FORESTRY-BASED SOLUTIONS TO THE CHALLENGES OF CLIMATE INSECURITY AND HEALTH HAZARDS

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INTRODUCTION

To address the topic, questions may help. What becomes of forestry in Nigeria especially now that forests are becoming "official" enemies of state? Are forests responsible for banditry in Nigeria? What is forestry? What happened to the scope of forestry in the past one hundred years? Has Nigeria's forestry changed significantly from the colonial format she had at independence? What has become of the various formulas in forestry management? Who are the managers of forestry in Nigeria, the forestry professional or the political officer holder? What are forest resources? Are forest soil microbes and macrobes as important as the "mined" timbers? What are the glorified products from the forests in the past one hundred years? What is the meaning of "minor forest products" and the later transmuted terminology "non-wood forest products"?

What is climate change? Can the forests survive? What is the scope of forestry? Are we aware that forest soils and microorganisms are crucial to the health of world's climate? Are we aware that soil microbes alone account for a large chunk of sequestered carbon? Are we aware that the oceans and the water bodies also sequester large quantities of carbon?
What happens to the climate when western nations begin mining on the Moon and perhaps Mars? What are the effects of deep-sea mining that has become a craze in the western world? What are the effects of military laser weaponry that is becoming a global threat on climate? What about classified information concerning the effects of nuclear tests on climate? Can forests help mitigate the current level of electromagnetic radiation in the environment? What will be the level of radon gas on soil surface and the environment generally, when forests are gone? Is there any consciousness about the possible level of radon gas emitted currently because of the removal of forest vegetation, indiscriminate mining, and house constructions especially in the mushrooming housing estates in the country? How many know that an increase in the level of radon gas in the environment will led to an increase in lung cancer? When the myriads of soil microbes are destroyed resulting from deforestation, what happens to human biome? Will geopathic stress increase when forests are gone? Does it ever occur to anyone that "estates" in Nigeria do not promote good health because of the concretes, buried microbes, and lack of forest plots?
Is there any relationship between forest destruction and the rising frightening level of deadly diseases such as cancer, diabetes, hypertension in Nigeria? Are the forests not helpful in minimizing road rage, domestic violence, and suicide? Can forest resources help to curtail the rising levels of hunger and "hidden hunger" (Type B malnutrition)?
What happened to indigenous knowledge especially about forest management? Is the assemblage of indigenous knowledge not important now than ever before? Can forestry begin to include indigenous knowledge studies in her curricular?
What are the prospects of forests in the next one hundred years? Is there a political will to plan for the next one hundred years? Are there forestry professionals who are dreaming of forests in the next one hundred years in Nigeria?
Are forestry professionals trained (formal and self-trained) enough to cope with the emerging scenarios in the world?
Are there forestry professionals who will champion neuroplasticity in foresters and stakeholders in forestry? Can FRIN and other stakeholders in forestry advance a policy on Healing Forests in Nigeria? When shall a school, faculty, department of herbal and natural medicine be established or taught in institutions of forestry in Nigeria?
What happens to the forests in case of nuclear attacks? Are there plants in the forests that can ameliorate or withstand nuclear radiation? Can there be a "doomsday forest reserve and vault" in Nigeria? Can FRIN, Universities with forestry faculties or departments and other stakeholders have lands where forest plants, insects and other creatures can be cultivated?
Is it not possible to extend the scope of forestry to plant and animal populations in oceans and other water bodies?
What have forestry professionals learnt in the past two decades about modern methods of forest management? Are the syllabi of forestry schools and institutions in Nigeria relevant in addressing current situations in the country and in the world? Can postgraduate studies in forestry include such fields of study as forest archeology, biophysics, human brain studies, e-electricity studies and innovation, graphene, and space science? Can forestry incorporate the study of Periodic Table as an economic tool for development? Can Nigeria's forestry learn from Japan, China, India and other nations that have developed trade in insects, scorpions, earthworms and others for medicine and medicine?
Is it not time to address the legendary corruption and indiscipline among forestry officials who are conduit pipes in siphoning resources from the forests and forest revenue? Have forestry officials not lived riotously and gluttonously to the detriment of their primary constituency, which is the forest?

Forestry as advocated in this paper can address the persistent and long-term development challenges in Nigeria. The challenges are those described by Anigbogu and Adelaja (2015) as challenges mitigating the emergence of Africa. The challenges include among others, undiversified production structure, weak governance, low human capital, and climate change.

This paper presentation will therefore focus more on the problem of undiversified production structure in forestry by giving examples of products and services that can be derived from forest resources.

A. Nuclear Tests: The Great Albatross Hanging on Global and Extra Terrestrial Climates

In the New Mexico desert just three weeks before the atomic bombings of Hiroshima and Nagasaki, in 1945, the United States conducted the world's first nuclear test explosion, code-named "Trinity". Its giant fireball turned the sands into glass, illuminated the surrounding mountains, and sent a mushroom cloud of radioactive debris 12 kilometres into the sky (The International Campaign to Abolish Nuclear Weapons (ICAN), 2017).

Since the first nuclear test explosion on July 16, 1945, at least eight nations have detonated 2,056 nuclear test explosions in many sites in the world (Arms Control Association, 2020). Around one-quarter of these tests were in the atmosphere – causing long-term harm to human health and the environment. The nuclear explosions have resulted in epidemics of cancers and other chronic illnesses. Large swathes of land remain radioactive and unsafe for habitation; even decades after test sites were closed. More than 60 sites around the world bear the scars of these tests. Even those that have been closed for decades and partially cleaned up remain uninhabitable. The sheer scale of the devastation is staggering. The 528 atmospheric tests alone had a destructive force equal to 29,000 Hiroshima bombs. They dispersed radioactive particles far and wide, poisoning the soil, air, and water (The International Campaign to Abolish Nuclear Weapons (ICAN), 2017). Many underground nuclear blasts have also vented radioactive material into the atmosphere and left radioactive contamination in the soil (Arms Control Association, 2020).

Figure 1 shows the nuclear testing numbers between 1945 and 2017.

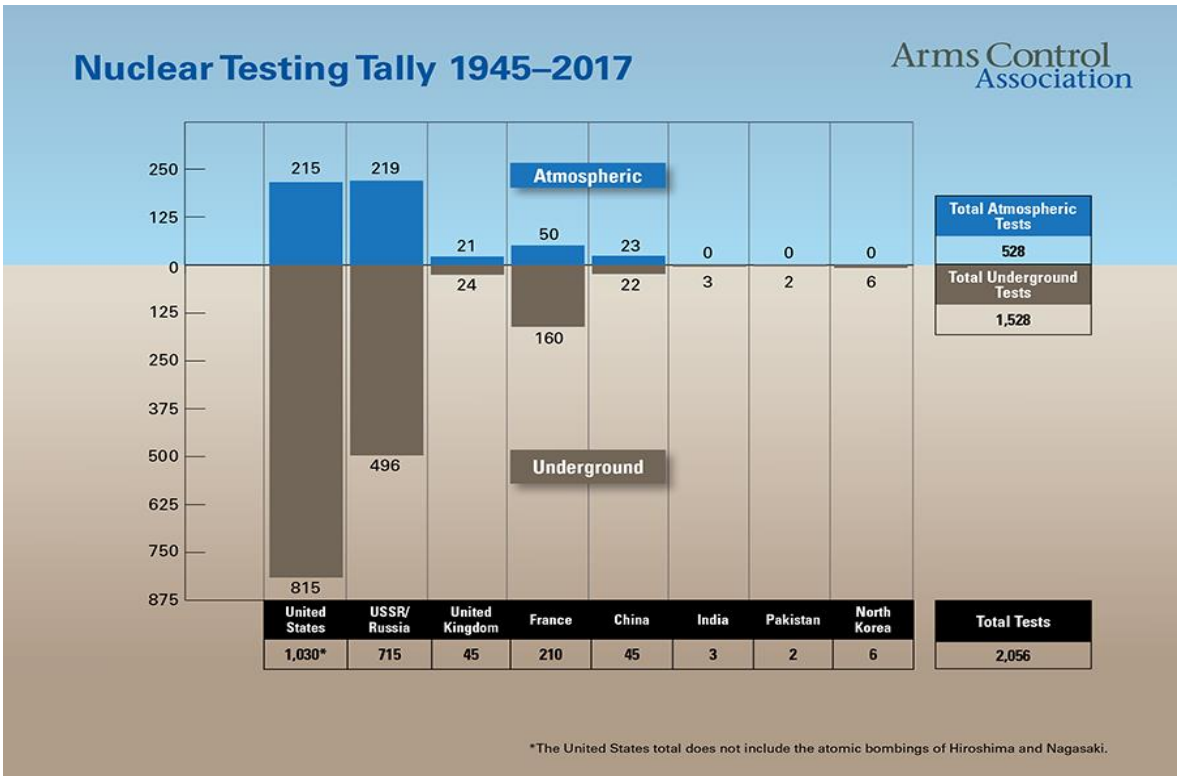

Figure 1. Nuclear Testing Tally 145-2017

Figure 2 shows the number of underground and atmospheric nuclear testing between 1945 and 2017. The number of underground testing is about three times that of the atmospheric. These have grave implications for soil, water and food contamination. Food produced from such areas are shipped for sale in many other parts of the world.

The effects of nuclear explosions on the environment are classified information. That is, the population is not to know the adverse effects on the environment.

The implications of the nuclear testing for people's lives and the Earth's fragile ecosystems will be felt for generations to come (The International Campaign to Abolish Nuclear Weapons (ICAN), 2017).

Type of Test	United States	USSR/ Russia	United Kingdom	France	China	India	Pakistan	North Korea	Total
Atmospheric	*215*	*219*	*21*	*50*	*23*	*0*	*0*	*0*	***528***
Underground	815	496	24	160	22	3	2	6	**1,528**
Total	**1,030**[1] *(Note: does not include atomic bombings of Hiroshima and Nagasaki.)*	**715**	**45**	**210**	**45**	**3**	**2**	**6**	**2,056**

Figure 2. The number of underground and atmospheric nuclear testing between 1945 and 2017 Source: Arms Control Association, 2020

The following remedies can be helpful against radiation. Plastic pollution and herbicides. Radiation is not limited to nuclear tests alone but also includes sources such as hospital diagnostic equipment, detection equipment in the airports and offices, telecommunication masts, home electrical appliances and the ubiquitous handsets.

1. Anti-radiation tea:

Blend Atlantic kelp, Atlantic dulse, dandelion leaf (*Taraxacum officinale* (L.) Weber ex F.H. Wigg.), and nettle leaf (Stinging nettle *Urtica dioica* L.) in equal parts. Blend all together, make a tea from a tablespoon of the mixture per cup of hot water.

Sea kelp is seaweed or algae. The kelp scientific name is Laminariales. Some species of kelp form large forests beneath the shallow waters of the ocean. These areas are sometimes referred to as the rain forests of the ocean because of the great biological diversity within their midst.

Kelp is also an important resource for humans and is harvested for food, medicinal purposes and its uses in various products (Bethney Foster, 2019).

