of their income in the purchase of food [12]. It serves as an avenue for making food *available* to low income population who are also the most vulnerable.

Owning and maintaining a home garden will give households added immunity fluctuating global food prices. Due to Nigeria's very high dependence on food imports, the country is very vulnerable to fluctuating food prices in global market. According to the Nigerian Institute for Social and Economic Research, the sudden rise

in world food prices of 2007 and 2018 resulted in inflation rise of 5.4% in 2007 and 9.7% in 2008 and income spent on food purchase also rose from 45% to 80% the same period [25].

One of the best advantages of dietary diversification as a nutrition intervention is that it gets to those most in need – the poor [14]. Women in Guatemala when asked about the benefits of owning homestead gardens promoted by the Ministry of Agriculture and supported by Private Organisations, 60% of the respondents' first answer was that it saves them both time and money as they no longer have to purchase vegetables from the market [26]. Fruits, vegetables, legumes and other staples grown in the household as well as meat and eggs can serve as steady supply of nutritious food as well as homemade beverages and snacks.

Homestead gardens can also be used in the promotion of exclusive breastfeeding. Even though breastfeeding rate in Nigeria is low at 17%, it is much lower among rural women in the poorest wealth quintiles and this may be because they are too undernourished and energy sapped to go through the process [24]. Owning and maintaining a home garden can serve as a targeted policy approach to providing pregnant and breastfeeding mothers with nutritious food to promote breastfeeding.

Gardens could, in addition, serve the important role of ensuring that suitable for complementary feeding are produced, readily available and consumed promptly. Because everything used in the management of these gardens such as kitchen waste, farmyard manure as well as water are readily available in homes, families can be assured of year-round supply of fresh vegetables, fruits, legumes and cereals thereby successfully combating food insecurity which is one of the main reasons for poor complementary feeding in Nigeria [27].

Improvement of livelihood is very crucial among rural farmers since they are the poorest in the population. 77% of subsistence farmers are in the lowest and second lowest wealth quintiles and 70% of these farmers are cash crop or mixed farmers [24]. Keeping of homestead garden teaming with nutrient rich fruits and vegetable can serve as a means of income diversification for farmers who devote most of their time on cash crops. It could serve as economic safety net for periods of crop failure in the main farm field. Surplus food produced in the

garden for home consumption could be sold to raise funds to purchase other foods, for health care or other household needs.

6. THE WAY FORWARD

The agricultural sector is a low cost but effective approach to combating malnutrition. In recognition of this fact, the Federal Ministry of Agriculture and Rural Development (FMARD) developed Agricultural Sector Food Security and Nutrition Strategy 2016 – 2015 to serve as a road map in achieving the roles agriculture is expected to play in the National Policy on Food and Nutrition [12]. This Strategy recommends promotion of homestead gardens as a means of achieving its priority of diversifying household food production and consumption.

The starting point of promoting homestead gardening for improved nutrition in Nigeria is to have a mental shift from viewing agriculture as just a means of increasing income to a means of increasing income, nutrition, health, and well-being. This kind of agricultural practice is used for nutritional and health benefits to reduce hunger and malnutrition and improve health status while also gaining additional income and/or savings. When agriculture is practiced to achieve nutrition and health objectives, all the other primary purposes of agriculture such as economic gains will be achieved in its entirety but the primary focus would be on the achievement of nutrition and health objective through production of diverse nutritious foods, promoting nutrition education, targeting poor households and promoting gender equality.

Women, as well as men, are engaged in farming in Nigeria. While women generally grow food crops, (such as cassava, yam, maize, and vegetables) men grow cash crops such as cocoa, oil palm and rubber [28]. As the major producers of food crops and determinants what is consumed at home, women should be used as an entry point in promoting home garden establishment and management. Women's management of homestead gardens will mean more food being available in the household. Also, women will be empowered through gaining of more income and control over how the money is spent. This has been shown to be very effective in other countries [13,14].

Access to nutritious foods alone cannot guarantee positive changes in nutritional status as has been shown by other studies [29]. One

study, in particular, recorded a higher prevalence of anaemia among women farmers with low education status [30]. This shows the great importance of education in ensuring good nutrition and health. In the rural area where most women engage in farming, more than half of rural women have no education, as compared with 16 percent of urban women [2]. It is also in this region that malnutrition is more widespread. It is thus, obvious that the inter-relationship between access, nutrition, and education (particularly nutrition education) must be properly addressed to significantly reduce malnutrition among the farmers who are also the rural poor. Education, specifically nutrition education, must be a part of national homestead garden intervention programme to achieve maximum impact and sustainability.

6.1 The Role of Agricultural Extension Workers

Nigeria already has developed network of agricultural extension workers and field workers who are responsible for instructing, advising, and assisting farmers and households to promote crop and animal production mainly for income generation and food security. These agents very rarely have any training to promote nutrition through production and consumption of varieties of foods [31]. Since extension workers have direct access to the farmers in the rural areas, their reach and understanding of the communities' complexities can be very instrumental in promoting not only increased food production but also improved production and consumption of superior diets through development of home gardens.

The extension agents' guidance in establishment and proper maintenance of home gardens is also most needed here. They can direct farmers on how to obtain the correct breed of seeds from Agricultural Development Programmes in their in their states. As part of their normal responsibilities, they can offer training in on the importance of crop residue use as soil mulch, farm yard manure, and improved crops varieties can enhance the farmers' knowledge and awareness of soil, management, cropping system, as well as livestock management, feed making, input, and technology transfer, etc. The extension workers, after due training, can go a step further to educate farmers on nutrition-sensitive food preparation.

