

Empowering Food Security in 21st Century through Container Gardening in North-East, Nigeria

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ABSTRACT

This paper explores the concept of food insecurity, with a particular focus on malnutrition, which manifests in various forms and dimensions. It clearly defines malnutrition as a pervasive issue that affects individuals across the board. Malnutrition, in its impact, particularly targets children, resulting in devastating effects on their growth and development. Moreover, it is portrayed as a global phenomenon that extends into every corner of the world, including Northeastern Nigeria. In the present era, science and technology have introduced various methods to combat malnutrition for sustainable development. These methods encompass biotechnology, tissue culture, irrigation, and poultry farming. Among these approaches, container gardening stands out. Container gardening involves cultivating plants in containers of different sizes and shapes. Today, it is gaining popularity among both rural and urban dwellers for various reasons, including inflation, insecurity, recession, and more. The paper emphasizes that it is feasible to cultivate a wide range of plant species in containers, with the only limitation being the size of the container. With convenience, individuals can successfully grow tomatoes, sweet potatoes, Irish potatoes, onions, and red peppers around their homes to meet family nutritional needs and generate additional income. Subsequently, the paper details the formulation of growth media for container gardening. In conclusion, the paper provides recommendations, highlighting the importance of people adopting container gardening as a farming system to address family nutritional deficiencies and other related issues.

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INTRODUCTION

Malnutrition is a global issue that retards growth and development in children and most often claims their lives when it reaches malign stage. It exists in several forms, such as wasting, stunting and underweight (World Health Organization- WHO, 2021). No country is free from one form of this scourge or another. Malnutrition is a condition that occurs when people

consistently do not consume the right types of food and essential nutrients daily (Adeyamo, 2022). The consequence of malnutrition is real and is directly driven by hunger.

Hunger is hydra-headed monster, which becomes conspicuous in event of food sufficiency. Many factors seem to be antecedents of hunger, amongst are drought, truncated rainy season, flooding, soil erosion and multiple of related

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environmental calamities (Action Against Hunger, 2023). Whatever might be the cause; hunger remains evil and a dreadful barrier to improved wellbeing, health and sustainable development (Adegokan, 2021). In the light of this account, the WHO (2021) reports that there are about 800 million hunger stricken people world-wide. Greater proportion of this figure is from South America and most regions in Africa where wars/conflicts were worsening the situations.

Malnutrition is mostly palpable in children, pregnant and lactating women, and to some extent, old aged. In view of this situation, Vanguard Newspaper (2023) reports that Nigeria may lose 876,000 children in 2023. Furthermore, United Nation Children's Education Fund (2018) submits that 45% of child deaths globally are associated to malnutrition. It also adds that management of malnutrition related cases could cause on Nigeria up to 3.5 US dollars. This is a crucial economic bane and indeed an emergency case in all fronts.

Additionally, malnutrition is a terrifying tragedy that bedevils actualization of countable national and personal aspirations. This can be justified from several reports that unveiled mortality cases related to malnutrition year-in and year-out. For example, Thisday, (2022) reports that 45% of child deaths in Nigeria are linked to malnutrition. In the same vein, Vanguard Newspaper (2018) adds that 2.5 million children under the age of five suffer from Severe Acute Malnutrition in Nigeria every year. These reports have actually warned that unless reliable and emergency interventions are considerably taken, our beloved ones will continue to die massively or to a lesser case become susceptible to highly dangerous medical cases such as diarrhea, pneumonia and stunted growth (NHS, 2023). Worst still, no single region of the country is free of malnutrition cases (Statistica, 2022). Furthermore, the Relief Web (2023) avers that the effect of the scourge has its most horrible hit in North West (55%), and then followed by North East (42%), while 22%, 16% and 18% go for South-West, South-East and South-South respectively. The consequences of the scenario if not address immediately will create a long lasting

damage, specifically problem related to stunted growth and low cognitive ability in children.