2. Anti-Plastic Tea:

Rid the body of plastic and plastic by-products, blend equal parts fenugreek (*Trigonella foenum-graecum* L), mullein leaf (*Verbascum Thapsus* Linnaeus), olive leaf (*Olea europaea* L.), and lemon balm (*Melissa officinalis* L.). Steep one tablespoon of the mixture per cup of hot water for tea.

3. Anti-Pesticide/Anti-Herbicide/Anti-Fungicide Tea:

To remove pesticides, herbicides, and fungicides deeply stored in the body, blend equal parts of burdock root, (*Arctium lappa* L.) red clover (*Trifolium pretense* L.), lemon verbena, and ginger. Steep one tablespoon of the mixture in a cup of hot water to make tea.

Source: 1, 2, 3: (Anthony Williams, 2015).

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The following anti-radiation remedies are from Oluwalana, S. A. and Oluwalana, E.O.A. (2010).

1. Flax seed (*Linum usitatissimum* Linn.) water: Shower for 10 minutes, then cleanse the entire body with a flax water decoction (3 tablespoons of flax seeds to 2 cups of water, boil for 10 minutes) and then wrap the body into a linen cloth soaked in flax water. Do this 2-3 times per day as a measure against radiation.

From Reinhard Schiller, Author of Hiddergard Medicine Practice.

2. Nascent Iodine: Supplement with nascent iodine to help counteract the effects of radioactive Iodine. Nascent iodine is one of the single most bio-available forms of iodine, and may be effective in aiding individuals exposed to radiation by lowering accumulated and stored radioactive toxins in the thyroid gland.

3. Potassium Ororate: In addition to exposure to radioactive iodine, the body may also be exposed to a radioactive isotope of caesium known as Cesium-137.Supplementing with potassium ororate can prevent the accumulation and retention of Cesium-137.

4. Calcium and Magnesium: Taking calcium or magnesium can decontaminate Strontium 90, a form of nuclear waste. Calcium supplementation can lower Strontium absorption by the body by up to 90 percent.

5. Organic Germanium-132: Taking 100 mg of organic germanium-132 per day is recommended in case of exposure to radiation.

6. Zeolites: Zeolite clay can be taken internally for detoxing radiation.

7. Kaolin, Red Clay, Bentonite, Fuller's Earth, Montmorillonite, French Green Clay: Any of these clays can bond to nuclear waste from the body. These clays possess the ability to rid radiation, toxic metals and chemical residues from the human body. They can be used in bath, or, can be ingested.

8. Cold-pressed organic vegetable oils: Drinking about 100 cl of cold-pressed organic oil is recommended in cases of exposure to radiation. Cold-pressed organic oils such as sesame oil, extra virgin olive oil and coconut oil are known to be able to pull radiation out from the human body. The lipids in the oils bind the toxins, and they also offer a protective layer on cellular membranes.
9. Organic Brewers Yeast: As a prevention against radiation exposure, 5 mg. to 15 mg. for children, and 25 mg. to 50 mg. for adults of organic brewers yeast are recommended. Double these amounts in cases of direct exposure to to radiation.
10. Bee pollen: Taking 2 tablespoons bee pollen may lower the negative side effects of radiation exposure, particularly that of radium, x-rays and cobalt-60 radiotherapy.
11. Beets (*Beta vulgaris* Linn.): Eating a diet heavy in beet pulp can effectively reduce the effects of radio active cesium-137.
12. Glutamine: Take 5,000 to 15,000 mg of the amino acid glutamine a day as one of the best remedies for shielding the intestine from the damage of chemotherapy and radiation.
13. *Umeboshi* tea (consisting of umeboshi, a Japanese word for salt plum paste, the root of kudzu plant and, ginger): Put ½ teaspoon of kudzu powder in a bowl and combine with enough cold water to make a paste. Mash the paste, then pour 1 cup of hot water over it to dissolve it. Then, add ½ teaspoon of umeboshi and ½ teaspoon of grated or powdered ginger, pour the water into a small pot, and simmer on low heat for 30 minutes. Strain the mixture before drinking, taking a cup twice a day, including one cup before breakfast. It helps to settle the stomach of the cancer patient when the tea is taken first thing in the morning. Umeboshi tea is one of the best remedies for nausea and vomiting caused by conventional cancer treatments.
14. Astragalus/Huang Qi (=yellow energy): Astragalus/Huang Qi (*Astralagus membranaceus* (Fisch.) Bunge/*Astralagus mongholicus* Bunge), a Chinese herb: is one of the best long-term immune tonics. For adults, take 20 to 30 drops of the tincture of Astralagus three times a day. In capsule form, dose is 1,000 mg capsule, three times a day. Astralagus helps to protect patients from the side effects of chemotherapy. Astralagus taken inconjunction with *Ligustrum lucidum* (glossy privet) may increase survival rates in patients being treated conventionally for breast cancer.
15. Supplement programme: Hair loss is often results from chemotherapy and radiation treatments for cancer. To help reduce hair loss and speed up its healthy regrowth, take the following supplement programme: Take:
3 mg biotin twice a day throughout the chemo or radiation treatment, and for two weeks after. After the two weeks, cut back to 3 mg once a day;
a multivitamin-and-mineral capsule every day;
400 IU of vitamin E succinate three times a day;
500 mg quercetin three times a day with meals;
500 mg hesperidin three times a day with meals;
500 mg curcumin three times a day. Dissolve the contents of one capsule in one tablespoon of extra virgin olive oil;
100 mg of decaffeinated green tea extract with each meal.
16. Supplement programme: Depressed production of blood-forming cells (bone marrow depression) is a major consequence of chemotherapy. The body's hemopoietic system (comprising of the bone marrow, instestinal wall (Peyer's patches), lymph nodes, spleen, and a few other tissues) produce immune cells. When these cell types are depressed, especially with chemo drugs, there can be increased risk of infections, increased spead of the cancer, abnormal bleeding, and severe state of blood insufficiency (anaemia).
To help protect the haematopoietic system, take the following supplement programme: Take:
500 mg of the flavonoid curcumin three times a day. Dissolve the contents of one capsule in one tablespoon of extra virgin olive oil. Curcumin derived from turmeric (*Curcuma longa* Linn.) not only protects the bone marrow cells, but also capable of stimulating the regeneration of the bone marrow cells;
800 mcg of folate every day. Folate is needed tin haematopoietic cell reproduction;
1,000 mcg of sublingual methylcobalamin three times a day. Sublingual means that it should be dissolved under the tongue. A day after the chemo or radiation treatments are finished, reduce the dosage to one tablet twice a day;
50 mg of pyridoxal-5-phosphate (the form of vitamin B_6 used by the blood cells) every day;
a multivitamin-and-mineral capsule every day between meals, but in case it causes stomach upset or nausea, take with meals;
500 mg vitamin C (buffered as magnesium ascorbate) three times a day between meals;
400 IU vitamin E succinate three time s a day; 500 mg of the vitamin niacinamide twice a day.
17. Pine Bark Extract: Cancer patients undergoing chemotherapy or radiation treatment should take 50 mg Pine bark extract (Pycnogenol) three times a day to reduce the effects of the chemo or radiation treatments such as nausea, vomiting, diarrhea, weight loss, ulceration and soreness of the mouth, water retention, and weakness.
Pine bark extract is a natural extract from the bark of the maritime pine tree (*Pinus pinaster* Aiton.), a European coastal pine that grows along the coast of southwest France.
Pine bark extract is sold as Pcynogenol (pronounced as *pik-NOJ-en-all*).
CAUTION: Avoid use if on blood-thinning medication, as Pycnogenol is a blood thinner. Also, avoid if on medication for diabetes as pycnogenol lowers blood-sugar levels. Avoid Pycnogenol if pregnant, or nursing baby.
18. Sacred clay (Pyrophyllite): Due to its exceptionally small particle size, high silica and high electrolyte content, sacred clay is highly recommended during times of radiation emergency. Eat and take sacred clay to pull out all forms of radiation faster and effectively.

19. Sacred clay (Pyrophyllite), Himalayan salt, Humic/Fulvic Earth, Ocean Magnesium: Combine sacred clay (pyrophyllite), Himalayan salt, humic/fulvic earth, and ocean magnesium and use in bath to drastically reduce the effect of radiation and expel radiation from the body.

B. Suggested Areas of Utilization in Forest Resources Management:

1. Soil Microbes: The Unsung Heroes of the Environment:

Soils bustle with life (Soil Association), and are essential to life. Soils are one of the main global reservoirs of biodiversity. They host more than 25 percent of the world's biological diversity (New FAO). The species range from beetles and springtails to worms, spiders, nematodes, and billions of other microorganisms too small to be seen by the naked eye, but vitally important to soil health and the planet. Up to 10 billion microorganisms can be found in just a quarter of a teaspoon of soil (Soil Association). In addition, more than 40 percent of living organisms in terrestrial ecosystems are associated with soils during their life cycle (New FAO report).

Soil microbes and animals, from tiny soil bacteria to earthworms, are unsung heroes in the environment, providing hundreds of billions of dollars in ecosystem services. These organisms are critical to maintaining the global biosphere and human existence (Virginia Tech. 2019).

Soil microorganisms have a significant potential to mitigate climate change. They play a key role in carbon sequestration and reducing greenhouse gas emission. They play a crucial role in boosting food production, enhancing nutritious diets, preserving human health, remediating pollution and combating climate change, but their contribution remains largely underestimated. Their protection is of the utmost importance to ensure the future of agri-food systems and the provision of key ecosystem services (New FAO report).

Soil microbes include nematodes, tarnigrades, bacteria, protozoa, and fungi. Soil-inhabiting nematodes are one of the most abundant creatures on Earth, as just one gram of soil may contain more than a million nematodes. Water bears, or tardigrades, are famous for being one of the most resistant animals on Earth. Incredibly, they can go up to 30 years without food or water, can survive at temperatures from freezing to above boiling, and can even withstand the vacuum of space (Soil Association).

Tardigrades, scientifically called Tarnigrada, are 0.5 mm microscopic eight-legged omnivorous animals. They have also been observed in all kinds of environments, from the deep sea to sand dunes. Around 1,300 species of tardigrades are found worldwide. They belong to an elite category of animals known as extremophiles, or critters that can survive environments that most others cannot. For instance, tardigrades can go up to 30 years without food or water. They can also live at temperatures as cold as absolute zero or above boiling, at pressures six times that of the ocean's deepest trenches, and in vacuum of space.

Their resiliency is in part due to a unique protein in their bodies called Dsup – short for "damage suppressor" – that protects their DNA from being harmed by things such as ionizing radiation, which is present in soil, water, and vegetation.

Tarnigrades also use another amazing survival trick called cryptobiosis. Cryptobiosis is a state of inactivity triggered by a dry environment. The micro-animals squeeze all the water out of their bodies, retract their heads and limbs, roll up into a little ball, and become dormant. When conditions improve, they unfurl themselves and go about their business. Tarnigrades were first described in 1773 by German pastor J.A.E. Goeze, who called them *kleiner Wasserbär*, or "little water bear." (National Geographic).

