IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 16, Issue 1 Ser. I (January. 2023), PP 45-53
www.iosrjournals.org

Healthy Food, Job Opportunities and Money Generation in Five In One (5 in 1) Bambara Groundnuts, Moringa Leaves, Pumpkin Leaves, Tomato Berries and Catfish Flesh Balanced Vegetables Powder

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***Abstract*:** *To enjoy life you must have good health, to have good health you must consume balance food/soup (5 in 1Balanced Vegetables Powder). In this paper, the consumption of bambara groundnuts powder, moringa green leaves powder, pumpkin green leaves powder, tomato fruits powder and cat fish powder as balanced soup/food for good health and longevity is discussed. They are sources of nutrients and are available in abundance in rural communities. However, they are seasonal and highly perishable limiting their consistent supply and utilization to contribute to global food and nutrition security. Intervention that incorporate indigenous skill based technology for processing, like sun drying in green house, may improve global food and nutrition security, livelihood, job opportunities and opportunity to earn higher income from the value added to the 5 in 1balanced vegetables powder. In this trial, 400g fresh bambara groundnut, 400g fresh green moringa leaves, 300g fresh green pumpkin leaves, 2kg fresh red tomato fruits and 2.9kg fresh black catfish were harvested, washed, boiled, sundried, grinded, sieved, weighed, mixed and airtight packed to produce 5 in 1 balanced vegetables powder, a poly diet, very delicious, healthy and convenience food/soup).*

Keywords: *balanced vegetables powder, healthy food, job opportunities, money generation, sun drying, global nutrition and food security*

Date of Submission: 02-01-2023 Date of Acceptance: 14-01-2023

I. Introduction

Healthy food is a natural food free of artificial substances, good for body and helps the body resist sickness. Job opportunity means a job opening for temporary and full-time employment at a place. Money generation is an investment, work, business or farm activity where individual or nation can earn money. For Nigeria education system to really prepare Nigeria students/youths for the world of work and self reliance after leaving university/college of education/school, it must include skill-building courses in areas of negotiation, dialogue, leadership, development of new products and services, creative thinking and exposure to technological innovations (Abdulazeez, et. al. 2022). The World and Nigeria in particular is seriously facing a growing demand for food, income and employment. Senna obtusifolia (Tafasa) mechanical cultivation and industrial processing can completely put an end to Nigeria youths unrests-cults, kidnappings, bandits, unemployment, etc (Abdulazeez, 2021). Diversification of both agricultural production systems and diet is a practical and sustainable approach to address challenges of internal conflict, flood, climate change, rapid human population, farm inputs depletion, unemployment, malnutrition and to improve global food and nutrition security. This strategy is aligned with the recommendations from the EAT-Lancet report (2019), which highlighted the urgent need for increased consumption of plant-based foods to sustain population and planetary health. Abdulazeez, et al (2014) reported that detoxified neem (Dogonyaro) kernel cake diets can key in to small scale business in Nigeria and poverty reduction programme in Africa. Nigeria and Africa in general have a burden of malnutrition and hunger; limited employment opportunities make it difficult for people to have purchasing power to meet their nutritional needs. The current socioeconomic conditions do not promote food and nutrition security at all levels. A state of food security is achieved when conditions that support the availability of food resources, access to such resources, adequate consumption and appropriate utilization of food in a nutritious and hygienic manner are attained at all times for all people (Baro and Deubel, 2006; Clover 2003). Without affordable and easily accessible interventions, the problem will escalate into a bigger socioeconomic issue for government and other food security relevant stakeholders. For poor rural households and low income people in the cities, purchasing fresh vegetables is costly in the long term as the vegetables are perishable. Inadequate nutrition makes people susceptible to health problems, which in turn limits their potential for earning a living to provide