In spite of the preceding verifications, the scourge of malnutrition in the North Eastern Nigeria is exclusively worsened by Boko Haram (BH) insurgency (Mugabe, 2023). The rampant killings and destruction of properties by adherents of the sect have driven people away from farming and fishing activities. Thus, they migrated to relatively safer parts of the region, where they become liability to host communities. Even before BH imbroglio, the region has embarrassing records of Rate of Severe Acute Malnutrition (RSAM), which was associated to annual truncated climatic factors. For example, the Integrated Food Security Phase Classification (2022) claims that Taraba State has the lowest percentage of RSAM as compared to Adamawa, Borno, and Yobe with higher percentage of the menace respectively. This implies that Taraba State was ranked higher in terms of food sufficiency when compared to other states of the region. This providence in Taraba State will not be unconnected to the prevailing favourable climatic factors (Umar, Nyame & Jauro, 2014). Additionally, the topography and physical reliefs have contributed a lot in making the state one of the food basket of the nation.

To combat the menace in the region (North-East) considerably, the country ought to expend 279, 540 billion Naira to save 123,000 malnourished lives every year (Relief Web, 2023). This is really too cumbersome for government to bear, especially at the existing financial crunches. It is indeed weighty on it for the fact that it dispensed only four billion naira in 2016 for that purpose, which was too meagre to achieve the desired result. On this backdrop, the Federal Government of Nigeria courteously called for honest participation of private bodies to tackle the predicament absolutely. Conceivably, that was the reason Dangote Foundation in 2017 played a substantial role and contributed huge amount of money purposely to meet goals of the programme, particularly in areas ravaged by BH insurgency (Osun Defender, 2017).

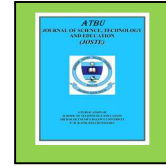
The previous discourses have relatively established that malnutrition exists in all crannies of

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the nation though at different levels. It is also believable that the bane of malnutrition is not a miracle but a child borne out of aggregated factors. To overcome the plight optimally, scientists toil through all moments to come up with what be the checks to food scarcity alongside developing strategies and technologies for improving food production, quality and preservation. Some of the innovations for improving food security include biotechnology, which is a trending field of biology commits to produce seeds and seedlings that grow and mature faster as well as possessing required nutrient supplements required by the body (Science Nigeria, 2022). This was very practical through meticulous manipulation and alteration of genetic make-up of plant and animal species. Furthermore, the Science Nigeria (2022) claims tissue culture as a recent breakthrough aims to producing large quantity of desired crop species within shortest possible time. The author adds that plants produced through these innovations are of high quality, resistant to pests and diseases, as well as plentiful yield. In the same dimension, irrigation is described as an alternative to rainy season farming and a reliable way of neutralizing food insecurity. However, much is spent in irrigation, yields derived from it are much healthier and better in quantity and quality (Gardena, 2019). Fish rearing is another method for boosting food security in a country. Poultry is a lucrative venture with glaring promises to improve food security and verily a reliable scaffold to poverty alleviation. Similarly, the latest technique for improving food security especially for urban dwellers and crisis zones is container gardening.

Container gardening is a way of growing plants in containers in corridors, balconies, windows and other corners at residential homes (Masabni, 2018). But in view of Hentges, Dunn, Layman (2019), container gardening is the practice of growing plants, including edible plant species exclusively in containers instead of planting them in the ground. In this method, containers of varied sizes from teacups and paint buckets to automatic watering system are used. This farming innovation is trending and gaining popularity, particularly among those who want

improve family nutrition at period of food insecurity and inflation (Cottem, 2016). Furthermore, Cottem (2016) enunciates that nowadays people go for container gardening because of scarcity of farmlands, insurgency, and retirement among other variables. Container gardening offers opportunity for cultivating variety of crops (Ondra, 2023). Some of the crops cultivated by this way include lettuce, tomato, pepper, ginger, and carrot. Others are sweet and Irish potato (Landers, 2023). Quite often, city dwellers grow medicinal and ornamental species in containers. The ensuing section states reasons for adopting container gardening as a way of mitigating food insecurity, as well as supplementing necessary nutrients for family well-being and health.

Reasons for Adopting Container Gardening in North-Eastern Nigeria.

The following statements establish container gardening as a panacea to the lingering food insecurity and malnutrition pervading the region for decades.