Bacteria are crucial to living, healthy soil and a balanced ecosystem. Most bacteria are decomposers, converting the energy stored in organic matter into nutrients that feed and enrich other organisms deep in the soil. Others are nitrogen-fixing bacteria, converting nitrogen into a useful form for plants, helping them to grow and thrive and playing an important role in the nitrogen cycle.

Springtails (eat fungi, bacteria, algae and decaying organic matter, recycling the nutrients back into the soil. They benefit most plants by spreading beneficial fungi onto plant roots, helping them thrive). Protozoa are aquatic single-celled animals that live in the water-filled pores, and the film of water that surrounds soil particles. Living in the top fifteen centimeters of soil, they consume bacteria, releasing excess nitrogen in a form available to the plant roots that surround them.

Soil fungi, hidden underground, can spread for kilometres, creating a huge network that's vital for soils, and helps plants and trees to communicate - it's sometimes known as the 'wood wide web'.

Most fungi live as an underground network of branching, fusing cells called mycelium. If teased apart and laid it end to end, the mycelium found in a teaspoon of healthy soil could stretch anywhere from 100 metres to 10 km.

Fungi are 'decomposers'. They get their nutrition by breaking down decaying organic matter like dead plants, trees and animals. This process releases nutrients into the soil, which then become available for plants and trees to absorb. In doing so, they enable the 'circle of life,' cycling nutrients throughout our ecosystem. Fungi have been shown to be amazing cleaners of soils, filtering out everything from heavy metals to pesticides, and even radioactive waste.

Fungi also capture carbon. There is more carbon in soils than there is in all the world's plants, forests and the atmosphere combined. The role fungi play in the ecosystem is invaluable (Soil Association).

Soil microbes are not just carbon processors, the vast microbial communities underfoot affect air quality and global temperatures, they can also affect the taste and quality of the food grown (Elizabeth Svoboda, 2015). Soil microorganisms have been sequestering carbon for hundreds of millions of years through the mycorrizal filaments, which are coated in a sticky protein called "glomalin." As much as 30 to 40 percent of the glomalin molecule is carbon. Glomalin may account for as much as one-third of the world's soil

carbon -- and the soil contains more carbon than all plants and the atmosphere combined (Mike Amaranthus and Bruce Allen, 2013).

There's more carbon in our soils than there is in all the world's plants, forests and the atmosphere combined. Studies show that healthy soils on organic farms are able to store ('sequester') up to 25% more carbon in the long term (Frederick Kirschenmann, 2021).

Soil biodiversity supports human health, both directly and indirectly. Several soil bacteria and fungi are traditionally used in the production of soy sauce, cheese, wine, and other fermented food and beverages. Soil microorganisms can also help prevent chronic inflammatory diseases, including allergy, asthma, autoimmune diseases, inflammatory bowel disease, and depression. Since the early 1900s, many drugs and vaccines have been derived from soil organisms, from well-known antibiotics such as penicillin to bleomycin used to treat cancer and amphotericin for fungal infections. In a context of increasing diseases caused by resistant microorganisms, soil biodiversity has enormous potential to provide new drugs to combat them (New FAO report). The single greatest leverage point for a sustainable and healthy future for the seven billion people on the planet is thus arguably immediately underfoot: the living soil, where food is grown. Overall soil ecology still holds many mysteries. What Leonardo Da Vinci said five hundred years ago is probably still true today: "We know more about the movement of celestial bodies than about the soil underfoot."

Much is heard about many endangered animals in the Amazon and now all around the world. So also about the chainsaw-wielding workers cutting trees in the rainforest. However, relatively little is heard about the destruction of the habitat of kingdoms of life beyond plant and animal -- that of bacteria and fungi. Some microbiologists are warning that man must stop the destruction of the human microbiome, and that important species of microorganisms may have already gone extinct, some which might possibly play a key role in human health.

The Earth Microbiome Project is dedicated to analyzing and mapping microbial communities in soils and waters across the globe (Mike Amaranthus and Bruce Allen, 2013).

2. Forest Archeology

Forest archeology may help to trace human history in the forests. As stated by Skibo (2020), one might never know that human history here goes back thousands of years, but forests can help tell the story through archeology. Cultural sites discovered through archeological activities can become places of research, and cultural protection.

The job of Forest Archaeologists, according to Skibo (2020), is to make sure that forest operation activities avoid disturbing or destroying cultural resources.

In Honduras, a lost city was discovered in the Honduran rain forest (Preston, 2015).

Forest archeology is a vital field of study in forestry, at least to expand the scope of forest resources management and protection.

3. Treasure hunting

Treasure hunting is an activity that can enhance forest management. There are specialized instruments that detect underground water bodies even up and more than 200 meters deep, in addition to mineral deposits such as gold, diamond, and many others. Forest plant and animal species as bio indicators of the water bodies and mineral deposits can then be mapped out. Underground caves, burial grounds, buried treasures are discovered in underground treasure hunting. Treasure hunting and forest archeology can be of help in discovering the history of a forest and human occupation even for the past thousands of years.

4. Entomotherapy Entomophagy, Insect Farming, and other Arthropods

a. Entomotherapy,

Insects have a long and rich history in traditional medicine across the globe (Shriram H Bairagi, 2019). The use of insects as medicine and is an important alternative to modern therapy in many parts of the world including India, Mexico, Korea, China, Spain, Brazil, Argentina, Ecuador and various African countries (Lauren Seabrooks and Longqin Hu, 2017).

Weaver ants (*Oecophylla smaragdina*) have been used in the treatment of severe cough, cold and flu in Myanmar, Africa, Australia and India. In Thai culture, they are used for detoxification of blood, arresting hemorrhage during miscarriages, restoration of uterus and removal of any aftermath from the uterine canal after childbirth, stimulating pulse and heartbeat, and dizziness (Lauren Seabrooks and Longqin Hu, 2017).

The medicinal uses of insects and other arthropods plays an important role to treat various maladies and injuries and has a long tradition can be effective and provide results. Insect as a natural product having potential source as a medicine that is useful in curing as well as giving protection from some major diseases such as bacterial infections, HIV and cancer (Shriram H Bairagi, 2019).

Insects constitute an almost inexhaustible resource for pharmacological research due to the defensive chemicals they have developed over millennia of co-evolution with plants and predators (Eraldo Medeiros Costa-Neto, 2005). If given the proper attention, insect-derived substances hold great promise for the future of natural product drug discovery (Shriram H Bairagi, 2019).

Smt. Maneka Sanjay Gandhi (2019) gave the following summary of some lesser-known insects, which are used in human medicine:

i. The University of Miami is researching the use of the venom of the South American Devil Tree Ant in rheumatoid arthritis.

Many native healers use ants. Black Mountain Ant extracts dilate blood vessels that supply the penis. The venom of the Red Harvester Ant was used to cure rheumatism, arthritis and poliomyelitis. The South American tree ant, Pseudomyrmex sp., commonly called as the Samsum Ant's venom can reduce inflammation, inhibit tumour growth and treat liver ailments.

Even 3,000 years ago the mandibles of soldier ants were used as stitches. The ant was agitated, and when it opened its jaws , it was placed around the wound to be stitched and the mouth allowed to close. The ant's body was then pinched away, leaving the head holding the wound together.

ii. Several African cultures use poultices made from ground grasshoppers as pain relievers for migraines. Neurologists hypothesize that grasshopper toxins stimulate the human central nervous system, and dilate blood vessels, increasing circulation. Powdered, sun-dried, grasshopper is turned into a tea for the treatment of asthma and hepatitis.
iii. Across Southeast Asia, healers have capitalized on blister beetles' healing powers since ancient times. Also known as "Spanish Fly," the beetles represent humankind's first remedy for erectile dysfunction. Blister beetle secretions reduce burning pain sensations commonly associated with urinary tract infections, insect bites, kidney problems, and burns.
Blister beetles secrete cantharidin, which is effective in treating severe viral infections, because it prevents viral cell reproduction, and may be useful in treatment of cancerous tumours resistant to radiation and chemotherapy.
iv. Emerging science suggests that silkworm extracts may have benefits, as dietary supplements, for patients with heart disease and circulatory disorders. Preliminary studies indicate they reduce serum cholesterol, and dissolve vascular plaque. Boiled silkworm pupae have been used by Chinese medicine to treat apoplexy, bronchitis, convulsions and frequent urination. A bacteria that lives in the digestive system of silkworms contains a substance known as serrapeptase. This substance appears to offer pain relief for people with back injuries. There are studies underway to see if they can also help with sports injuries.
v. Traditional Asian practitioners use centipedes to treat tetanus, seizures, and convulsions. Centipedes are dried, ground into a paste, and applied topically to sores and carbuncles.
vi. Ayurveda uses termites, and their mounds, for ulcers, rheumatic diseases, anaemia, and pain. In Africa Termites are used in asthma, bronchitis, influenza, whooping cough.
vii. Spider silk is an ideal material to use in skin grafts, or ligament implants, because it is one of the strongest known natural fibres, and triggers little immune response. Spider silk may also be used to make fine sutures for stitching nerves, or eyes, to heal with little scarring.
viii. The Jatropha Leaf Miner, a moth who feeds on the Jatropha plant, is an example of an insect considered a pest who has medicinal value. The larvae of the insect are harvested, boiled, and mashed into a paste which is administered topically and is said to induce lactation, reduce fever, and soothe gastrointestinal tracts.
Jatropha Leaf Miner, *Stomphastis thraustica* (Meyrick, 1908) is a moth of the family Gracillariidae. It is known in Democratic Republic of Congo, Congo, Central African Republic, Ghana, and Nigeria. In addition, from Namibia, Zimbabwe, South Africa, Madagascar, Indonesia, India, and recently recorded in China.
ix. In southwestern Nigeria, an infected foot is treated by smearing and rubbing mashed mole crickets on it.
Gryllotalpa africana (Palisot de Beauvois, 1805), also known as the African mole cricket.
x. Locusts are eaten in post childbirth anaemia, lung diseases, asthma and chronic cough.
xi. The May Beetle is used as a remedy for anaemia and rheumatism. The Peanut Beetle for asthma, arthritis, tuberculosis and the Palm Beetle for earache.
May beetle of the Order Coleoptera, Family Scarabaeidae and Genus *Phyllophaga* (Harris, 1827).
xii. Cicadas are crushed and applied to treat migraine headaches and ear infection.
The cicadas are a superfamily, *Cicadoidea* (Latreille, 1802), of insects in the order Hemiptera (true bugs).
xiii. The Red Velvet Mite is eaten in urogenital disorders, and paralysis.
Red velvet mites, true velvet mites, or rain bugs, are small arachnids (eight-legged arthropods) found in plant litter and are known for their bright red color. They belong to the family *Trombidiidae* Leach, 1815.
xiv. A mass of boiled Mealybugs was ingested to alleviate the affects of poisonous mushrooms and other fungi, or diarrhoea, and to clean the teeth and in the treatment of caries.
xv. In the heads of cockroaches are chemical compounds that can kill Escherichia coli (E. Coli) and Methicillin-resistant Staphylococcus aureus (MRSA), two harmful bacteria that are resistant to most drugs. It was discovered that tissues, taken from the brains and nervous system of the insects, killed off over 90% of MRSA infections and E. coli.
xvi. At the Institute for Biomedical Research, Barcelona, scientists have carried out successful *in vitro* tests, using wasp venom, to kill cancer cells. Wasp venom contains Polybia MPI (from venom of the wasp Polybiapaulista), which shows anti tumour activity and kills only cancer cells, leaving the healthy cells around it.
xvii. Studies on caterpillar venom show that cecropins, which are a group of peptides isolated from the caterpillar blood of the Giant Silk Moth Hyalophoracecropia, have anti-microbial activity, and have been used as a potent anti-cancer agent against a variety of tumour cell lines. Cecropins are active against several mammalian lymphomas and leukaemia, and may offer novel strategies for the treatment of bladder cancer.
xviii. In 1993, Margatoxin was synthesized from the venom of the Central American bark scorpion. Patented by Merck, it has the potential to prevent bypass graft failure. Scorpion venom extract has been shown to be able to detect and spotlight cancer cells, under a special light used during surgery.
b. Entomophagy

Entomophagy, the scientific term for eating insects as a form of sustenance, is prevalent in over 3,000 ethnic groups across the world, which totals around 25 percent of the global population. Crickets, ants, beetle pupae and such have been regarded as nutritious, sustainable sources of protein before mankind discovered farming, and continue to be viable, if not more so, today (Beatrice Bowers. 2020.).

