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Concepts and trends of sustainable food security and its approach at global level.

Conceptos y tendencias de la seguridad alimentaria sostenible y su enfoque a nivel global.

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ABSTRACT

These days, all living things in the world, specifically humans, are dealing with different problems associated with poverty, food scarcity and disease. Food is the primary and fundamental tool for every organism to survive and growth. The United Nations Organization main role and aim is to remove hunger from worldwide. In order to provide the right quality of food and a large amount of nutritious food systems for all organisms. These better nutritious food systems developed by the suitable application of new technologies and sustainable agriculture development. The new technological approach is used to find the new and advanced techniques are implemented through well equipped machines, etc for good nutritious food production with low cost against hungry and diseases. Developing nutritious foods through sustainable agriculture for the production of highly nutritional, medicinal and disease-resistant plant varieties for society. The agriculture sustainable development also helps for poor people are easy to utilize and remove the hungry.

Key words: Food scarcity, Quality of food, Development of food, Sustainable Agriculture, Technology Improvement,Better food production.

RESUMEN

Hoy en día, todos los seres vivos del mundo, específicamente los humanos, se enfrentan a diferentes problemas asociados con la pobreza, la escasez de alimentos y las enfermedades. La comida es la herramienta primaria y fundamental para que todo organismo sobreviva y crezca. La principal función y objetivo de la Organización de las Naciones Unidas es eliminar el hambre en todo el mundo. Con el fin de proporcionar la calidad adecuada de alimentos y una gran cantidad de sistemas alimentarios nutritivos para todos los organismos. Estos sistemas alimentarios mejor nutritivos se desarrollan mediante la aplicación adecuada de nuevas tecnologías y el desarrollo agrícola sostenible. El nuevo enfoque tecnológico se utiliza para encontrar técnicas nuevas y avanzadas que se implementan a través de máquinas bien equipadas, etc., para la producción de alimentos buenos y nutritivos a bajo costo contra el hambre y las enfermedades. Desarrollar alimentos nutritivos a través de la

agricultura sostenible para la producción de variedades vegetales altamente nutritivas, medicinales y resistentes a enfermedades para la sociedad. El desarrollo agrícola sostenible también ayuda a los pobres a ser fáciles de utilizar y a eliminar a los hambrientos.

Palabras clave: Escasez de alimentos, Calidad de los alimentos, Desarrollo de los alimentos, Agricultura Sostenible, Mejora tecnológica, Mejor producción de alimentos.

INTRODUCTION

Population explosion is always increasing and due to high population growth is driving up commodity prices and will significantly increase demand for nutritious food in the years ahead [1, 2]. By, 2050, the explosion of human population with low income, needs more than 500 megatons of meat per year. Due to hunger and malnutrition still present in many undeveloped and some developed countries. United Nations Sustainable Development Goals include eradication of hunger and to feed 10 billion persons 2050, we need to get the trade-offs right between sustainability, food security, food safety, and make better use of food already produced [3].The hierarchy of strategies for reducing food loss and waste is reducing food sources in descending order, reusing or reprocessing surplus food, recycle food as feed for animals, recover the energy as biofuels, nutrients as compost, or raw materials for industry, while as last resorts one may consider recovering the energy by incineration or dumping as garbage in landfills.

This review will explore the trade-offs inherent when aiming at triple goals of sustainability, food security, and safety looking at these strategies for reducing food losses and waste and resource footprints. Intensification of food production and circular food systems could be part of these solutions to future food security. In this regard could our future trade-offs be informed by the experiences from the use of antimicrobials to intensify food production and from the outbreak of bovine spongiform encephalopathy in terms of circular food production. There is no trade-off between increasing antimicrobial-assisted food production and the public health risks associated with antimicrobial resistance as a result of the zoo technical use of antimicrobials.

A sustainable future requires control of antimicrobial resistance, if one avoids that cycles of nutrients become cycles of pathogens and/or hazards, circular food production systems will a major contribution to the future sustainable food security. The food source reduction i.e., limiting food losses and waste appears to the strategy most promising for achieving sustainability. By using artificial intelligence and intelligent packaging major progress is possible, with the added benefit of better control of food fraud. A changed diet-eating more plant-based foods and not eating animal protein produced by edible feedstuffs, and source reduction of the food lost or wasted should enable us to feed at least an additional billion persons [4].Solutions to sustainability and food security should take food security considerations into account from the outset.