Extension workers can make household farmers more nutrition sensitive by emphasizing on

sustainable intensification and year round production of different varieties of fruits, vegetables, and legumes. This has been proven to be easily adopted by households in Bangladesh where Hellen Keller International in collaboration with the Bangladeshi government began a nationwide programme for year round intensification of various varieties of fruits and dark leafy green vegetables [14]. The research did not only reveal high adoption rate but also showed increased consumption of dark leafy green vegetable by children as well as improved nutritional status in households with developed home gardens.

Critics of home gardens as a sustainable means of eradicating malnutrition usually cite high cost of project establishment and maintenance such as procurement of farm inputs like seeds and fertilizers, labour, market, and credit as well as weak extension delivery system [13,16]. Strengthened and properly funded extension service can solve these problems if they tutor every farming household on cost saving but highly productive means of managing integrated homestead garden [32,33,34].

6.2 The Policy Makers

As severe as Nigeria's malnutrition problem is, there is no nationally led nutrition intervention programme in the country. Most national interventions are reactionary poorly coordinated emergency food security programmes that mostly include supply of rice, indomie noodles, some other food materials as well as infant formulae [35,36]. However, there has been recent policy interest in food security and nutrition and the special role agriculture has to play to achieve this. This has been evidenced by the passing of new policies in the country such as National Policy on Food and Nutrition in Nigeria 2016, National Plan of Action for Food and Nutrition in Nigeria 2016, Agricultural Promotion Policy 2016 - 2020 and the most recent Agricultural Sector Food Security and Nutrition Strategy 2016 – 2025. Nigeria is also a signatory to the Rights of the Child Convention of 1989, member of the Scaling-Up Nutrition Network and a UN Member state which owes every Nigerian the basic human right of *Right to Food*.

Priority Area 2:b of the Agricultural Sector Food Security and Nutrition Strategy 2016 – 2025 call for *promotion of homestead gardens* to improve the food diversity, especially fruits and

vegetables, at the household. Nigeria is, however, popular for having poor implementation of good policies and commitments [37,38]. If the war against malnutrition is to be won, the Nigeria government has to move from commitments to action. For instance, the National Plan of Action for Food and Nutrition has "ensuring household level food security" as its number one objective in ensuring optimum nutrition, yet, in reality, food security as an entry point to eradicating malnutrition is barely given any attention by policy makers [39].

Budgetary allocation to nutrition in the FMARD is very poor. Even though promotion of homestead gardens is one of the priority areas of the Agricultural Sector Food Security and Nutrition Strategy 2016 – 2025, there are no budgetary allocations to its implementation in the 2017 budget. In fact, nutrition as a whole received very little attention from the Ministry. Only 2.46% of the 2017 budget in the FMARD was dedicated to nutrition [40]. The Ministry of Agriculture at the Federal, State, and Local Government levels should make specific and sufficient budget provision for nutrition and ensure that it is used for nutrition and nutrition only.

One of the highest drawbacks to nutrition-sensitive agricultural policies in Nigeria is lack of nationwide evidence based research. Most targets set by these policies are too high due to poor evidence-based analysis which are supposed to guide planning and prioritization of project activities [12,41]. It is pertinent that policy makers recognise that evidence-based decision making achieve more impact and also more cost effective [42,43,44].

Synergy of actions and coordination also pose a problem. Agriculture-sensitive nutrition interventions in the Federal Ministry of Agriculture, the state Ministries and LGAs, bilateral and multilateral organisations and institution are fragmented with no established coordinating body. Bodies such as the FMARD, National Programme for Food Security, FADAMA III, and the Food and Agricultural Organisation (FAO) of the United Nations are all involved in promoting homestead gardening for improved nutrition but these actions are fragmented with duplication of activities by the different organizations. Major actors in promoting nutrition through agriculture need to work together to ensure that commitments, especially financial, are made, policies sustained and translated into action for greater impact.

Evidence from other countries show that higher success is achieved in reducing public health malnutrition when the government plays a major role in high level policy making, coordination of nutrition activities and implementation [45,46,47].

Nutrition education and awareness creation are highly important in combating malnutrition [48,49,50]. The Nigerian government could learn from some successful nationwide nutrition campaigns abroad such as the highly successful UK government campaign which says "Your five a day". This successful public campaign by the United Kingdom government is aimed at reminding and encouraging people to eat more fruits and vegetables, at least 5 portions equivalent to 400 grams every day, to stay healthy [51,52]. Even though some Nigerians know that they are supposed to eat healthy, sometimes people just forget because it is not part of their culture to eat that much fruits and vegetables. An improved public understanding of nutrition and strategically placed reminders will act as a strong motivational factor to have and maintain domestic gardens.

7. CONCLUSION

The simplest and most effective way of combating malnutrition is to encourage consumption of adequate well-balanced diet. As much as supplementation and fortification are effective nutrition interventions, their sustainability and impact across the different wealth quartiles will not, on its own, achieve swift reductions in rates of malnutrition unless combined with food security programmes such as establishment of homestead gardens. Keeping properly managed homestead gardens will not only ensure year-round availability of well-balanced nutritious diets as well as homemade drinks and snacks but also extra income to purchase other foods and healthcare. The government has a role to translate policies and commitments into action by improving policy implementation, funding nutrition sensitive agricultural programmes and embarking on nationwide nutrition education to make the people aware of the importance of nutrition and the benefits of homestead gardens. However, there is limited peer-reviewed literature and field data on homestead gardens in Nigeria to start-up nationwide intervention. Empirical data on homestead gardens presently in Nigeria need to be gathered to aid policy actions and project implementation.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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