for their basic needs. Climate change is also playing a significant role because the volatile and dry weather conditions make non irrigated farming difficult, thus promoting the vulnerability of food production systems, underdevelopment and the persistence of poverty among the vulnerable smallholder farming households (Beddington *et al.* 2012). Yet, in parts of Africa, such as Nigeria, there are abundant local, wild and home-grown green leafy vegetables and fruits that are nutrient rich and adapted to the predominantly harsh Nigeria agro-climatic conditions. There is therefore a need to increase their utilization, make them accessible and affordable by applying simple skills of sun drying in green house to maximize the potential of these green leafy vegetables and fruits. Faber *et al.* (2010) identified that a low intake of fruits and vegetables is a risk factor in the high mortality rates associated with diet-linked chronic diseases and micronutrient deficiency. Several international organizations like the World Health Organization (WHO) and United States Department of Agriculture (USDA) recommend the consumption of fruits and vegetables to prevent diet-related illnesses. The USDA proposes that 1.5 to 2 cups of dark green vegetables should be consumed per week (USDA 2013). Bukky (2022) reported that, consuming more plant-based foods can improve your health and longevity. The food that provides body with necessary substances include carbohydrate-rice, fat-oil, protein-fish, minerals-vegetables, vitamins-fruits and water (Abdulazeez, 2021). Green leafy vegetables and tomato provide vitamins, minerals, essential nutrients and antioxidants necessary to promote human health and disease prevention (Khattak 2011; Sithole & Chitja 2011).When cooked or dried vegetables can taste similar to fresh ones. Dried tropical vegetables, such as spinach and pumpkins and fruits, such as mangoes, papayas and bananas, are becoming very popular with consumers in some African, European and Asian markets, where they are sold pre-packed in small polythene bags as tasty snacks. There is also a market for bulk quantities of these dried vegetables and fruits (CTA 2007). Green leafy vegetables and fruits are rich in minerals and vitamins, especially Vitamin C. Minerals and vitamins are essential in the diet of everyone, but especially so for children, nursing and pregnant women, the elderly and sick. Fresh green leafy vegetables and fruits start to lose their quality immediately after harvest, becoming damaged, wilted and eventually rotten. Drying fresh vegetables and fruits allows them to keep for longer, reduces bulkiness and weight and so eases storage and transportation, and avoids wastage and post-harvest loss. Storing and drying fruits and vegetables can provide your family with a better diet year round and earn you more money (CTA 2007). Dried green leafy vegetables and fruits can be sold directly to neighbours, local markets, hotels, restaurants, shops, supermarkets, schools, hospitals and local famine relief agencies, especially during the dry season (CTA 2007).

1.1 Preservation by sun drying

Preservation is necessary for extending the shelf-life and preventing post-harvest loss and waste often associated with the seasonal abundance of low-value stock produce such as green leafy vegetables and fruits (Sagar & Suresh 2010). It is common for households in developing countries to devise means to adapt to unfavourable circumstances as a survival mechanism. For example, to overcome seasonal shortages, households apply a traditional skill based preservation technique of sun drying to preserve green leafy vegetables, fruits and other foods such as meat and fish (Faber *et al.* 2010; Tembo *et al.* 2008; Muchoki *et al.* 2007). Preservation ensures that the biological activity is minimized in order to reduce the threat of microbial growth to the health of a consumer (Demarchi *et al.* 2013; Nguyen-The 2012). Findings by Voster *et al.* (2007) revealed that in rural households, dried vegetables form the basis of up to 80% of winter food consumption. Preservation through sun drying is the logical option for rural households in developing countries that have limited resources because of the low cost of such preservation. The option of adding value to these green leafy vegetables, nuts, fish and tomatoes by sun drying in green house would make them available throughout the year. There is little or no research focused on healthy food, job opportunities and money generation in five in one (5 in 1) bambara groundnut, moringa, pumpkin, tomato and catfish balanced vegetables powder to increase its accessibility and utilization. Therefore the aim of this trial was to employ heat energy of sun to preserve bambara groundnut, moringa leaves, pumpkin leaves, tomato berries and catfish in 5 in 1 balanced vegetables powder.

1.2 Objectives

Specifically, the trial sought to; 1. create job opportunities and money generation in bambara groundnut, moringa , pumpkin and tomato farming - planting, management, harvesting, industrial processing/preservation and marketing of their products as balanced vegetables powder locally and internationally throughout the year

2, to encourage world community to plant bambara groundnut, moringa, pumpkin and tomato throughout the year to reducing the effects of climate change.

3. to create global awareness on healthy life style that is, stop eating junk food. Eat poly diet- balanced vegetables powder healthy food, which do not give illnesses.

1.3 Significance of the Trial

Global economic recession, global arms race, increased war and terror, leaders and followers problems, little/no trust, deviant behaviour, disobedient to the Lord of the Worlds, developed nations/organizations/individuals interest, internal conflict, flood, zero/little self reliant-practical skills education system, climate change, rapid human population and depletion of farm inputs are among the challenges that threaten global food and nutrition security. Balance food is needed for a person to grow well, work hard and stay healthy. At present global challenges, a poly diet rich in nuts, green leafy vegetables, fruits and fish - five in one (5 in 1) balanced vegetables is the right balance diet needed to improve global food and nutrition security. Five in one (5 in 1) balanced vegetables will reduce a person's chances of developing a range of health conditions, including obesity, anemia, malnutrition, diabetes, and cardiovascular disease.