FOOD SECURITY

The sustainable food security is achieved by the following golden activities including proper sufficient food with appropriate food production, availability including access food in free of cast to purchase, the foods have well nutritious without any malnutrition and the food used for longer. Food scarcity is dominantly occupied in all people in the world, the food security is one of the important need of lifeat all times, maintain social, improve physical, develop economic access to sufficient, excellent healthy and the well nutritious food that meets their food preferences for long healthy life time [5]. Recently 670 million people facing very hunger problem in worldwide, but in Indiathere are approximately 195 million people undernourished, which is a quarter of the world's hunger incident. Also roughly 43% of children in some countries are chronically undernourished (Figure 1). India ranks have 113 major countries in terms of food security index 2020. The food security is emphasis on supply, the food availability at all times of nourishing, adequate, balanced, diverse and moderate world food supplies of basic foodstuffs to sustain the steady expansion of all people food consumption offset fluctuations in prices and production [6,7].

Figure: 1. Chi 2018

SUSTAINABLE AGRICULTURAL DEVELOPMENT

Sustainable agriculture is the development of farming, to improve food and other industrial products and which meets sustainable development of society. The sustainable agricultural development is to improve or reduce the water pollution, water scarcity, deforestation, land degradation and other processes. The sustainable agriculture elements includes mixed farming, renewable energy, non renewable energy production, agro-forestry, multiple cropping, crop rotation, organic, industrial &regenerative agriculture and perma-culture is used for dryland area crop production and other non cultivated lands [8].

The SMS-based weather forecasts are best information system, which is used to monitor the Temperature, Light and Humidity. Although some farmers were not receiving SMS-based weather forecasts, they typically did not know what the forecasts meant for their crops or what action they should take in their fields. Recently most of the farmers are illiterate, they don’t have the ability to monitor weather forecast, high yield crop varieties such as

diseases resistant, pest or insects resistant and biotic resistant varieties, so the sustainable agricultural development is do the help by means of Kisan Diary, Mobile Courseware, Market Engagement, Interactive Voice Response, Loop, Satellite Yield Estimation, Farmerbook, VideoKheti, Television, Radio shows and Wonder Village and some other techniques are implemented to people and increase the sustainable agriculture development [9,10].

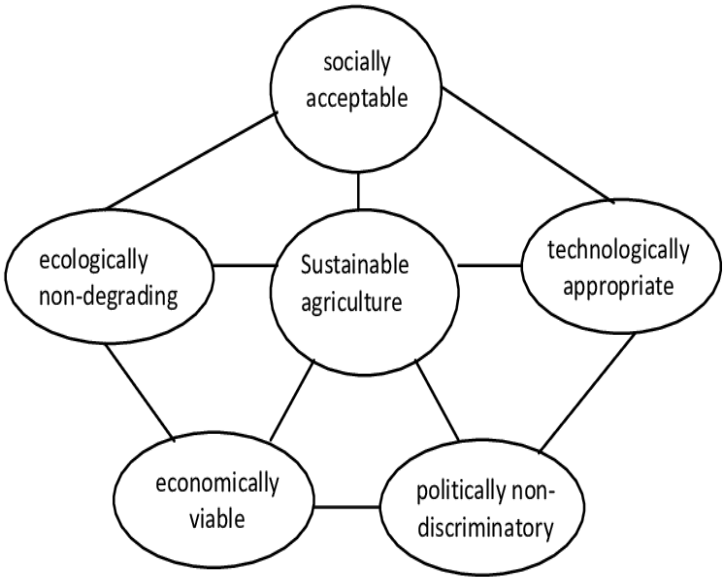

Figure: 2. Sustainable Agricultural Development

TO DEVELOP WELL NUTRITION FOOD

The Nutrition is the biochemical and physiological process by which an organism uses food to support its life. It includes ingestion, assimilation, absorption, biosynthesis, catabolism and excretion.The nutrition is improving the healthy life and provide balanced diet to increase physiological functions [11].

The nutritious food contains various types of minerals and vitamins, it includes macro elements such as carbohydrates, dietary fiber, fats, proteins, and water needed in gram quantities and micro elements includes minerals and vitamins needed in milligram or microgram quantities and the vitamins are classified by fat and water soluble vitamins and nutrition's present in various types vegetables, dairy products, whole grains, fruits and nuts for a source of protein. Each organism is primarily provided in between with carbon there are in one of two ways:The first one is autotrophy means the own production of organic material and second one is heterotrophy which means the consumption of organic carbon from other organism. Some other organisms do food production by combined with the source of light energy, or chemical energy used for organism survives [12].