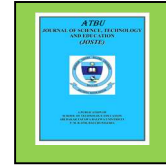
- a) **Insecurity:** one kind of uncertainty or another afflicts virtually all sections of the region and North East is not an exception. Boko Haram insurgents spread to all nooks of the region and commit all kind of atrocities, such as rampant killing of innocents, looting, raping and kidnapping. Most often, they chase away farmers and fishermen from practicing their lawful sources of livelihood (Eke-Okocha & Eze, 2023). Seldom, they allow them on condition that they should pay lump sum of money as an annual levy. Besides the collection of alms (zakat), which is must even to those whom are not legally obliged to do so. In the previous decades, the case of kidnapping was only heard from North-West region of Nigeria. Unfortunately, it has now become proliferating in other sections of the nation, including North-East. Kidnappers like BH too contribute negatively to food insecurity through robbing farming communities. Usually,

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they promulgate uncompromising levies, which as a result necessitate farmer to flee to safer environment (Sahara Reporters, 2022). Farmer/herders and ethno-religious conflicts usually promote food insecurity (Daily Trust, 2022). As erstwhile mentioned, victims of those quagmires are compel to resort to relatively safer destination as migrants in host communities. By and large, they become dependents and therefore put pressure on the hosts' available food stocks. In due course, food insufficiency emanates, as well as malnutrition. To sustain food adequacy, the visitors should practice container gardening around premises of their camps to meet their nutritional need.

- b) **Inflation:** is the price increase of commodities, particularly those types that are required daily for sustainability (Central Bank of Nigeria, 2023). In recent times, the price rise of food items was triggered by currency redesign, which made money hoarders to buy all the available items in markets (Business, 2023). Currently, the fuel subsidy removal has affected all endeavour, and consequently made life unbearable (Punch, 2023). Additionally, the present shortened rainfall in the region creates phobia on uncertainty of the season, thus, circulation of food items in the market falls short drastically (Osun Defender, 2023). Spontaneously, the cost of food item rises exorbitantly beyond the reach of a common man. It was in the light of this that the Federal Government of Nigeria (FGN) deliberated to intervene into situation with focus to improving food sufficiency, circulation and purchasing power (Nigerian Tribune, 2023). To survive through the status quo, rural and urban dwellers are advised to use available space in homes to raise variety of foods items for consumption. In entirety of its

operation, container gardening is cost effective, in addition to providing nutritional foods (gardening Mentor, 2023). The money that would have been for purchasing highly priced foods will now be used in settling schools fees and other bills.

- c) **Recession:** Recession is a decline of economic growth, epitomized by shrink in the degree of growth of Domestic Growth Product (GDP) (Economic Times, 2023). It is usually conspicuous in shortfall of citizens' purchasing power. Recession usually lasts for few months (Economic Times 2023). Nigeria was completely down into real recession following a sustained drop of GDP of about 2.06 second quarter of 2016 after falling of 0.36% in the previous months (Noko, 2016). This has in consequence generated a lot of hardship including hike in the cost of food and its production (Noko, 2016). Fall in the production of food usually costs a country to spend billions of dollars in the procurement of food. This certainly affects the GDP, especially in the way that the money ought to for national development will thus be diverted for food exchange. Perhaps, one of the strategies planned by the FGN to reduce cost of food is through importation. Punch (2022) in this regards argues that the sum that will be procured for that purpose could now be used for financing national projects. Container gardening during recession will be a wise option for populace in the sense that the saved money for food consumption will go for maintenance of home and family, which is quite cost effective.
- d) **Source of Income:** Conspicuously, greater percentage of Nigerians are in serious food challenges. This implies that quite time people go to bed empty stomach or to a lesser extent half belly due to uncompromising price of

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foodstuffs (Daily Trust, 2023). In view of these crises, people are up and serious to buy affordable and nutritious foods. Fresh container gardening crops, such as tomatoes, hot peppers, onions and ginger are scarce in markets in some seasons of year (People Gazette, 2023). Hence, their demands becomes very high, as well as the prices. Now the cost of a basket of fresh tomato is around ₦70,000 in southern part of the country (Daily Trust, 2023). For example, if a family can raise and harvest four baskets of tomato in a week, it suggests that it will incur ₦280,000 in its coffer. This amount seems significant to fill multiple of family lacunae. Feasibly, if the same family grows hot pepper and onion together, the total sell will be enough to enable them venture into another endeavor, such as poultry and fish farming efficiently.