1.4 Bambara groundnut

Bambara groundnut (*Vigna subterranea* (L.) Verdc. Fig. 1) is a legume indigenous to Africa and is cultivated across the semi-arid sub-Saharan Africa region (Hillock, et al, 2020). Bambara groundnut an underutilized African legume, has the potential to contribute to improved global food and nutrition security, while providing solutions for environmental sustainability and equity in food availability and affordability (Tan et al, 2020). In Nigeria Bambara groundnut is called Gujiya in Hausa, Okpa in Igbo and Epa-roro in Yoruba. It is a hardy crop and has been recognized as an important nutritious food source when food is scarce (Mbosso, et al, 2020). This could be attributed to its climate-smart features, including its ability to fix nitrogen, and to grow under adverse environmental conditions such as poor soils and drought (Mayes et al, 2019, Paliwal et al, 2020). This nutrient-dense legume is sometimes termed a "complete food" due to its balanced macronutrient composition. Bambara groundnut contains ~64.4% carbohydrate, 23.6% protein, 6.5% fat, and 5.5% fiber and is rich in minerals such as potassium, magnesium, phosphorus, zinc, and iron (Azman et al, 2019, Oeyinka et al, 2019). It is relatively underutilized compared with major cash crops. There is a growing trend toward increased consumption of plant-based diets, resulting in a need for more plant-based protein foods. Bambara groundnut is the obvious crop to consider. It serves as an important source of essential nutrients in areas where animal protein is scarce (Boye and Pletch 2010). Bambara groundnut is commonly consumed as snack food after roasting or boiling (Mubaiwa 2018). In Africa, the seeds and the flour have also been used to produce a myriad of traditional foods like pastries, crackers, biscuits, weaning food, vegetable milk or yoghurt and steamed bambara groundnut pudding – flour and red palm oil - okpa. Bambara groundnut can also be paired with cereals such as wheat, maize and millet, which is beneficial in improving protein quality (Mbosso, et al 2020).

Fig. 1 Bambara groundnut plant

1.5 Moringa

Moringa (Moringa oleifera. Lam. Fig.2), Common names include Zogele, drumstick tree, horseradish tree, ben oil tree or benzolive tree. In Moringa oleifera, leaves are the most nutritious part. It acts as major source for B- vitamins, vitamin C, provitamin A as beta carotene, vitamin-K, manganese and proteins. When compared to the other leaves, the leaves of Moringa oleifera have high content of nutrients. The leaves are cooked and used like spinach, dried and crushed into a powder used in soups and sauces. Moringa leaves are used in India and Africa in feeding programs to fight malnutrition (Ramasubramania, et al, 2016). Moringa is rich in nutrition owing to the presence of a variety of essential phytochemicals present in its leaves, pods and seeds. In fact, moringa is said to provide 7 times more vitamin C than oranges, 10 times more vitamin A than carrots, 17 times more calcium than milk, 9 times more protein than yoghurt, 15 times more potassium than bananas and 25 times more iron than spinach. The fact that moringa is easily cultivable makes it a sustainable remedy for malnutrition. About 6 spoonfuls of moringa leaf powder can meet a woman's daily iron and calcium requirements, during pregnancy (Rockwood, et al, 2013). Moringa leaves also have a low calorific value and can be used in the diet of the obese. Moringa can also be preserved for a long time without loss of nutrients. Drying or freezing can be done to store the leaves. A report by Yang et al (2006) shows that a low temperature oven used to dehydrate the leaves retained more nutrients except vitamin C than freeze-dried leaves. Hence, drying can be done using economical household appliance like stove to retain a continuous supply of nutrients in

the leaves. Preservation by dehydration improves the shelf life of Moringa without change in nutritional value (Yang et al 2006).

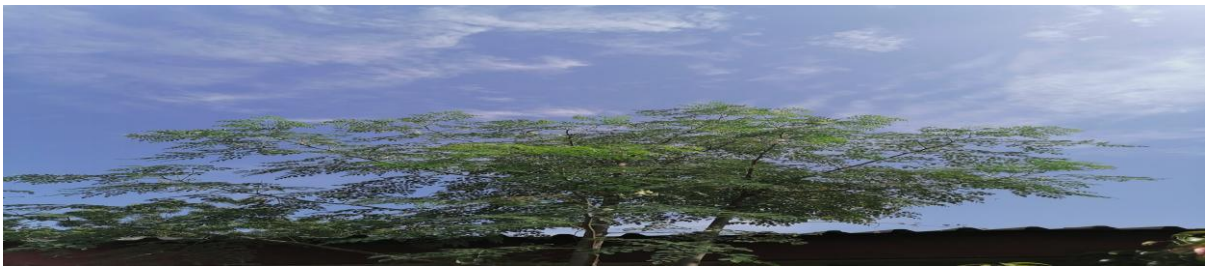

Fig.2. Moringa plant

1.6 Pumpkin

Pumpkin (Cucurhita moschata, fig. 3). In Nigeria, pumpkin is called Kabewa in Hausa, Anyu in Igbo and Elegede in Yoruba. Pumpkin leaves are packed full of nutrients that may contribute to quality and longevity of life. Every part of pumpkin is edible, including the pulp, seeds, skin, leaves, flowers and stems. It can be eaten raw. Pumpkin pie is America's favourite (Demand, 2022). Pumpkin is highly rich in potassium which can prevent high blood pressure, stroke, diabetes and other heart-related diseases. Pumpkin leaves are good sources of beta-carotene or vitamin A (a vital immune-boosting nutrient), which is proven to prevent the growth of cancers like prostate and breast cancer and eye diseases. Also, there is abundant number of vitamin C in pumpkin leaves which strengthens our immune system and keeps us healthy. Fiber in pumpkin leaves helps in the digestion of food and also prevents the blood from absorbing too much sugar. Pumpkin leaves can be consumed in various ways. They can be eaten raw; they can be used to prepare local soups, tomato stews, sauces, porridge beans and porridge yam. It is essential to make sure the leaves are not overcooked to prevent the nutrients being destroyed. The best way is to eat the leaves raw or half-cooked for the most results. Fresh green pumpkin leaves will start to decrease in quality and nutritional value almost immediately after harvest. However, they can be frozen and stored or sun dried, grinded and packed for later use. Green pumpkin leaves can be boiled in hot water for half an hour and drink as tea (Demand, 2022. HerbaZest 2021), an excellent tea to always drink.