The malnutrition or under-nutrition causes growth stunting, obesity, cardiovascular disease, diabetes, osteoporosis, the poor nutrition can cause deficiency-related diseases such as scurvy, blindness, anemia, preterm birth, stillbirth, cretinism and other metabolic diseases. In order to rectify to develop the well nutritious food by

agriculture sustainable agricultural development or other technological improvement in food processing.Sea-food meat of marine organisms has an excellent renewable food source to address food shortages and provide future global demand scenarios [13].

Nutrients are substances used by an organism to survive, grow, and reproduce. The seven major classes of relevant nutrients for animals (including humans) are carbohydrates, dietary fiber, fats, proteins, minerals, vitamins, and water. Nutrients can be grouped as either macronutrients like carbohydrates (Figure 3), dietary fiber, fats components (Figure 4), proteins, and water needed in gram quantities or micronutrients.

Under-nutrition can lead to wasting in acute cases, and stunting of marasmus in chronic cases of malnutrition. Human nutrition deals with the provision of essential nutrients from food that is necessary to support human life and good health (Figure 5).The vitamins are not synthesized in animals and required from outside to maintain and coordinate body metabolism (Figure 6).

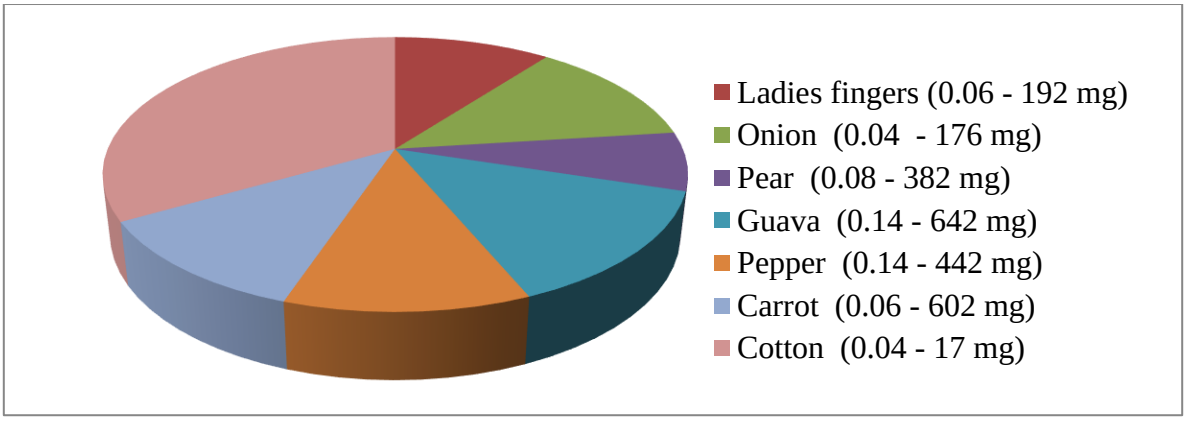

Figure: 3. Carbohydrate content increased by the implement of new technologies. Source: Adam Drewnowski et al, 2022 – Nutrients, MDPI.