The world population is grows by 80 million a year and is expected to reach 9 billion by 2050. This means that there will be 2 billion more people in the world, which the current food production system may not be able to produce enough protein to feed. Eating insects may offer the way out (Sens Foods, 2017**).**

There is a growing global demand for healthy insect products as shown in Figure 3. The factors responsible for the growing demand include the rising cost of animal meat. The current worldwide annual meat consumption of 280 million tonnes is to double by the year 2050 (Iwuoha, 2015a). Meat production already takes up a lot of agricultural land and is responsible for a huge amount of greenhouse gas emissions. The world clearly needs other alternative sources of animal protein, because meat production takes up a lot of land and water resources, and is clearly not sustainable in the long run. As shown in Figure 3, the market value of edible insects worldwide grew from US$503 million in 2019 to a projected over US$1 billion in 2023.

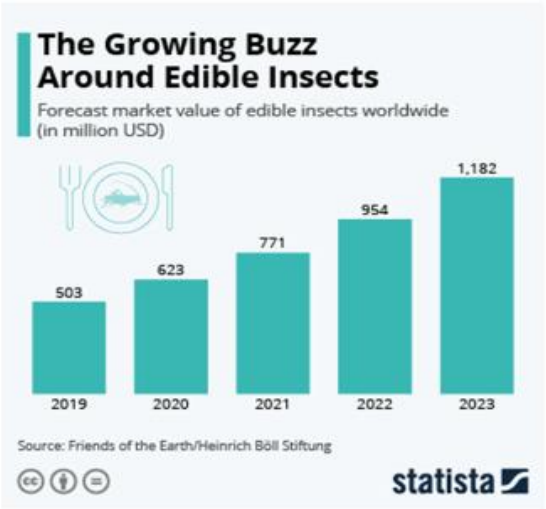

Figure 3: Market Value of Edible Insects Worldwide (in USD)

Despite the over 1,500 different edible insect species in Africa, Africa is not exploiting the world market for edible insects as shown in Figure 4. All other regions of the world apart from Africa and the Middle East are taking advantage of the economic boom of insect trade.

Figure 4: The Global Edible Insect Market Forecast by Regions (in USD)

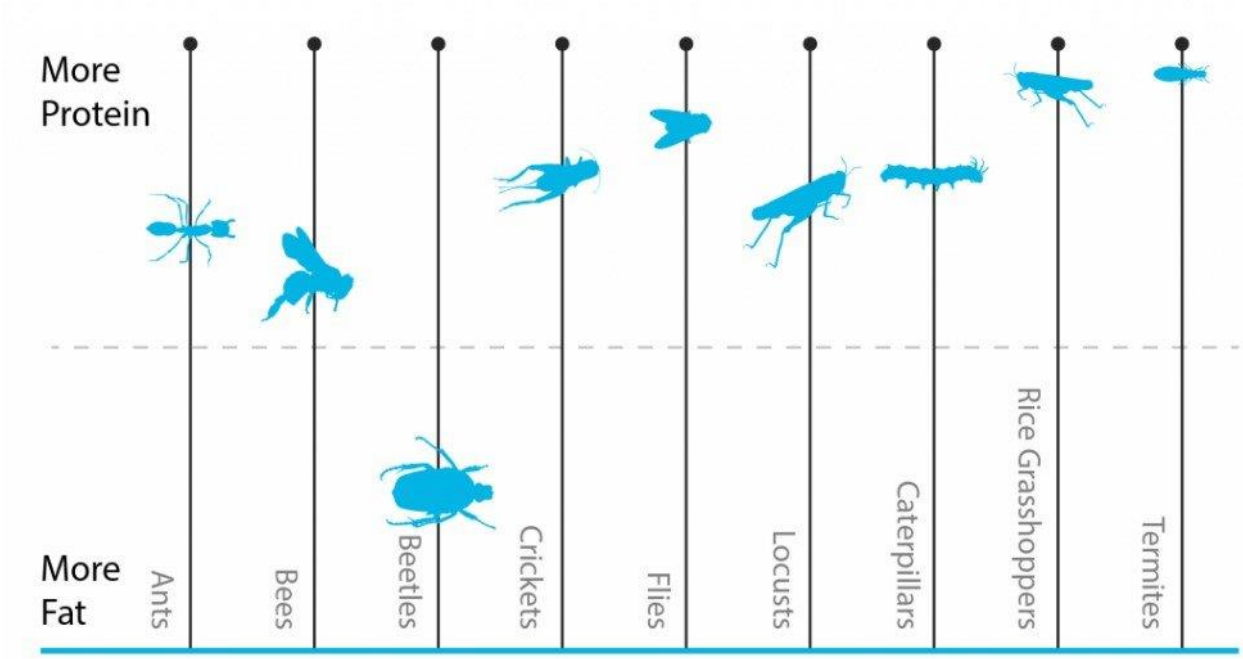

Figure 5: Insects as Healthy Protein Alternatives

Source: Broad nutritional scale of major insects. (Photo credit: precisionnutrition.com). Iwuoha (2015a)
Figures 5 shows that insects are good sources of protein.

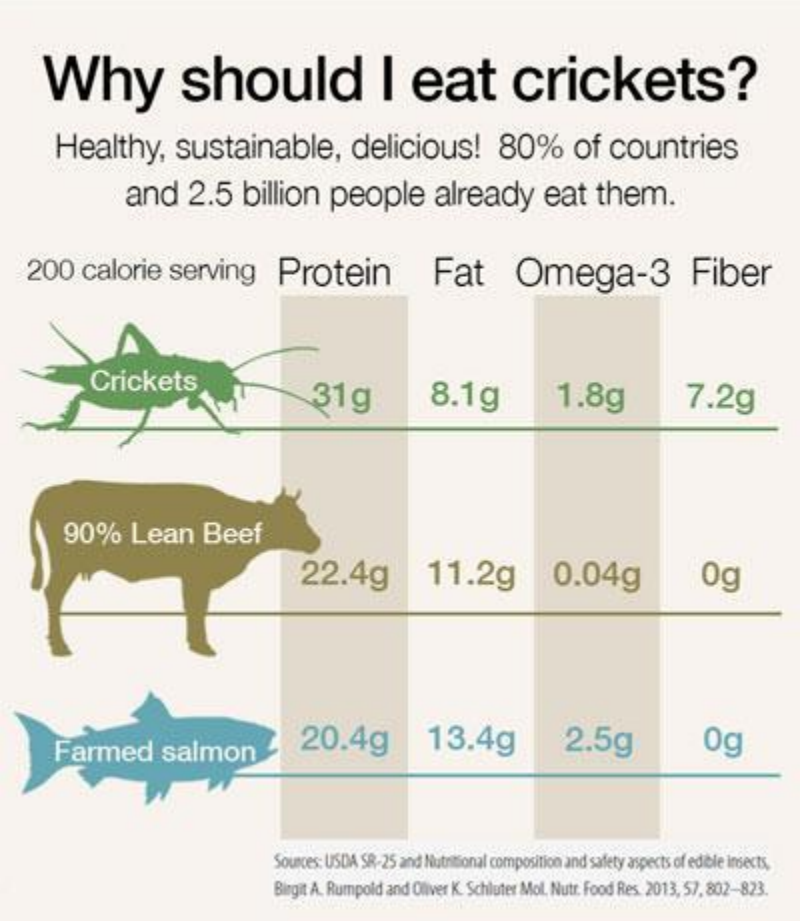

Figure 6. An infographic by Edible Insects (Photo credit: Edible Insects) (Beatrice Bowers. 2020).

Crickets for example have more protein than beef and salmon fish (Figure 6). It has less fat than beef and salmon. Crickets are good sources of omega-3. Fiber, which is totally lacking in beef and salmon, is present in crickets.
Crickets, for example, not only do they have a higher protein count than the same amount of ground beef per kilogram, but they also require fewer resources to farm, and therefore they less taxing on our environment to produce. In a period tormented by global warming, eco-consciousness is the norm, and entomophagy seems like the fairytale solution.

c. Insect farming:
AgriProtein, a South African young business, is breeding billions of flies on a farm to mate, lay eggs and produce maggots. AgriProtein's facility in Cape Town (South Africa) is the world's largest fly farm and houses roughly 8.5 billion flies that produce more than 20,000 kilograms of maggots every day. AgriProtein wants to shake up the international animal feed business by producing a cheaper and more valuable product that will help farmers around to world to make extra profits by reducing some of their feed costs (Iwuoha, 2015b).
A fly lays up to 400 eggs daily. The eggs, gathered from the cages, are hatched in a separate place. The maggots increase in size nearly 5,000 times in the span of just a few weeks. As they grow, they feed on the organic waste and convert it into protein. According to Iwuoha (2015b), the fast growth and efficient conversion of waste to protein is the biggest miracle in the entire process. The maggots recycle smelly organic waste, such as blood and animal manure, into odourless humus. The humus can be used as fertilizer to replenish farmlands. After feeding on and digesting waste for a couple of weeks, the maggots reach the optimum size for harvest after which they are separated from the residue.
After harvesting, the maggots are washed, dried, and crushed for oil extraction. The oil is very rich in fatty acids. The solid residue is milled into a flaked product that is packaged and sold to animal feed mills.
Bill Broadbent (2014) gave a graphical presentation of the protein content differences in protein and calorie, methane generation, feed, and water needs between crickets, chickens and cattle as presented in Figure 6 below.