Fig. 3, Pumpkin plant

1.7 Tomato

Tomato (Lycopersicon esculentum, Fig.4) is one of the most widely cultivated and consumed horticultural crop globally. The numerous uses of tomato can be a contributing factor to its extensive production. It provides an ample and reasonable source of energy, body building nutrients and large deposits of vitamins and minerals. Lycopene in tomatoes is an antioxidant found to neutralize free radicals and thus prevent proliferation of cancer cell types, tomatoes regulate blood pressure, improve skin and hair health, good for pregnant and nursing mothers, reduce cholesterol and improve heart health, enhance digestive system, help in managing diabetes, reduce inflammation and promote liver health (USDA, 2013). Due to the wide variety of nutrients and the many health related benefits fresh tomatoes and tomatoes based food products provide to the body, they are eaten raw or most times included as ingredients in a lot of dishes such as salads and sandwiches, and the processed ones are consumed dried or as pastes, sauces, soups, juices and drinks (Geeta 2021). Tomato is rich in vitamins and minerals, sodium, iron, phosphorous, beta-carotene, potassium, magnesium, calcium, zinc, vitamins – A, B1, B2, B6, C, E and K, dietary fiber, carbohydrate and fatty acid.. Presently, tomatoes are utilized at a higher rate in developed countries than in developing countries and hence it may be referred to as a luxury crop (Victor and Ronald 2008). One of the ancient ways of preserving tomatoes is drying. The basic procedure involves removal of moisture from the fruit to a point where decay is not likely. This can be achieved b using an oven, a dehydrator or the warm heat of the sun. Once finished, the produce should be stored in a dry

place in air tight containers (Adegbola and Bodunde 2012). Irokanulo and Owa (2015) concluded that, to ensure continuous supply of tomatoes throughout the year, there is need for sundry and preservation of tomatoes in powder form or by prolong the shelf life of the produce.

Fig.4.Tomato plant

1.8 Catfish

Most adults need around 0.75g of protein per kilogram of body weight per day. Catfish, Siluriformes (Clarias gariepinus. Fig 5) is high in many nutrients. It is low in calories, high in protein, selenium, sodium, and vitamin B12. It is also high in potassium, omaga-3 and omega fatty acids. Its proteins help in repairs tissues and muscles. Omaga-3 is essential for an embryo's brain development, nervous system and eye sight, improved skeletal muscle strength, heart health and digestive system. Vitamin B12 in catfish improves mental health and preventing anemia. Vitamin D in catfish boots human body immune system thus lowers a variety of chronic diseases (Collins 2022). Catfish is preserved by smoking, freezing, sun drying and in powder (Ahmad, 2010).

Fig. 5 2.9kg Catfish

II. MATERIALS AND METHODS

2.1 Materials:

Materials employed for this trial are; fresh bambara groundnut seeds, green moringa leaves, green pumpkin leaves, red tomato berries/fruits, catfish, sieve, green house, black polythene sheets, transparent polythene sheets, wooden pestle and mortar, clean water, stove, pot, scoop net, knife, flat platform drying surface, spoon, electric fruit grinder and electric weighing machine.

2.2 Description of trial site

In October, 2022, the trial was set up in green house of Department of Agricultural Education, Federal College of Education (Technical) Bichi, with geo-reference position Latitude 8^0 14' – 12^0 14'E and Longitude 12^0 14' – 14^0 13'N, 2775.8m above sea level, average temperature per annum 25^0 and average rainfall per annum 80cm, Sudan Savanna Zone of Nigeria.

2.3 Methods

2.3.1 Fine Bambara groundnut seeds powder

Fresh bambara groundnut seeds were manually harvested, washed with clean water to remove impurities. 400g of the cleaned bambara groundnut seeds were boiled in hot water for sixty minutes then dehulled manually, crushed with mortar and pestle and spread the paste on a clean black polythene sheet in full sun in green house. After four days, the dried and cracking bambara groundnut seeds paste was further crushed, grinded and sieved to obtain a fine bambara groundnut seeds powder/flour.

2.3.2 Fine Moringa leaves Powder

Fresh green moringa leaves were manually harvested from moringa plants, washed with clean water to remove impurities. 400g of the cleaned moringa leaves were placed in hot water for five minutes to preserve their deep green colour (Herbazest, 2021), then spread on a clean black polythene sheet in full sun in green house. After four days, the dried and cracking moringa leaves were crushed, grinded and sieved to obtain a fine moringa leaves powder.