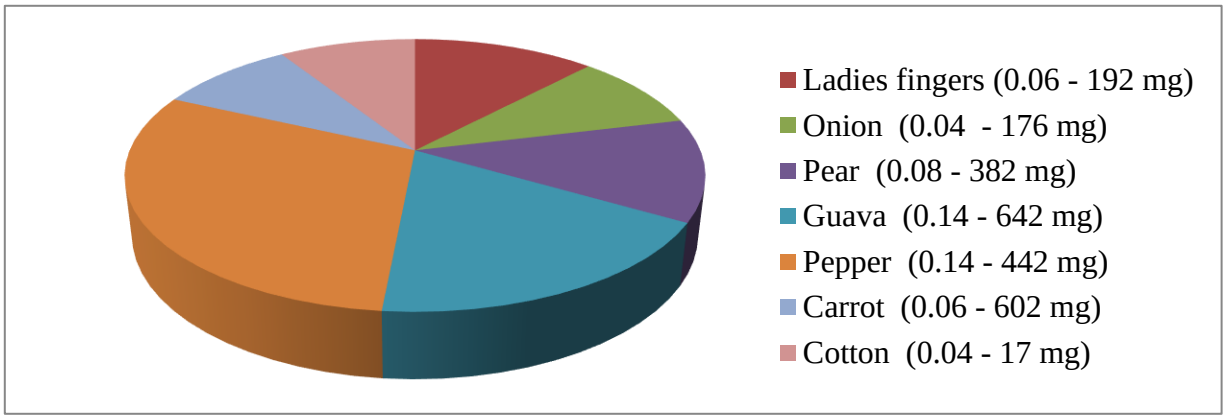

Figure: 4. Fat content increased by the implement of new technologies. Source: Adam Drewnowski et al, 2022 – Nutrients, MDPI.

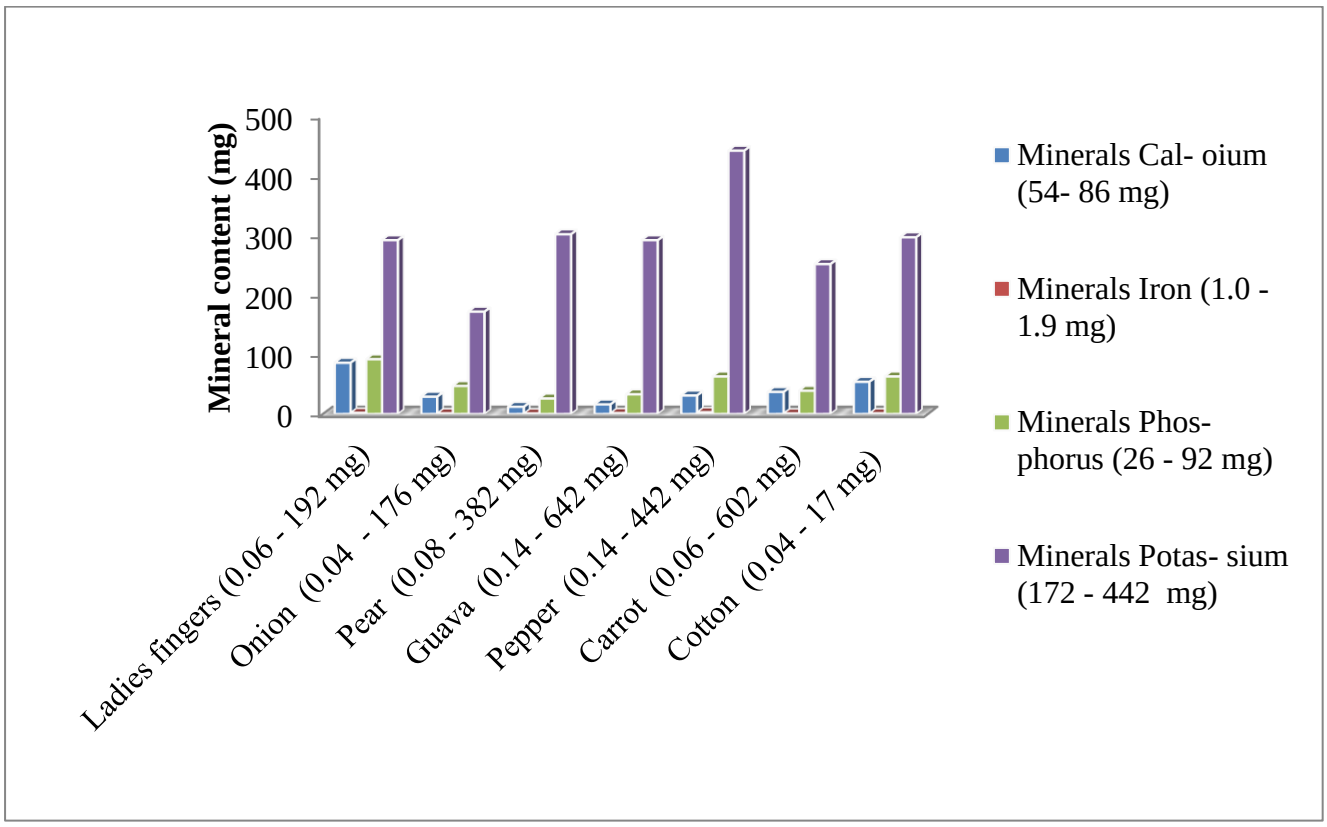

Figure: 5. Mineral content increased by the implement of new technologies. Source: Adam Drewnowski et al, 2022 – Nutrients, MDPI.