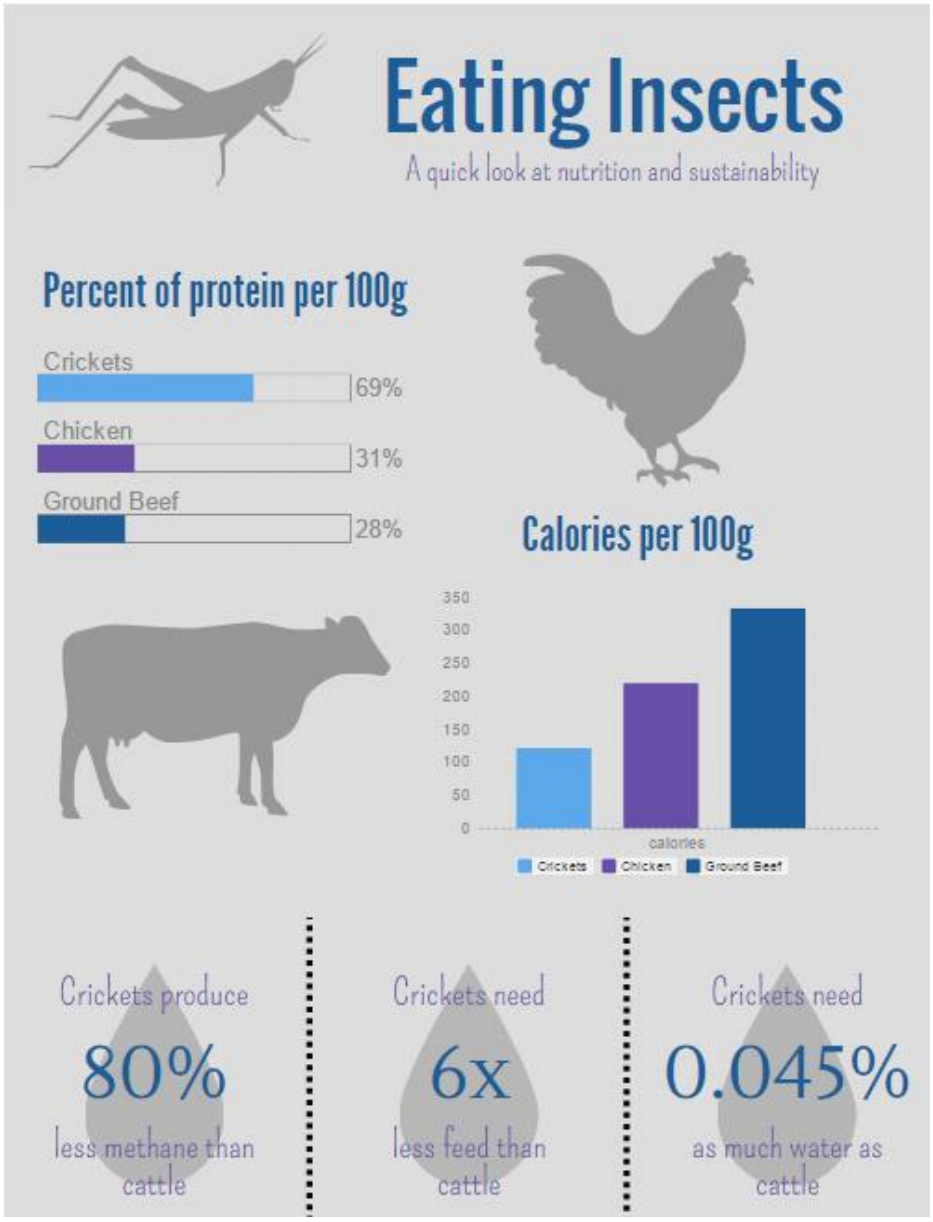

Figure 7: Eating Insects. Source: Bill Broadbent (2014).

Figure 7 shows that cricket farming can help cut greenhouse gases as crickets produce 80% less methane than cattle, need six times less feed than cattle, and need 0.045% as much water as cattle.

Figure 8. Cricket faming for the reduction of greenhouse gases. From Sens Foods (2017).

Figure 8 shows that for every one kilogram mass gain, about 3000 g of carbon dioxide are produced in cattle, 1130 g in piggery, and only 2 g in crickets.

Crickets, for example, not only do they have a higher protein count than the same amount of ground beef per kilogram, but they also require fewer resources to farm (Figure 7), and therefore they are less taxing on the environment to produce. In a period tormented by global warming, eco-consciousness is the norm, and entomophagy seems like a solution.

Crickets as beer. A Tokyo-based startup known as Join Earth launched a cricket-based craft brew in February, 2020, made in collaboration with Tono Brewing. It is the world's, first foray into drinkable bug juice. Grass-fed crickets are roasted and brewed with malt to create a dark ale that tastes like roasted caramel.

Gin from ants: The Cambridge Distillery worked with Rene Redzepi's Nordic Food Lab in 2014 to produce the Anty Gin (Figure 9), which contains the distillate of red wood ants, as well as nettle and wild wood avens to accent the traditional gin botanicals used (Beatrice Bowers. 2020).

Figure 9. Anty Gin. (Photo credit: The Cambridge Distillery)

Anty Gin bagged the top prize at the World Beverage Innovation Awards in 2015.

d. Other Arthropods

i. Scorpions:

Daniel A. Medina (2014) wrote that scorpions were in high demand for researchers from the US and EU for the venom they possess, and used as an ingredient to develop compounds for ant-cancer medicines. In China, they are eaten as a street-food snack

The demand has created a lucrative industry in Pakistan. A black scorpion weighing 60 grams can bring in $50,000 or more. Daniel A. Medina (2014) quoting a report in 2007 in The Wall Street Journal, 3.785 liters (one gallon) of scorpion venom sold for about US$ 39 million. In addition, at Los Angeles International Airport, California, described by authorities as a hub of exotic animal trafficking, scorpion smugglers were detained.

In some cultures of the world, scorpions are used as food as shown in Figure 10.

In China, scorpions are a tasty delicacy – Punch Newspapers

Figure 10: Scorpions prepared as a tasty delicacy in China

ii. Crabs:

Medicinal Bandage from crabs:

Figure 11. Seafood shells, such as from crab claws (here), contain a valuable material called chitin. Researchers have turned chitin into a new type of medical dressing that can boost wound healing (Silke Schmidt, 2021).

According to Silke Schmidt (2021), a new medical dressing helps skin wounds heal faster. Its innovative ingredient is the structural material in the skeletons, scales and shells of marine animals and insects.

Called chitin (KY-tin), a polymer, is second only to plant cellulose as nature's most abundant material. As a natural waste produced by seafood-processors, chitin costs little.

5. Fish Collagen:

There are benefits associated with all animal collagen sources, but fish collagen peptides have the best absorption and bioavailability due to their smaller particle sizes compared to other animal collagens, making them antioxidant powerhouses. Fish collagen is absorbed up to 1.5 times more efficiently into the body and has superior bioavailability over bovine or porcine collagens. Because its high bioavailability, fish collagen is absorbed more efficiently and enters the bloodstream more quickly, it is a best collagen source for medicinal purposes (Axe, 2021).

The scales, skin, bones and fins of fresh or saltwater fish are used for making fish collagen supplements. The scales, skin, bones and fins are usually considered waste products during fish processing, using them to create other products helps reduce environmental pollution.

According to Axe (2021), the health benefits of fish collagen include:
i. Anti-aging ii. Bone healing and regeneration iii. Wound healing
iv. Good protein source. Fish collagen is over 97 percent protein with no fat, sugars or carbohydrates, making it one of the absolute best protein foods. It also has a very distinctive amino acid profile. v. Antibacterial abilities
6. Nixtamalization: Enhancing the nutritional quality and economic value of maize:
About 1,500 B.C., cooks in coastal Guatemala figured out that cooking dried corn in alkali water removed thekernels' skins and produced a softer dough than unprocessed ground corn.
This process, called nixtamalization, increases the bioavailability of both protein and niacin, and radically reduces the toxins often found in moldy corn. The resulting dough, called masa, is the basis for corn tortillas, chips, tamales and other specialty corn foods. Whole corn that has been nixtamalized is called hominy or posole, while the ground form is called masa (The Mother Earth News Editors).
7. Gold and other minerals from an unusual Source – Human Feces
The headings for written articles on human feces are revealing. Stinking Rich? Human Waste Contains Gold, Research Finds (Charles D. Winters. 2015), Your poop could be a literal goldmine of precious metals (Rachael Feltman, 2015), You can earn $13,000 a year selling your poop (Rachael Feltman, 2015), Scientists claim gold in human excrement is worth millions (Celicia Jamasmie, 2015), and, Mining for Metals in the Waste We Create (John R. Wilsdon, 2022). Others are, Americans poop up to $4.2B in precious metals every year (Yaron Steinbuch, 2015), Sewage sludge could contain millions of dollars' worth of gold (Warren Cornwall, 2015), Turning manure into gold: The excrement economy (Melissa Pandika, 2015), and, 10 Exceptional Ways to Put Human Waste to Use in an Environmentally-Friendly Way (Conserve-Energy-Future).
All the nine pointed to the latest in human resources, gold and other minerals from human feces. Beyond the minerals, Conserve-Energy-Future listed possible uses of human feces.
According to Charles D. Winter (2015), researchers have detected trace amounts of gold, silver and other precious metals in human waste and are exploring how to make their extraction commercially feasible — a move that may stymie the dispersal of metals in the environment and lessen our dependence on mining. Rachael Feltman (2015a) wrote that a recent study estimated that a city of 1 million people in the USA might produce US$13 million worth of biosolid metals a year.
When biosolids are separated from effluent and dried, they become sludge. In some countries, the sewer sludge is gathered and sifted to extract precious metals. This can be especially profitable in third world nations. In Japan, the sludge, or what remains after the sewage is treated, is collected. In Suwa in Nagano Prefecture, a treatment plant near a large number of precision equipment manufacturers reportedly collected nearly 2 kilograms of gold in every metric ton of ash left from burning sludge, making it more gold-rich than the ore in many mines. The Japanese prefecture (similar to a U.S. county) has been mining its sewage treatment plant for the last 10 years. In 2008, it recovered $168,000 worth of gold. The recovery value is based on fluctuating gold prices (John R. Wilsdon, 2022).

Of particular interest is the report by Rachael Feltman (2015b). She wrote "…Yes**,** your feces are perhaps your greatest untapped monetary resource. Thanks to a nonprofit organization called OpenBiome, you can cash in to the tune of $13,000 a year -- and save lives while you're at it.
Since 2013, OpenBiome has been processing and shipping loads of it all over the country. The frozen stool is administered to patients who are very sick with infections of a bacterium called *C. difficile*. The bacterium can cause extreme gastrointestinal distress, leaving some sufferers housebound. Antibiotics often help, but sometimes the bacterium rears back as soon as treatment stops. That leads to a miserable, continuous course of antibiotics. By introducing healthy fecal matter into the gut of a patient (by way of endoscopy, nasal tubes, or swallowed capsules) doctors can abolish *C. difficile* for good.
…Finding a donor is tough business, and some patients grow so desperate that they treat themselves with fecal matter from friends and family. That's what happened to a friend of OpenBiome's founders, inspiring them to open up the first nationwide bank. So far they've shipped about 2,000 treatments to 185 hospitals around the country."
Melissa Pandika, (2015) also reported on the same fecal transplant.
Of particular interest is the submission by Conserve-Energy-Future tagged "10 Exceptional Ways to Put Human Waste to Use in an Environmentally-Friendly Way."
i. Production of biogas ii. Fertilizer iii. Fecal Transplant
iv. Hydrogen Fuel. Hydrogen fuel can be obtained from human waste through the same process as one of passing a current through water. It proves to be more efficient with less energy required in the process. Water is distilled from human waste solids then the waste is left in air-sealed tanks for microbial action to take place. This results in the formation of methane and carbon dioxide.
Methane formed in this process is cheaper as compared to relying on natural gas. Methane and carbon go through a tri-generation process that produces hydrogen fuel, heat, and electricity. With the abundance of human waste, a consistent supply of hydrogen

fuel can be achieved. Hydrogen fuel can be utilized in the running of rockets and the production of electricity by combining hydrogen and oxygen atoms.

v. Brick-making. Who knew that human waste could be used in the making of bricks? Incinerated sewage sludge ash is combined with vegetable oil in the making of bricks. These bricks are carbon-negative as the oil used is derived from plants, which have sucked carbon dioxide from the atmosphere.