2.3.3 Fine Pumpkin Leaves Powder

Using kitchen scissors, fresh green pumpkin leaves were harvested from the pumpkin vines, washed with clean water to remove impurities. 300g of the cleaned green pumpkin leaves were placed in hot water for five minutes to preserve their deep green colour (Herbazest, 2021), then spread on a clean black polythene sheet in full sun in green house . After four days, the dried and cracking pumpkin leaves were crushed, grinded and sieved to obtain a fine pumpkin leaves powder.

2.3.4 Fine Tomato berries Powder

Fresh red tomato berries were manually picked from tomato plants, washed with clean water to remove impurities. Using multi-functional electric fruit grinder, 2kg of the cleaned tomato berries was grinded into thick tomato paste and drained. The drained tomato paste was spread on a clean black polythene sheet in full sun in green house. After four days, the dried and cracking tomato paste was crushed, grinded and sieved to obtain a fine tomato fruits powder.

2.3.5 Fine Catfish Powder

700g catfish flesh was boiled in water for thirty minutes, then sliced and spread on a clean black polythene sheet in full sun in green house. After seven days, the dried and cracking catfish slices were crushed, grinded and sieved to obtain a fine catfish powder.

2.3.6 Cooking preparation of 5 in 1 balanced vegetables powder (soup)

Balance food is needed for a person to grow well, work hard and stay healthy. Put 15g 5 in 1 balanced vegetables powder (3g bambara groundnut seed powder, 3g moringa leaves powder, 3g pumpkin leaves powder, 3g tomato fruits powder and 3g catfish powder) into cooking pot with150ml ordinary water. Then, place the cooking pot and its content on fire, stew and stir for five minutes. You may wish to add salt, oil and seasoning cubes. It is delicious, nice to taste and good to remember. Stop eating junk food. Eat easy to prepare balanced vegetables powder healthy food/soup, which do not give illness.

III. RESULTS

Fresh bambara groundnut seeds, fresh green moringa leaves, fresh green pumpkin leaves, fresh red tomato fruits and fresh black catfish were harvested, washed, boiled, sun dried in full sun in green house, grinded, sieved, weighed, combined, packed and labeled as 5 in I balanced vegetables powder.

Fig. 6. Pack of 5 in 1 Balanced Vegetables Powder

1V. DISCUSSION, SUMMARY AND FINDINGS

Findings of this trial: The finding i, fine bambara groundnut seed powder/flour; this finding confirms the report of Mbosso (2020) which stated that, in Africa, the seeds and the flour/powder of bambara groundnut have been used to produce a myriad of traditional foods, the finding ii, fine green moringa leaves powder; this finding corroborates the results of Ramasubramann et al (2016) and Rockwwood et al (2013) who reported that moringa leaves are cooked, dried and crushed into powder used in soups and sauces, the finding iii, fine green pumpkin leaves powder; this finding is in consonant with the reports of Demand (2022) and Harbazest (2021) who reported that fresh green pumpkin leaves are cooked, boiled and sundried for later use, the finding iv, fine tomato berries powder; this finding confirms the observations of Irokanulo and Owa (2015) who documented

that to ensure continuous supply of tomatoes throughout the year, there is need for sundry and preservation of tomatoes in powder or by prolong the shelf life of the produce, the finding v, fine catfish flesh powder; this finding is in agreement with the results of Ahmed (2010) who reported that fish (catfish) are preserved by smoking, freezing, and by sun drying, the finding vi, poly diet balanced vegetables powder; this finding aligns with the recommendation of EAT-Lancet report (2019), which highlighted the urgent need for increased consumption of plant-based foods to sustain population and planetary health and the finding vii**;** balanced vegetables powder (5 in 1) in airtight polythene bags, this finding is similar to the findings of CTA (2007) who concluded that, when cooked, dried or in powder, vegetables can taste similar to fresh ones, and also, dried tropical vegetables, are becoming very popular with consumers in some African, European and Asian markets, where they are sold pre-packed in small polythene bags as tasty snacks. The finding also agrees with Bukky (2022) who reported that, consuming more plant-based foods can improve your health and longevity.

V. RECOMMENDATION

Five in one (5 in 1) Balanced Vegetables Powder is a reliable source of income therefore, the authority of Federal College of Education (Technical) Bichi should partner Federal Government of Nigeria/Tertiary Education Trust Fund/Rich Individuals or Organizations in commercial production of 5 in 1 Balanced Vegetables Powder. To open up many job opportunities, more income to governments and individuals and attract multiple local and international business people/investors to Bichi Local Government/Bichi Emirate, Kano state (Centre of Commerce) and Nigeria in general, job seekers in Nigeria should be encouraged in Bambara groundnut, Moringa, Pumpkin, Tomato and Fish farming, industrial processing and marketing of 5 in 1 Balanced Vegetables powder. To prevent and eradicate many common sicknesses (high blood pressure, stroke, diabetes, eye diseases, obesity, kwashiorkor, marasmus and anemia) in our society, teaching and learning of five in one (5 in 1) balanced vegetables powder should be included in medical/community health/health education, vocational and entrepreneurship curricula at all levels of the educational system in Nigeria. To provide job opportunities, earn more money and curb criminal activities in Nigeria, importance of five in one (5 in 1) balanced vegetables powder should be emphasized during marriage counseling and youth employment/self-reliant programmes. Food and Agricultural Organization (FAO) and World Health Organization (WHO) may consider inclusion of five in one (5 in 1) balanced vegetables powder in global food, nutrition and health programmes respectively. Five in one (5 in 1) balanced vegetables powder is the right balance diet for aircraft, ship and spaceship crews and passengers. Leaders of advanced/developed or industrialized nations should **sincerely** collaborate with leaders of developing nations bestowed with numerous agricultural and human resources to attain world target of zero/slow global warming, job, food, nutrition, life, property and health security by year 2030. Every world citizen should plant Bambara groundnut, Moringa, Pumpkin and Tomato on his or her premises for consumption, good health, income and to reducing effects of climate change. Soybean is a good substitute for catfish in five in one (5 in 1) balanced vegetables powder.