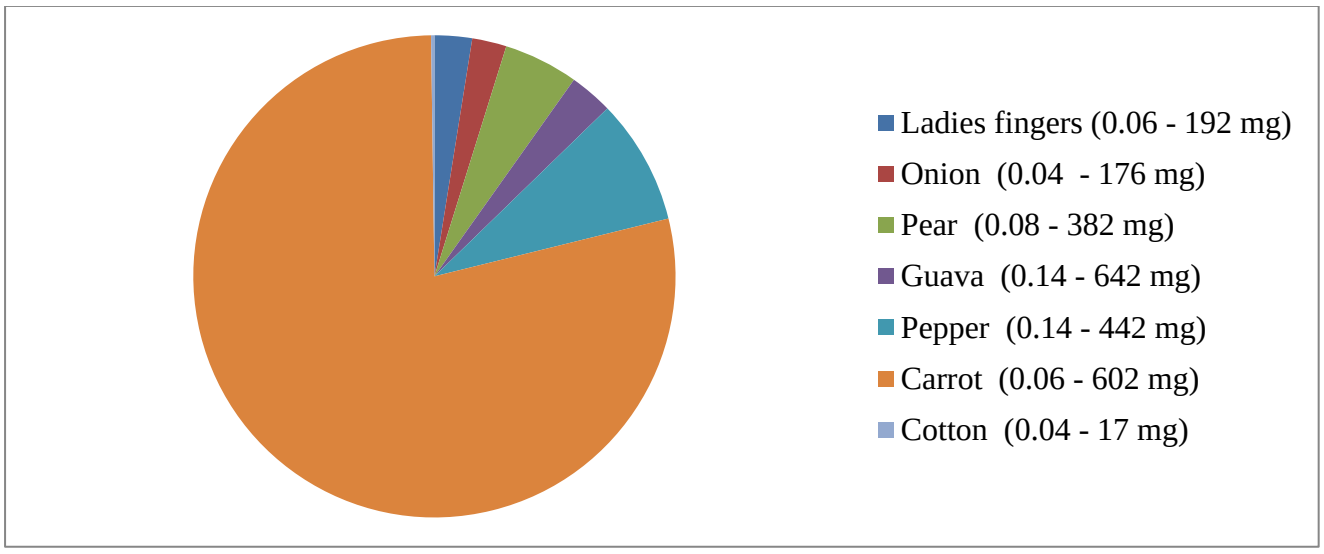

Figure: 6. Vitamin content increased by the implement of new technologies. Source: Adam Drewnowski et al, 2022 – Nutrients, MDPI.

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TECHNOLOGICAL IMPROVEMENT IN FOOD SCIENCE

The food scientists uses their technology or engineering knowledge to design novel food processing and food packaging technologies and finally profound improvements in food to the quality, safety and low cost consumption. For nearly a century, scientific advances have fuelled progress in some countries by farmers to allow producers to provide safe and abundant food to the country and provide a trade surplus in bulk and high-value agricultural commodities and foods. The food science field breakthroughs to develop advance food and agricultural research by 2030 identifies innovative, emerging scientific advances for making the world food and agricultural system more efficient, resilient, and sustainable.

Alternative proteins development techniques also very important in good and immediate food production include lab-grown food, cultured meat, plant-based nutrition mycoprotein and edible insects.The technology improvement in food science is allowing to analyze, track and understand the way in our food system improve healthier and more nutritious, taste food [14] and to reduce the amount of carbon emissions, food waste and ultimately reduce poverty.Recently, the emerging technologies have included 3D food printing, cellular agriculture, including cultured meat and use of arthropod protein to improve food quality [15].

The emerging food biotechnology is to improve in different fields, the genetic engineering approach used for single cell proteins are production from *Spirulina*, *Azolla*, etc, which is highly rich in proteins and recommended for ~1-3 grams need for daily intake. The fruit clarification and ice cream production using desired fruits with*cellulase* and *pectinase* enzyme technology. The food waste technology is used to produce highly valuable items like probiotics, baby foods, cosmetics, naturaceuticals, biofuels and biomedicals, etc(Figure 7).