In addition, in the utilization of such bricks in construction, the environment is protected considering that traditional bricks are made using processes that emit carbon dioxide. Human waste that traditionally would be sent to a landfill is utilized to build structures of many kinds without a scent and it is pocket-friendly.

The bricks are lighter and stronger which means wide usage of such bricks would revolutionize the construction industry not mentioning improvements could be made to them to make them better over time. Making these bricks could serve as a source of revenue for many.

vi. Fuel. In developing countries, the majority of households cook using biomass. Charcoal and fuelwood being the major sources of energy lead to the degradation of forests. A great solution is the use of human poop heated in the sun as fuel. This alternative fuel burns for two times longer compared to charcoal and releases lesser carbon monoxide.

Packaged as briquettes, one ton of these briquettes saves around 88 trees and proves to be a cheaper source of energy.

The process of making this fuel begins with the treatment of fecal waste by heating it in a waiting container so as to remove any harmful pathogens. The fecal waste is heated by the Sun to temperatures of around 60^{o} C for three hours.

Further improvements in technology would help mean that the lowest possible temperature and time can be used to sanitize waste. Upon cooling, hard and solid briquettes are formed as a result of the high fiber content present in feces.

vii. Source of Metals

viii. Janicki Omni Processor. The Janicki Omni Processor combines solid fuel combustion, steam power generation, and water treatment in the recycling of human waste to produce energy and clean drinking water. Therefore, the process can be used to sustain millions in the world who lack access to clean water. The process begins with human waste fed into a dryer to remove moisture thereby reducing it to dry fly ash.

The heat generated in this process is used to heat water in boiler pipes to form steam, which runs a generator to produce electricity. This electricity is enough to power the whole processor and surplus can be sold.

The steam that leaves the dryer goes through a series of filters before condensation and distillation to produce clean water. The Omni Processor doesn't let out the foul smell and meets current emission standards.

ix. Cosmic Radiation Shield. Life in Mars is expected to pose a great risk to the health of those who will visit it since there is exposure to radiation from cosmic rays. The extent of the effects posed to human beings on exposure to galactic cosmic rays is not clearly known but it is known to increase the risk of cancer.

To protect humans, human waste together with water and food can be put in bags. These are used as a shield against radiation by lining the bags on the space shuttle used in interplanetary travels. Initially from the earth, the bags will be filled with drinking water. On reaching Mars, when the water is depleted, they will be replaced by bags with human waste.

x. Source of water. Due to the potential of producing water that is not potable from human waste, electrolysis of this water can be used to produce oxygen and hydrogen. This method of producing oxygen is used as a backup oxygen system for astronauts on long missions. Arguably, this method of extracting non-drinkable water can be utilized further to come up with water that is safe to drink by treating it.

Human waste in the production of renewable energy is a milestone. Through recycling of poop that would have ended up in a landfill and polluted the environment, benefits such as biogas, fertilizer, fecal transplant, hydrogen fuel, building bricks, metals, and drinking water can be obtained.

By all the uses, human waste proves to be cheap and an environmentally friendly alternative. Human waste has great potential to change the world.

8. Indigenous Knowledge:

I. Plants and animals in warfare:

a. Goat droppings and salt, combined and used as bullets.

In China, goat droppings are used as a drink as shown below.

TRENDING!! Goat Feces Now In High Demand In China Because Of It's Richness In Protein It's served in most cases with a combination of fruit juice, soya milk and other such extracts. – newsdesk, December 4, 2021

b. "Crab eye"seeds (Abrus precatorius subsp. africanus) used as bullets. The seeds are very toxic if ingested. In Queensland, Australia, the toxicity category is 1 (One).

Children's Health Queensland - Crab's eye (Abrus precatorius subsp. africanus)
Toxicity Category: 1

Warning**:** Seek urgent medical attention for any ingestion.

c. Army ants and Maize grain
Army ants (known as soldier ants in Nigeria) and a grain of maize seed are used in warfare especially in dislocating enemies out of a location.

Army Ants – Pinterest

d. *Sida acuta*: The dry leaves on the stems are harvested, wrapped, smoked or sniffed as tobacco against accidents, and gunshot attacks.

f. Black ant -"ikandu" in Yoruba, and palm kernel oil, used to secure property from being stolen by people from outside the home but not from thieves from within.

g. Black ant -"ikandu" in Yoruba, and bitter kola are used in war fronts against being hit by bullets.

II. Fire outbreak prevention:

a. *Securidaca longipedunculata* Fresen. (Igi Ìpẹta in Yoruba): To use this plant, the centre of a house wooden roof is located, and a piece of *Securidaca* wood is nailed to the located position of the roof; this serves as a thunder catcher and lightning arrestor.

Securidaca longipedunculata Fresen.- Alchetron

III. Storm prevention:

a. Onion peels and the peels of native banana ("ogede ominni" in Yoruba), dig a hole in the ground, put the onion peels first and on top, put the banana peels, cover with soil. There will be no storm in such a place.

b. Stubborn grass (*Eleusine indica*): The grass is uprooted and is placed on a forked tree stem with a piece of stone or rock placed on it to prevent storm on a farm.

IV. Anti-army ants (soldier ants) preparation: White bowl, white quartz stone and water: To effect the moving out of army ants from properties they have invaded, put water and a piece of white quartz stone in a white bowl. The bowl(s) are placed at the entrance(s) of the property, the army ants will move out of the property.

V. Infertility:

a. *Waltheria indica* (Padimo in Yoruba): Uproot whole plant, cut into roots, leaves and stems. In a pot, first put the roots, then the leaves, and the aerial parts. Next put ashes wrapped in banana leaves on top of the aerial parts. Add water, boil, and drink for infertility.

Waltheria indica – Photoimages.siu.edu

VI. Low or No sperm count:

Fresh maize grains (*Zea mays* Linn.), Monkey cola (*Cola millenii*/*Cola laurifolia* (obì ẹdun in Yoruba), table salt; grind all together, dry, and take with maize pap every night.

VII. Diseases:

a. Asthma: *Thaumatococcus danielli* (Benn.) Benth. and, Megaphrynium macrostachyum (K.Schum.) Milne-Redh:

The roots of *Thaumatococcus danielli (*Ewéran in Yoruba), and *Megaphrynium macrostachyum* (Gbòdògì in Yoruba) are dried, pyrolysed, powdered; the powder is mixed with honey and licked for asthma.

b. Bile duct obstruction/Oliguria: *Hoslunda opposita* Vahl: Boil the dried ground leaves in water, cool and strain. Drink three times daily for bile obstruction and oliguria.

African Plants - A Photo Guide – *Hoslunda opposita* Vahl

c. Hypertension: For, hypertension, pyrolyse the whole fruit of *Blighia sapida*, orally take the powder with warm water daily.

Fruits fro A-Z – WordPress.com Ackee/akee apple/Blighia sapida

9. Plants used in the management of brain disorders:

i. *Achyranthes aspera* Prickly chaff flower When inhaled the powder of the seeds, it gives relief from stiffness and headache of migraine.

ii. *Albizzia lebbek* (i) Its seeds and black pepper powder when applied near eyes, cures unconsciousness. (ii) Its seed powder is one of the constituents for treating psychosis, insanity, anxiety, hysteria.

iii. *Allium cepa* Onion Tea from its seeds is beneficial in sleeplessness.

iv. *Brassica nigra* Black mustard (i) Its seeds and pigeon's droppings after grinding, are applied on forehead. It helps relieve migraine. (ii) Its fresh oil when massaged, reduces fatigue and laziness.
v. *Citrus aurantifolia* Lemon (i) Seeds and juice are beneficial in insanity related disorder. (ii) Lemon juice is given to the patient of anxiety to regularize the heart beat.
vi. *Cynodon dactylon* Dobb grass, Carpet grass Extract of whole plant helps cure madness and epilepsy.
vii. *Daucus carota* Carrot Leaves are extracted with warm "ghee" and drops given in nose and ears to cure migraine through sneezing.
viii. *Eclipta alba* After mixing black pepper powder in its juice, it is applied on forehead for relief in migraine.
ix. *Lawsonia inermis* Henna Seeds in honey or decoction of flowers are given to cure giddiness.
x. *Moringa oleifera* Moringa (i) After grinding the bark, the liquid is squeezed and put into the nostrils or given orally as drink to cure meningitis. (ii) Decoction of its roots is given for epilepsy and hysteria in women.
xi. *Mucuna pruriens* Velvet bean In Ayurveda, it has been described for use in several illnesses and overall body strength. Scientifically it has also been found to be effective in Parkinson's disease.

xii. *Psidium guajava* Guava (i) Decoction of leaves is given to cure mental and physical deformities. (ii) Tincture of leaves is massaged on the backbone of children for convulsions.

xiii. *Punica granatum* Pomegranate (i) Leaves after boiling with water and concentrating, the extract is given in warm milk to cure fatigue, tiredness and insomnia. (ii) Leaves and rose flowers are cooked in water and concentrated. It is given in ghee to cure madness.

xiv. *Sesbania grandiflora* Sesbane (i) Sesbane leaves and black pepper are ground in cow urine and made to inhale. It brings immediate relief from epilepsy. (ii) Few drops of leaf or flower extract are put in the opposite nostril of migraine pain giving immediate relief.

xv. *Sida cordifolia* Country mallow (i) Its powder after cooking in milk, is given to the patient or massaged, giving relief in facial paralysis. (ii) To control the excessive anxiety, the plant and "apamarg" (Achyranthes aspera) are boiled in milk until concentration and given.
xvi. *Syzygium aromaticum* Cloves are ground in water and the paste is applied on the earlobes to cure migraine. Except genetically rooted brain disorders, the Ayurvedic plants have potential to cure most of the mental diseases (Balkrishna, and Misra, 2017).
10. Plant oils: Health Benefits of Navel Oiling:
Navel oiling or navel therapy is an age-old practice of massaging the belly button with essential oils to achieve astounding health benefits, thereby helping to treat various ailments in the body. Once a gateway to the life-sustaining umbilical cord, the belly button serves as a centre of balance in adulthood, where a lot of energy is stored (Nikita Bhardwaj, 2021). Scientific studies recommend a delay of cord clamping to one to three minutes post birth, citing benefits to the infants. Interestingly, after a person's death, the belly button stays warm up to three hours. Being rich in stem cells, several studies also support the storing of the umbilical cord blood. These cells can morph into other cells and can help deal with ailments (Resha Patel).