- e) **Source of Nutrients:** Nutrients are chemical substances available in variety of food items (Hashim, 2023). When consumed in correct proportion, they contribute to the enhancement of growth, development, as well as balanced well-being and health status in organisms (Otsuka, 2023). Deficiency of nutrients in diets causes several diseases in our body (WHO, 2023). There two types of nutrients: macro nutrients and micro nutrients (Byju's, 2023). The former are required in large quantity by the system of organism. They include carbohydrates and proteins. On the other side, the latter are needed in smaller proportion. For example, insufficiency of vitamin C in diets causes scurvy, an ailment diagnosed with appearance of lesions in mouth (Health Line, 2023). Parents can avoid vitamin C deficiency in children through eating related plants from container gardening, such as guava and orange. Similarly, carrot contains

vitamin A and carotene. Vitamin A improves vision, whereas carotene promotes development of healthy skin (Harvard, 2023). Inability to take the mentioned substances at a correct ration leads to night blindness and wrinkle skin respectively. Quality carrot is grown in container garden in courtyards and corridors. According Perst, Gyurian and Crawford (2023) all plants species that provide body with required nutrients can be raised in container gardens around our homes.

- f) **Source of plants with medicinal values:** Medicinal plants, such as garlic, ginger, clove and black pepper thrive well in container gardening (Perst, Gyurian & Crawford, 2023). Today, people troop for ethno-medicine due to poverty and non-efficacy of synthetic drugs. Furthermore, the traditional medicines are ascertained to possess lower side effects when compared to pharmaceutical counterparts (Mensa, Komeaga, Forkuo, Crawford, Firemping, Alexander & Dickson, 2017). University of Idaho (2023) posits that container gardening has all what it takes to grow the mentioned plants in our midst copiously. Besides the family use of ethno-plants, markets are in dear need of such excess harvests. Money realized through sales will be used to meet family demands.
- g) **Aesthetic Purpose:** Growth media used in this innovative way are put into containers made from different materials. The containers are also modelled into different shapes and sizes (Deike, 2023). When properly arranged in strategic locations and decorated with appealing colours and design, they make havens in our homes (Sanctuary Home Decor, 2023) Moreover, the gardens attract pollinating birds and butterflies, thus, turning our homes beautiful and lovely.

- h) **Environmental Sanitation:** Discarded materials, such as cups, jugs and paint containers are converted to growth media carriers. Thus, the environment becomes tidy through this effort. In another dimension, container gardening helps tremendously in clearing excessive emissions, particularly in cities. This implies that exhausts from automobiles and industries are absorbed by plants via stomata (some openings on the lower surface of leaves). Additionally, green plants refresh environment through release of large volume of oxygen, by this in view of Danielski, Svesson, Weiner, Lorentzen and Warne (2022) they contribute to improvement of air quality.
- i) **Education Resource:** Container garden comprising different species of plants serves as a learning environment where students learn life processes, such as reproduction, growth, heredity and respiration. More so, students acquire propagation skills, which help them to be self-reliant in future (Robinson-pant, 2016). Importantly, container gardening provides opportunity for students to observe relationship between green plants and environment.

Plant Species Grown in Container Gardening and their Nutritional Values

One may wish to raise almost all kinds of green plant in this innovation. The only hindrance this development is inadequate space and size of containers. Nevertheless, rural and urban container gardeners usually raise the following plants.

- a) **Tomato:** It belongs to group of succulent fruit with seed arranged in the centre called berry. It is an indigent of South America. Botanically, it is identified as *Solanum lycopersum*. Nature has endowed it with the capability to grow and reproduce in almost all climes with the exception of

very cold one (Starke Ayres, 2023). Lister (2005) authenticates that tomato flourishes well in containers. Cervoni (2023) establishes that tomato plants contain vital nutritional values, such as carbohydrates, vitamins and antioxidants. Furthermore, he adds that the plant possesses beta-carotene, such as lycopene, which reduces incidence of prostate cancer, heart problem, as well as eye dysfunction. Quantitative analyses have revealed that *Solanum lycopersum* carries vital vitamins, such as vitamin B1 (Thiamine), which facilitates digestion of food (Sarwan, Tuz, Khatun, Begum, Khathun, Ahsan & Islam, 2020). Additionally, it contains vitamin B complex, which is a mixture of several substances. Subsequently, it contains significant quantity of folic acid, vitamin E, potassium, calcium and magnesium (Chaudhary, Sharma, Singh & Nagpal, 2018). The aforementioned confirmations have actually qualified tomato fruit as a vital condiment that should not be missed in every dish. In a period of food insecurity, family can raise containers around their residence to cultivate tomato for supplement of the mentioned nutrients.