5.1. CONCLUSION

To enjoy life you must have good health, to have good health you must consume balance food/soup (5 in 1Balanced Vegetables Powder), to consume balance food/soup you must have good job (5 in 1Balanced Vegetables Powder). Innovative and appropriate technology, including preservation by drying in full sun in green house, for processing fresh bambara groundnut seeds, fresh green moringa leaves, fresh green pumpkin leaves, fresh tomato berries and fresh black catfish into value added products (balanced vegetables powder) could increase their utilization and thereby improve the livelihoods, job opportunities, good health, food and nutrition security of world citizens. The world citizens' incomes could increase from the sale of the value added products (balanced vegetables powder) in high-value formal markets and their nutritional security would also improve due to a rich, diversified poly diet comprised of these seeds/nuts, vegetables, berries and catfish purchased with the increased income

ACKNOWLEDGEMENTS

I sincerely and humbly express my gratitude to the following organizations and people. The Sulaiman J.A, (Dept. of Agric. Edu. SOSE.V. F.C.E.T.Bichi) and Abubakar Integrated Farms Ltd, Kano, thank you for the catfish you availed for the success of this trial. The Creativity Continuum Enterprise, Nigeria Ltd Adedokun S.A, (Dept of Fine and Applied Arts, SOSE.V. F.C.E.T.Bichi), thank you for design and production of the packs for keeping the five in one (5 in 1) Balanced Vegetables Powder. I am deeply grateful to Mrs. Abdulazeez A.O. Dept. of Home Economics, SOSE.V, F.C.E.T.Bich for cooking the delicious and healthy five in one balanced vegetables soup. I sincerely appreciate Bashir Abdulrahim Dept. of Fine and Applied Arts, FCETBichi, Ibrahim Abubakar Abdullahi and Auwalu Muhammed Musa Dept. of Agric. Educ. SOSE.V, F.C.E.T.Bichi for consuming the cooked five in one balanced vegetables powder soup and Miss Augustina Ndu Dept. of Agric. Educ. SOSE.V, F.C.E.T.Bichi for taking beautiful pictures when consuming the cooked five in

one balanced vegetables powder soup in HOD Agric. Education office. I acknowledge with thanks, the encouragement (in valuable research works, articles publication in standard international journals and academic achievement) of the Principal Scientist at International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) Kano, Dr. Hakeem A, the former Vice-Chancellor Federal University Dutse, Jigawa State, Professor (Mrs) Fatima B. Mukhtar and the Vice -Chancellor, Federal University Dutsin-Ma, Katsina State, Professor, Arma Yau Bichi. For the technical assistance, thanks to Dr. Adeosun T.A, the HOD Agric. Edu. F.C.E.T.Bichi, Dr. C.I Madu, former Dean, SOSE Science, F.C.E.T. Bichi, Dr. Okegbile S.A, former Director Research, Seminar, Conference and Publication committee F.C.E.T.Bichi, Umar Sani Shariff Bursary Department F.C.E.T.Bichi, Dr. (Mrs). Onazi, B.O, former HOD, Dept. of Agric. Edu, F.C.E.T.Gusau, Tasiu Halilu, Security unit, F.C.E.T.Bichi, Suleiman Sani Central/Jummat Mosque, F.C.E.T.Bichi, Mustapha Abba Dept. of Agric. Educ. SOSE.V, F.C.E.T.Bichi, Muminat Abdulazeez and Kauthar Abdulazeez Aljunfunbaya's Compound Okesuna Ilorin, Kwara state, my NCE project students Dept. of Agric. Edu. F.C.E.T.Bichi and my Undergraduate project students Dept. of Agric. Educ. Abubakar Tafawa Balewa University Bauchi/F.C.E.T.Bichi. To all the staff Works and Services Unit, F.C.E.T.Bichi, thank you for collaborating with me on construction of the simple, indigenous, low cost, durable and long lasting green house.