The belly button is more than just a little dot on the navel (News18). The belly button is connected to every organ of the body through multiple veins, so massaging oil can help to nourish the nerve endings and help the body stay healthy (Nikita Bhardwaj, 2021).

According to Resha Patel, the belly button is not so little. Resha Patel lists the following about belly button:

i. The belly button has the thinnest layer of muscle between the inner vagus nerve and the skin compared to other areas. By activating it, one directly stimulates the vagus nerve, affecting the brain.

ii. There are 72,000 veins in the navel, making the belly button a focal point. All these nerves get stimulated when the belly button is cared for and nourished.

iii. In Ayurveda, *nabhi* (navel or umbilical cord) is considered as an anatomical landmark to identify the position of various organs.

iv. The displacement of the umbilicus or *nabhi chyuti* leads to various diseases. Many conditions get cured just by correcting this.

v. The nabhi is '*agni sthana*' or 'seat of agni.' This is where *samana vayu* (the prana or life force energy that supports digestion, formation, and elimination of urine) and *pachaka pitta* (digestive fire) resides. Massaging or stimulating the *nabhi* will aid these functions.

vi. A scientific study of 60 participants found 2,368 different types of germs nestling in the belly button. Similar to every human being's fingerprints being unique, the belly button bacteria are also one-of-a-kind, many of which are a sign of good health.

vii. The center of the belly button is at the center of the solar plexus. This region assumes unique physical and spiritual significance. The solar plexus is also called the Manipura chakra, which when balanced, promotes clarity of mind, confidence, strength, and compassion. Physiologically, the solar plexus is connected to the central nervous system, optic nerves, and stomach.

Oiling the belly button is an Ayurvedic practice. In Ayurveda, belly button oiling is known as Nabhi Chikitsa. Nabhi means the belly button in Sanskrit. Ayurvedic experts practised this method to get optimum relief from various ailments. They believe the belly button is a secret spot on the body that can effectively cure daily health problems. The belly button is the source of energy connected to other parts of the body; to the mouth, the skin and even to health concerns like menstrual cramps. Once inserted into the belly button, oil is easily absorbed and effortlessly distributed throughout the body, and studies have shown systemic bioavailability of medications via navel administration (Healthy Huemans, 2021).

As an ancient practice, Navel therapy is about filling the belly button (on an empty stomach) with lukewarm oil for detoxifying, nurturing, and treating ailments in the body. Since the belly button presents an abundance of blood vessels and pathways to the body's extremities, the absorption of oils through the navel pathways is very strong. Hence, it has unbelievable health and beauty benefits. However, remember to keep the belly button clean all the time, as it is a very sensitive organ of the body and has tendency for the buildup of bacteria and fungi (Dallas Yoga Fest, 2019).

'The Gut' (Intestines), situated right behind the belly button is home to millions of neurons – all of which are connected to the brain. Hence the connection between 'gut feelings' and many emotions. The intestines hold 60% blood of in the body, produce 90 per cent of serotonin and 50 per cent of dopamine. Serotonin and Dopamine are known as the 'happy' hormones due to the roles they play in regulating mood and emotion (Dallas Yoga Fest, 2019).

From dryness of the eyes, poor vision, chapped lips, weight loss, fertility, infections, glowing youthful skin, healthy hair, joint pain, and more, oiling the belly button can provide a ton of health benefits (Healthy Huemans, 2021).

Just by tending to this little one, you could (Resha Patel):

- feel instantly calmer
- switch on the glow lights in your skin
- coax your hair to grow longer and thicker
- improve your moods (clue: feel happier)
- stimulate your brain to function better
- increase your digestive ability
- be kinder to your knees

According to (Dallas Yoga Fest, 2019), try Navel Therapy if you are looking to….

- Improve mood, energy cure depression
- Relieve chronic pain
- Want to sleep better
- Achieve hormonal balance
- Increase blood circulation
- Want to cool off the head and heat up the belly
- Improve gut health and enhance your digestive function
- Promotes inner peace and empathy

- Sharpens eyesight

Navel Therapy (Nabhi Chikitsa) (Dallas Yoga Fest, 2019).

i. Enhances digestive ability

Massaging the belly button with a few drops of mustard oil can help to relieve irritable bowel syndrome, aid gut health, and reduce other digestive issues like an upset stomach, bloating, or constipation.

Daily application of mustard oil around the edges of your belly in circular motion helps to release gastric and bile juice from the spleen in the liver, which improves digestion. To get relief from nausea and gut pain, apply peppermint or ginger oil on the belly button (Nikita Bhardwaj, 2021).

ii. Stomach Pain

Belly button oiling can alleviate stomach pain by releasing the pressure off the belly area. It can cure symptoms like indigestion, food poisoning, nausea, gastritis, bloating, and diarrhea. **Recommended oil: Peppermint Essential oil diluted with Olive Oil (**Healthy Huemans, (2021)**.**

iii. Calms the mind

Rhythmically stimulating the belly button with circular motion can help to de-stress and relax. Lavender oil, popularly used in aromatherapy for de-stressing, can be used to massage the belly button for improved mental well-being (Nikita Bhardwaj, 2021).

iv. Stimulates natural glow to the skin

For a smooth, clear, and glowing complexion, massage the belly button with olive oil every day. Enriched with natural fatty acids and antioxidants, olive oil can help to reduce inflammation, prevent skin problems, cure skin infections and moisturize the skin from head to toe, including lips and heels (Nikita Bhardwaj, 2021).

Applying almond oil on the naval ensures optimum absorption of the nutrients and subsequently, it helps in improving the texture of skin and imparting glow to skin. **Recommended oil:** Almond **(**Healthy Huemans, (2021)**.**

v. Clear Skin

Applying oil on belly button helps treat acne quickly. Apply oil to the belly button is often considered more potent a remedy than topical application. **Recommended oil:** Neem (Healthy Huemans, (2021).

vi. Stimulates hair growth

Connected to 72,000 veins inside the body, the belly button helps the body to absorb minerals that are responsible for healthy hair growth and volume. Providing nourishment to the veins responsible for graying of hair can help to prevent premature graying, making the hair strong from the roots.

Rich in vitamins, minerals, vitamin C, B, E, copper, and zinc, coconut oil is the best choice to prevent hair loss and improve hair quality. One can also use olive oil or jojoba oil on the belly button to prevent excessive dry scalp and hair (Nikita Bhardwaj, 2021).

Belly button oiling can help speed up hair growth. **Recommended oil: Castor** (Healthy Huemans, (2021).

vii. Improves reproductive health/Fertility

Ayurvedic experts recommend massaging the belly button with essential oils can improve reproductive health in both males and females. Putting a few drops of neem oil, rosehip oil, coconut oil, or lemon essential oil to the belly every day can help to increase sperm count, relieve menstrual cramps, boost fertility, and prevent reproductive disorders (Nikita Bhardwaj, 2021).

The belly button is connected to fertility. Adding oils to this spot can influence fertility, whether in a man or woman. The remedy works by promoting relaxation of the uterine and abdominal muscles, protecting the sperm inside the tube for fertilization, enhancing the sperm motility and count, and treating menstrual issues like irregular periods. **Recommended oil: Coconut (**(Healthy Huemans, 2021).

viii. Relieves joint pain

Inflammation in muscles or excessive wear and tear could result in joint pain. Using castor oil, rosemary oil, for navel therapy can help to reduce pain, strengthen joints, and improve flexibility. Navel therapy is a natural alternative for people in their early stages of arthritis or with weak bone density **(**Nikita Bhardwaj, 2021**).**

ix. Improves dry eyes syndrome

Pollution, too much reading, watching the screen, smoking, aging, or any other medical condition could result in dry eyes that might hinder vision and result in a burning sensation in the eyes. Massaging the belly button with coconut can help to nourish the dry veins, which in turn improves blood circulation and improves eye health (Nikita Bhardwaj, 2021).

x. Anti-Aging

Belly button oiling benefits include reducing the signs of aging. Applying oil to belly button reduces the appearance of wrinkles and under eye circles. **Recommended oil: Castor (Healthy Huemans).**

xi. Menstrual Cramps

Belly button oiling benefits include relieving menstrual cramps and pain. By relaxing the abdominal muscles and soothing the discomfort caused by uterine contraction. The pain is relieved due to the antioxidant properties of oil. **Recommended oil: Ginger Essential oil diluted with Olive Oil (Healthy Huemans, 2021).**

xii. Infection

The belly button is a very sensitive organ of the body and connects to other parts of the body system. Belly button oiling can help cure bacteria and fungi. The best oils for this purpose is tea tree oil, coconut oil, and eucalyptus oil. These oils have antibacterial and antiviral properties that effectively kill the bacteria. **Recommended oil: Coconut and Tea Tree (Healthy Huemnas, 2021).**

xiii. Nail Health

Belly button oiling can help with nail health by removing any fungus. **Recommended oil: Castor (Healthy Huemans, 2021).**

xiv. Lightens lip shade

Coconut oil applied to the belly button every night before bedtime lightens and protects lips from chapping.

xv. Blood cleansing

Belly button oiling helps in cleaning blood and getting rid of pollutants and blemishes in the body. Therapeutic oils such as neem oil, rosehip oil, coconut oil, and lemon essential oil can help (News18, 2021).

xvi. Balanced Chakra

According to Ayurveda, the Navel Chakra is a major source of energy and imagination. It is home to one's biggest dreams, fantasies, and goals. You should keep your navel balanced if you want to connect with your creativity. **Recommended oil: Grapeseed (Healthy Hueman, 2021).**

xvii. Helps to remove dirt. Cleaning the belly button removes bacteria and filth that has accumulated and keeps the stomach and navel regions clear of any potential ailments.

xviii. Good for eyes. Oiling the belly button with any suitable oil mixed with mustard oil will improve eye health in people suffering from poor vision. In addition, it is suitable to reduce the appearance of puffy eyes and dark circles in people who constantly strain their eyes on the screens.

The procedure for belly button oiling takes only few minutes. Warm oil is poured over the belly button, and the belly button is massaged in a circular motion for 5-10 minutes. For the best outcome, this should be done every day before going to bed or after bath. In addition, oiling at night can make one feel more relaxed upon wake up in the morning (News18, 2021; Healthy Huemans, 2021). The belly button should be regularly cleansed; and not too much pressure should be applied on the navel.

Rub a few drops of oil inside and around the belly button every night. Regular practice of this will give stunning results, and with absolutely no side effects. There are certain oils that can be used for specific conditions (Resha Patel).