- b) **Sweet Potato:** Sweet potato belongs to family *Convolvulacae* and is botanically described as *Ipomoea batatas*. It is a native of tropical America. Though it thrives well in other climates, it is more viable and plentiful in tropical biomes. Food and Agricultural Organization in Truong, Avula, Pecota and Yenco (2023) ranked sweet potato as the fifth important food crop. It is propagated through adventitious roots, which grow into new shoots. *Ipomoea batatas* bears vital nutritional values that improve health status of individual beings (Senthikumar, Muragod & Murulu, 2020). For example, it within its system considerable amount of vitamin A and



C. These substances are very important in protecting body system against protracted diseases. It also contains resistant starch, which informs the brain that one's food intake has reached its saturated level (Bodjrenou, Li, Lei, & Zheng, 2023). In addition, sweet potato is significantly imbued with manganese, omega-3 poly saturated fatty acid and digestive fibres. Advanced analyses have revealed presence of beta-carotene, an important nutrient that expels free radicals destroying cellular constituents (Tiruneh, Urga, Bekerie, Tassew, 2021). In view of the plethora of nutritional benefits derive from eating this species, sweet potato container gardening becomes most for every household, particularly in this season of food insufficiency that threatened North-East region in particular and the country as a whole. Importantly, it gives massive harvest when raised in containers (Moody, 2023).

- c) **Irish Potato:** Irish potato is botanically identified as *Solanum tuberosum*. It is native of Ireland and a stem tuber, which proliferates through vegetative propagation (Mississippi State University Extension, 2023). It flourishes well in containers, and as a result, offers bounteous harvest (Irish Eye, 2023). Irish potatoes raised in container may significantly exceed same variety grown on field in terms of quality and productiveness. This could be related to the treatment and protection given to the former. This will only be certain through pragmatic approaches. Though it is massively produced in Plateau States, empirical studies have shown that *S. tuberosum* performs in all climatic conditions in Nigeria (Gulak, 2019). Thus, it can also be cultivated in the North- East region. In view of the security issues threatening farming activities, people can opt this way of farming as an

alternative. More so, *Solanum tuberosum* has been verified to hold important nutrients in its tubers (Tribune, 2022). For instance, potassium, calcium and magnesium have been verified to regulate blood pressure. In like manner, fibres and choline in their unique wisdom regulate digestion processes and improve cognitive ability respectively. Furthermore, the Tribune (2023) describes Irish potato as a reservoir of vitamin C, which boosts body immunity, as well as B6 for energy metabolism.

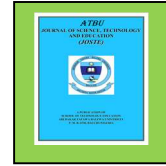
- d) **Red Pepper:** Red pepper, also scientifically known as *Capsicum annuum* is a hot culinary spice (Saleh, Omer & Teweldemedhin, 2018). It is an indigent of Mexico. It grows plentifully in all climatic zones. Similarly, it flourishes well in containers (Tagawa Garden, 2023). Nutritional investigation according to Amaechi, Udeogu and Irondi (2021) has indicated that red pepper embodies many dietetic values. Some of which include but limited to folate, niacin, riboflavin and vitamin k. Practically, folate influences formation of red blood cells, in addition to facilitating normal growth and development. Whereas niacin lowers cholesterol level, as well as easing arthritis. Riboflavin on its side provides protection against oxidative damages. Equally, Lee, Villalon (2023) confirm the presence of the substance in red pepper and furthermore, they adds that it contains flavonoids and capsaicin. The former plays role in protecting cellular damages, as well as reducing rate of inflammation, while latter influences low mortality rate. In view of the erstwhile facts, it is assumed that if people embark on growing red pepper for family consumption, the cases of diseases related to deficiency of the mentioned nutrients will reduce to possible minimum.