REFERENCES

[1]. Abdulazeez, A, Abdullahi, S, Adamu, M.I, Abdulazeez, A.O, Lukman, M.A and Y. Danlami, . "Job Creation and Income Generation in Three in One (3 IN 1) Balanced Tomato, Sweet Pepper and Sardine Fish Powder.2022. IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS), 15(07), 2022, www.iosrjournals.org DOI:10.9790/2380-1507015056 pp. 50-56.

[2]. Abdulazeez, A . **Shoot Growth and Yield of Transplanted Senna obtusifolia (Sickle pod) Seedlings in Response to Different Levels (0g, 4g, 8g and 12g) of NPK (15:15:15) Fertilizer in Bichi: A Potential Crop for Post COVID-I9 Economic Recovery.** 2021. IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS) e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 14, Issue 1 Ser. I (January 2021), PP 14-20 www.iosrjournals.org DOI: 10.9790/2380-1401011420 www.iosrjournals.org. PP 14-20

[3]. EAT-Lancet Commission. EAT-Lancet Commission Summary Report. (2019): https://eatforum.org/content/uploads/2019/07/EAT-Lancet_Commission_Summary_Report.pdf

[4]. Abdulazeez A, Abdulmumini S and J. Sulaiman .. Potential of Detoxified Neem Kernel Cake as a Protein Source in Broiler Feeding. 2014. IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS) e-ISSN: 2319-2380, p-ISSN: 2319-2372.Volume 7, Issue 1, Ver. IV (Feb. 2014), PP 22-29.www.iosrjournals.org

[5]. Baro M and F.T. Deubel F. Persistent hunger: perspectives on vulnerability, famine and food security in sub-saharan Africa.anual review of anthropology.2006. Vol.35:521-538

[6]. Clover J. Food security in sub-saharan Africa. African security review.2003. Vol.12. 2003-issue 1.

[7]. Beddington J.R, Asaduzzaman M, Clark ME, Bremauntz AF, Guillou MD, Jahn MM, Mamo T, Negra C, Nobre CA, Scholes RJ, Sharma R, Van Bo N, and J. Wakhungu J. The role for 22 scientists in tackling food insecurity and climate change. **Agriculture and Food Security**. 2012(10):1-9.

[8]. Faber M, Oelofse A, van Jaarsveld PJ, Wenhold FAM, Jansen V and W.S Rensburg. African leafy vegetables consumed by households in the Limpopo and KwaZulu-Natal provinces in South Africa. **South African Journal of Clinical Nutrition.** 2010. 23(1):30-38

[9]. United States Department of Agriculture, USDA. Food groups. URL http://www.choosemyplate.gov/food-groups/vegetables.html. (2013 (Accessed 2013, April 19)

[10]. Bukky. Longest –living people on Earth eat these 6 foods. 2022. Fakazanews. 26/10/2022

[11]. Abdulazeez, A. Family Case Study. A Case Study of a Patient with Tetanus. 2021. A Research Report Submitted to the Department of Community Health, Bichi Academy of Health Science and Technology in Partial Fulfillment of the Requirements for the Award of National Certificate in Junior Community Health Extension Worker (JCHEW). Bichi Kano State.

[12]. Khattak KF.. Nutrient composition, phenolic content and free radical scavenging activity of some uncommon vegetables of Pakistan. 2011. **Pakistan Journal of Pharmaceutical Science** 24(3):277-283

[13]. Sithole N.T.N and J.M Chitja. The role of traditional leafy vegetables in household food security in rural KwaZulu Natal. 2011. **Indilinga – African Journal Of Indigenous Knowledge Systems** 10(2):195-209

[14]. CTA Preserving Green Leafy Vegetables and Fruits. 2007.Practical Guide Series, No.8. www.cta.int

[15]. Sagar VR, and K.P Suresh. Recent advances in drying and dehydration of fruits and vegetables: a review. 2010. **Journal of Food Science Technology**. 47(1): 15-26

[16]. Tembo L, Chiteka ZA, Katzere I, Akinnifesi FK, and F.Tagwira. Blanching and drying period affect moisture loss and vitamin C content in Ziziphus mauritiana (Lamk.). 2008. **African Journal of Biotechnology**. 7(8):3100-3106

[17]. Muchoki CN, Imungi JK, and P.O. Lamuka. Changes in beta-carotene, ascorbic acid and sensory properties in fermented, solar-dried and stored cowpea leaf vegetables. 2007. **African Journal of Food Agriculture Nutrition and Development** 7(3):1-20

[18]. Demarchi SM, Ruiz NAQ, Concellón A and S.A. Giner. Effect of temperature on hot-air drying rate and on retention of antioxidant capacity in apple leathers. 2013. **Food and Bioproducts Processing**. 91:310-318

[19]. Nguyen-T. C.. Biological hazards in processed fruits and vegetable: Risk factors and impact of processing techniques. **LWT – Food Science and Technology**. 2012. 49:172-177

[20]. Voster HJ, Stevens JB and G.J. Steyn. Production systems of traditional leafy Vegetables: challenges for research and Extension. **South African Journal of Agricultural Extension.** 2007. 37:85-96

[21]. Hillocks RJ, Bennett C and O.M. Mponda. Bambara nut: a review of utilisation, market potential and crop improvement. 2012. African Crop Sci J. (2012) 20:1–16. https://www.ajol.info/index.php/acsj/article/view/78601