Table 1: Oils and their specific uses in Belly Button Oiling

Coconut Oil	• Keeps internal organs strong and prevents bloating • Helps in treating cough, cold and flu. • Provides relief from stomach cramps pain during menstrual cycles • Provisions for better eyesight • Reduces belly fat
Almond Oil	• Softens the skin, makes it supple and glowing as Almonds are rich source of Vitamin E and proteins • Fades dark circles and wrinkles • Heals dry and cracked lips
Neem Oil	• Cures acne, dark spots and other skin infections, due to medicinal properties of Neem • Cures itching and rashes on the skin • Cures intestinal worms thus improves conditions of loss of appetite • Reduces hair fall conditions
Castor Oil	• Reduces intestinal swelling • Relieves stomach pain and helps to expel trapped gas • Works on Hair growth • Reduces knee pain • Relieves Arthritis, back pain and muscle aches
Mustard Oil	• Eliminates dryness of skin and moistens lips especially during the winter season • Cures throat infections, nose congestion, ear and leg pains • Improves memory, reduces feeling of tiredness and signs of depression • Stimulates the intestine and activates the excretory system thus improving the digestion process
Olive Oil	• Stabilizes hormonal imbalance in women and consequently increase fertility • Relieves vitiated Pitta conditions for example, high blood pressure
Clarified Butter/Indian Desi Ghee	• Keeps lips and skin optimally moisturized and improves fairness • Improves blood flow of the nervous system and increase immunity • Prevents hair fall and keeps them silky and shining • Relieves knee and joint pains • Cures constipation and improves digestive system

Source: Adapted from Dallas Yoga Fest, 2019. Want To Know The Simple Secret Key To Daily Good Health?

10. Charcoal Medicine:

Charcoal is an incredible substance renowned in history for its healing powers and has been commonly used by man and beast alike for possibly thousands of years. Charcoal is a lifesaver and it is one of the most powerful antidotes known to man (Not the Norm Ltd, 2015).
Animals knew the medicinal properties of charcoal before man and many species of wild beast are known to eat charcoal resulting from bonfires or lightning strikes (Engel, Cindy, 2003). Many scientific studies confirm these observations (Not the Norm Ltd, 2015).
Since ancient times, animals and humans have relied on charcoal to counteract the ill-effects of harmful materials that have been ingested, intentionally or otherwise. This is especially valid for wild animals and ancient peoples who had to depend upon limited food resources. The diet of charcoal-eating animals includes a variety of plants that contain a high amount of phenolic and other harmful compounds that interfere with their digestion. Studies have confirmed that ingested charcoal render these toxins harmless once inside their guts (Not the Norm Ltd, 2015).
It is natural, safe, non-toxic and relieves several ailments including drug overdose (Engel, Cindy, 2003), poisoning, stomach disorders (Lucas, G. H. W., and V. E. Henderson, 1933) and high blood cholesterol (Neuvonen, P. J., et al. 1989). One study carried out using rat models even suggests the ability of charcoal to increase the lifespan of mammals by 43% (Frolkis, V. V., et al., 1989).
According to ANI (2009), a study found that charcoal could prove useful in dealing with the high rate of heart disease in patients with advanced kidney disease.
It has been observed in the past that patients with advanced kidney disease have high rates of atherosclerosis or "hardening of the arteries" and death from heart disease.

Studies have shown that AST-120, the form of oral activated charcoal a product called AST-120 previously used by doctors in emergency treatment for certain types of poisoning, can be helpful in treating kidney disease as well. This is especially important because there is no effective treatment to reduce the high rate of cardiovascular mortality in patients with end-stage renal disease (ANI (2009).

In the great book titled “Charcoal, God’s Humble Doctor,” the author, John Densely gave an in-depth into some uses of charcoal as follows:
i. Charcoal is used for cooking.
ii. It is used in the International Space Station (ISS) to purify water and air so that the two can be used repeatedly. One liter of water can cost upwards of US$10,000 to take to the ISS, so it is important to be able to clean it and use it again repeatedly.
iii. Charcoal is used to purify the air in nuclear submarines that travel for months under the water in the deepest oceans.
iv. Charcoal is used in the most modern hospitals in the world to treat different health problems.
Charcoal is used in kidney and liver dialysis machines to purify the blood when the kidneys or liver are sick and not functioning properly.
v. Charcoal works to prevent cerebral malaria.
vi. Charcoal is used in very expensive wound dressings to stop the spread of infections when antibiotics fail.
vii. Charcoal neutralizes ingested poisons. When people take drugs and become sick, charcoal is used to reverse the drug poisoning.
viii. A tablespoon of very fine charcoal powder mixed with olive oil is swallowed to cure indigestion.
ix. Charcoal crumbs given to chickens help the chickens to lay more eggs and bigger eggs.
x. Charcoal crumbs given to cows help in the cure of mastitis and in addition help the cows to produce more milk.
xi. Charcoal crumbs spread in animal pens help adsorb bad odours, thereby having less flies and with less flies, less infections.
xii. There are hundreds of different charcoal products. These include, charcoal soaps, charcoal creams and salves for skin problems, charcoal fabric, charcoal cosmetics, charcoal powders and toothpaste.
xiii. Charcoal is used in different foods for colourings.
xiv. Charcoal fibres are used in combat uniforms to neutralize poisonous gases including radioactive chemicals and athletic gear to promote circulation.
xv. Charcoal fibres are used in athletic gear to promote circulation.
xvi. Charcoal is used in hundreds of applications to purify contaminated water.
xvii. Charcoal in agriculture. Adding charcoal to the soil has be shown to increase some crop production up to 400%.
xviii. Charcoal in agriculture. Sprinkling charcoal in banana plantation has shown to help stop the dreaded BXM or BBW wilt.
xix. Charcoal in agriculture. Where the soil has been poisoned by repeated use of pesticides, herbicides, and fertilizers, charcoal helps to restore the soil by neutralizing the buildup of the poisons in the soil.

11. Healing Forest:
Healing forest is a concept that I have actively promoted over the years to enhance the health and welfare of our citizens. It has immense benefits for urban dwellers exposed to stress and the attendant consequences. I acknowledge the Ogun State Traditional Medicine Board who immediately accepted my suggestion to have it in the State.

Evans (2018) has noted that "Nature deficit disorder" is a modern affliction. This manifests increasingly in people living in cities, working in high-rise office buildings, and becoming addicted to their innumerable electronic devices.

University of Minnesota (2016) noted that research revealed that environments could increase or reduce stress, which in turn impact human bodies. The stress of an unpleasant environment can cause one to feel anxious, sad, or helpless. This in turn elevates blood pressure, heart rate, and muscle tension and suppresses immune system. A pleasing environment reverses that. The University further stated that what people are seeing, hearing, experiencing at any moment is changing not only their mood, but also how the nervous, endocrine, and immune systems are working. In addition, that "Nature deprivation," a lack of time in the natural world, largely due to hours spent in front of TV or computer screens, has been associated, unsurprisingly, with depression.

Exposure to natural world reduces mental fatigue provoked by the city environment and increases concentration and the ability to perform tasks. Having a walk in nature may clear the head of bad feelings. Natural spaces have also an effect on behaviour: promotes self-discipline, self-esteem, self-reliance, self-concept, and self-perception and reduces aggressive behaviours. Plants in a work office or a classroom decreases coughing, headaches, dry skin and fatigue. They also reduce the occurrence and frequency of time off through illnesses (Camps, 2016).

Being in nature, or even viewing scenes of nature, reduces anger, fear, and stress and increases pleasant feelings. Exposure to nature not only makes one feel better emotionally, it contributes to physical wellbeing, reducing blood pressure, heart rate, muscle tension, and the production of stress hormones. It may even reduce mortality.

Research done in hospitals, offices, and schools has found that even a simple plant in a room can have a significant impact on stress and anxiety (University of Minnesota, 2016).

A Japanese organization, Japanese Society of Forest Medicine promotes research on the therapeutic effects of forests on human health and educates people on the practice of forest. It has found that spending time in a forest can reduce stress, anxiety, depression, and anger; strengthen the immune system; improve cardiovascular and metabolic health; and boost overall well-being.

Japan, in 1982 launched a national program to encourage forest bathing, and in 2004, a formal study of the link between forests and human health began in Iiyama, Japan—a place particularly known for its lush, green forests. Now, each year upwards of 2.5 million people walk those forest trails as a way to ease stress and enhance health. The art of "forest bathing"—shinrin-yoku *involves slowly walking through a forest (Evans, 2018).*

Camps (2016) listed the following as benefits of connecting children with nature:

- Foster their intellectual, cognitive, emotional, social, spiritual and physical development.
- Supports creativity and problem solving.
- Display decision-making skills.
- Increases their ability to focus and enhances cognitive abilities.
- Improves academic performance (social studies, science, language arts and maths).
- Reduces symptoms of Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD).
- Increases physical activity, aware of nutrition, politeness and creativity.
- Increases calmness and reduces disruptive behaviour.
- Reduces myopia.
- Improves social relations, self-control and self-discipline.
- Reduces stress.
- Promotes wellness of future adults.
- Promotes support and concern to conservation initiatives in adulthood.

Recommendations:

1. A broader perception about forests, their products, services, and uses needs to be taken beyond being regarded only as wood production lots.
2. Forest soils, and all soils, are a life production machine that can enhance national economy, and the health of the people. We need not wait until we start importing soil organisms from other nations before we know that we have destroyed and forfeited our own natural resources. Soils need protection for the sake of human survival.

Foresters and soil scientists should be seen as important doctors of nature and should therefore be rightly accorded the prime place of importance.

3. Forestry is the science and management of life of all components of the ecosystem including that of man. A revolutionary insight into forestry is advocated in this submission. The current focus and overemphasis on teaching forestry for the production of wood is myopic. In any case, deforestation has shown that the timber is no longer freely available.
4. Revolutionary research areas highlighted in this paper can help enhance the scope and acceptance of forests and forest practitioners by the general populace and the ruling class.

5. The establishment of healing forests will contribute significantly to the health of Nigerians especially the overstressed individuals in the cities.
6. Insect and all other arthropods should be documented. In addition, they should studied for their medicinal values and ecological services. Insect farming practice is recommended.
7. Man is a central point in forestry. Therefore his products such as the feces and urine, if properly used can contribute to the enhancement of the environment.
8. On belly button oiling, tropical oil seeds in Nigeria can be studied for their use in belly button applications.
9. Forestry organizations especially the Forest Products Society should begin the use of YouTube channels, television programmes for nature, nature photography such as underwater photography, Time lapse photography are avenues for the development of radical forestry in the 21st Century.
10. Leadership studies should be included in forestry programmes. It is clear that Nigeria needs a new crop of leaders from every sphere including forestry. Political leadership has become an albatross on forestry development.
11. Forestry institutions in Nigeria should become the best especially in Africa in order for forestry to be regarded and respected. This can be through innovative programmes. Forestry can be oriented to become the "economic basket" of the nation through innovative research, programmes and products. This association can set up a body to study and compile research studies that can be further developed for innovations.
First class laboratories are "sine qua non" (indispensable) for forestry development. So also is the acquisition of technological instruments such as drones, geo-hunters, telescopes, DNA testers, food sniffers, black light, essential oil extractors, refractometers, banana fiber extractors, cow dung dewatering machine, among many others.

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