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- e) **Onion:** Onion with a scientific nomenclature *Allium cepa* is a most ingredient for preparation of Nigerian dishes. It belongs to the botanical structures called bulb (UASR Aropedia, 2023). Specifically, onion is large and has typically globe-shaped. It is a condensed shoot with fleshy leaves. *Allium cepa*'s condensed leaves are considerably packed with important nutrients, such as calories, proteins, sugar, fibre, fats, potassium and vitamin C (Sami, Elhakim, Alharbi, Benajiba, Almatrafi & Helal, 2021). Besides, onion contains other unique nutritional values like quercin, anthocynins and onionin (Lee, Patil & Yoo, 2015). Quercin is a substance that pacifies high blood pressure. Anthocynins are also organic substances, specifically are pigments that regulate blood sugar, thus, they protect an individual from developing diabetes. Furthermore, onionin is a sulphur containing compound that decreases possibility of developing tumor, as well as slowing down ovarian cancer (Elasr, Fujiwara, Takaya, Ikeda, Tsukamoto, Ono & Nakamu, 2021). Additionally, the onion contains other substances that boost bone density and digestive health. Particularly, the substances also pose anti-bacterial properties.

Growing Media for Container Garden

Growing media in container gardening refers to the materials on which plants are raised towards accomplishing predetermined purposes. The media in mind is usually put into containers made from different materials, sizes and shapes. There are two types growing media: garden soil and soil-less blend. The garden soil is collected from nearby farm land. It is seldom treated against soil insects and nematodes before being poured into containers. Most often, garden soil has disadvantages, for example, it is heavy and not well drained, and thus, it affect soil aeration. Similarly, it is infested with soil-borne diseases

(University of Maryland Extension, 2023). On the other hand, the soil-less blend, according to Masabni (2013) is the best medium for this purpose because of its numerous benefits. One among is that it is free from pathogens and microorganisms affecting processes in plant species. Others include its uniqueness in having lightweight property, as well being well drained and aerated.

Furthermore, soil-less mix is of two categories: commercial types, which is sold in agricultural stores and the one, which is prepared at home. The former is expensive because they are mostly imported from abroad. As a result, becomes unaffordable to all practitioners. Equally, it can be prepared at home via observing guidelines forwarded by University of Idaho (2023), Hentges, Dunn and Layman (2023). According to the preceding standards, mixture of some partially decomposed plant bark, coarse sand and cow dung in the ratio of 2.5 g, 1.0 g and 1.5 g will be transferred into a 20 litre plastic bucket. In addition, 10 tablespoonful of limestone, 5 tablespoonful of 0-20-0 Super Phosphate and a teacup of NPK fertilizer will be added upon. The mixture will be thoroughly shaken to ensure that all the components are evenly distributed across every all the cubic of the container through pouring some quantity of water to make it truly an artificial growing medium. The essence of adding lime as a component of the mixture is to neutralize PH level of the composition to 6.8.

The growing medium so formed will be transferred into 25-litre light plastic buckets. Before, some quantity of coarse gravel will be introduced to cover about one inch from the bottom and put the media thereafter. Drain holes will be created along the side of the buckets, about a quarter to half of an inch from the bottom. These holes enable excess water to drain into the saucers, which will be placed underneath the buckets.

CONCLUSION

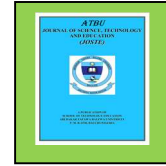
The preceding discussion has firmly established that engaging in container gardening represents a viable means of supplying nutritious food items to a family, regardless of whether they

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find themselves in a stressed condition or not. This conclusion underscores the resilience and adaptability of container gardening as a practical solution to address the nutritional needs of households, irrespective of external challenges or circumstances. Container gardening emerges as a versatile and accessible approach, capable of yielding a variety of nutrient-rich produce that can significantly contribute to the well-being of families, even in challenging or uncertain situations. The viability of this method is further reinforced by its ability to thrive in various environmental conditions, offering a sustainable and reliable source of wholesome food for families, thus promoting food security and resilience in the face of adversity.

RECOMMENDATIONS

Based on the previous fact on container gardening and its prospects, the following suggestions are therefore given:

1. People should practice container gardening in their residential surrounding to supplement nutritional insufficiency.
2. Retirees should find container gardening as a way of generating extra income.
3. Container gardening should be embedded into national curriculum for primary and secondary schools.
4. Non-governmental organizations should train interested people on practice and management of container gardening.
5. Interest free loan should be disburse to prospective container gardeners.

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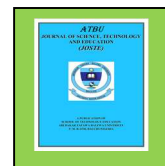
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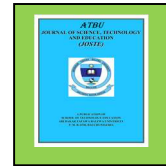
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