[22]. Tan X.L, Azam-Ali S, Goh EV, Mustafa M, Chai HH, Ho WK, Mayes S, Mabhaudhi T, Azam-Ali S and F. Massawe. Bambara Groundnut: An Underutilized Leguminous Crop for Global Food Security and Nutrition. Front. Nutr. 2020. 7:601496. doi: 10.3389/fnut.2020.601496

[23]. Mbosso C, Boulay B, Padulosi S, Meldrum G, Mohamadou Y and A.B Niang. Fonio and bambara groundnut value chains in mali: issues, needs, and opportunities for their sustainable promotion. Sustain. (2020) 12:4766. doi: 10.3390/su12114766

[24]. Mayes S. H, WK, Chai H.H, Gao X, Kundy AC and K.I. Mateva. Bambara groundnut: an exemplar underutilised legume for resilience under climate change. Planta. (2019) 250:803–20. doi: 10.1007/s00425-019-03191-6

[25]. Paliwal R, Abberton M, Faloye B and O. Olaniyi. Developing the role of legumes in West Africa under climate change. Curr Opin Plant Biol. (2020) 56:242–58. doi: 10.1016/j.pbi.2020.05.002
[26]. Azman Halimi R, Barkla BJ, Mayes S and G.J. King. The potential of the underutilized pulse bambara groundnut (Vigna subterranea (L.) Verdc.) for nutritional food security. J Food Compos Anal. (2019) 77:47–59. doi: 10.1016/j.jfca.2018.12.008
[27]. Oyeyinka AT, Pillay K and M. Siwela. Full title- in vitro digestibility, amino acid profile and antioxidant activity of cooked Bambara groundnut grain. Food Biosci. (2019) 31:100428. doi: 10.1016/j.fbio.2019.100428
[28]. Boye J, Zare F and A. Pletch. Pulse proteins: processing, characterization, functional properties and applications in food and feed. Food Res Int. (2010) 43:414–31. doi: 10.1016/j.foodres.2009.09.003
[29]. Mubaiwa J, Fogliano V, Chidewe C, Jan Bakker E and A.R. Linnemann. Utilization of bambara groundnut (Vigna subterranea (L.) Verdc.) for sustainable food and nutrition security in semi-arid regions of Zimbabwe. PLoS ONE. (2018) 13:e0204817tt. doi: 10.1371/journal.pone.0204817
[30]. Ramasubramania R, Sreenivasulu M, Vaishnavi S, Muni D. N, G.Samatha G and S. Geethalakshmi. Moringa Oleifera-An Overview. RA Journal of Applied Research 2016. ||Volume||2||Issue||09||Pages-620-624||Sept-2016|| ISSN (e): 2394-6709.www.rajournals.
[31]. [31] Rockwood, J.L, Anderson, B.G and D.A. Casamatta. Potential uses of Moringa oleifera and an examination of antibiotic efficacy conferred by **M. oleifera** seed and leaf extracts using crude extraction techniques available to underserved indigenous populations. Int. J. Phytothearpy Res., 3 (2013), pp. 61-71
[32]. Yang, R. L, Chang, J. H, Weng, B.B.C, Palada, C, Chadha, M.L, and V. Levasseur. Nutritional and functional properties of moringa leaves from germplasm, to plant, to food, to health. Am. Chem. Soc. (2006), pp. 1-17. CrossRefView Record in ScopusGoogle Scholar
[33]. Demand. A.. https:/demandafrica.com/food/recipes/how-to-prepare-and-cook-pumpkin-leaves. 2022
[34]. Harbazest https://www.herbazest.com/herbs/pumpkin/pumpkin-leaves/(2021).
[35]. Geeta D. Amazing benefits of tomatoes. US National library of medicine. https://www.ncbi.nlm.nih.gov/pmc/articles. (2021).
[36]. Victor RP and R.W. Ronald. Tomatoes and Tomatoes Products. Nutritional, Medicinal and therapeutic properties. Science publishers.EnfieldNH,USA, 2008
[37]. Adegbola J.A and A.A. Bodunde. Investment opportunities in tomato processing in Kano. Global Advanced Research Journal of Agriculture, 2012, 1(10) 288-297.
[38]. Irokanulo E.O and S.O. Owa. Use of Moringa oleifera in preservation of fresh tomato. Journal of Agricultural and Veterinary Science.2015;8(2):127-132
[39]. Collins, N.. 5 Amazing Health Benefits of Catfish. Healthguide.ng. 2022.
[40]. Ahmed G.. Introduction To Fish Production System Practices in Nigeria. 2010. Unique Press. Kontagora, Nigeria

Abdulazeez Abubakar. "Healthy Food, Job Opportunities and Money Generation in Five In One (5 in 1) Bambara Groundnuts, Moringa Leaves, Pumpkin Leaves, Tomato Berries and Catfish Flesh Balanced Vegetables Powder." *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)*, 16(1), 2023, pp. 45-53.