MEDICINALLY IMPORTANT PLANTS FOR FOOD PRODUCRTION

Figure: 7. Different fields of food biotechnology. Courtesy: Archana Dash. 2016 - Recent Patents on Biotechnology

The vegetables like spinach, carrots, broccoli, garlic, brussels sprouts, leaf cabbage, green peas, swiss chard, beets, asparagus, red cabbage, sweet potatoes, collard greens,cauliflower and the fruits such as apples, blueberries, bananas, oranges, dragon fruit, mango, avocado, lychee, pineapple, strawberries, durian, cherries,

olives, watermelon, kiwi, peaches, guava, grapes, pomegranates and grapefruits have rich in medical properties (Figure 8) containing ingredients such as vitamins, dietary fibers, carotenoids, anthocyanins, phenolics, antioxidants, saponins, terpenoids[16] andthese nutraceuticals are good for health [17]. The subsequent intact of these compounds remove the body diseases such as cancer, lipoma, cardiovascular diseases, neurological disorders, urinary diseases, vision, and hearing and other blood cells diseases [18].The cooling effect, enhance immunity, excellent digestive support to maintain by reduce constipation and oxidative stressand regulate body metabolism. The plant products are natural, disease free and these plant products specific compounds have excellent resistant mechanism against animal bites [19-25].

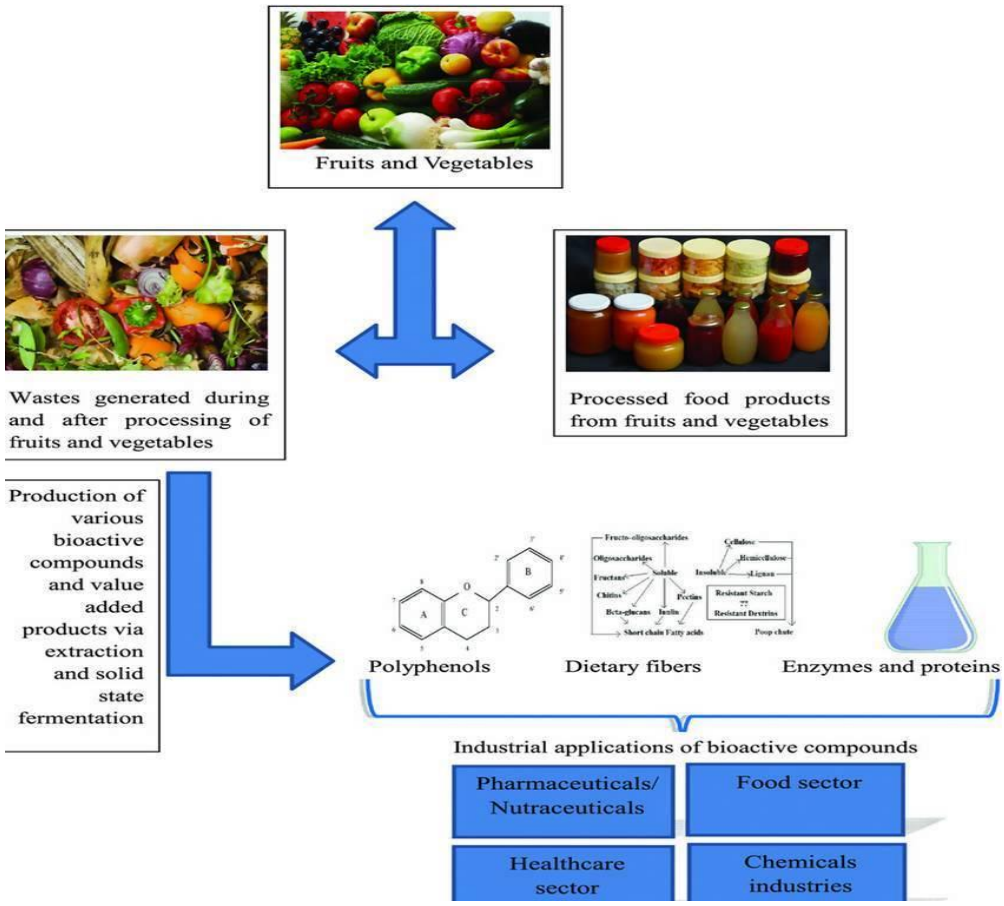

Figure: 8. Medicinal aspects of important compounds from fruits and vegetables. Courtesy: Sagar NA, 2018 – Comprehensive reviews in Food Science and Food Safety

NATURALLY IMPORTANT MEDICINALPLANT PRODUCTS

*Aloe vera*is considered as king of plants, fleshy leaf pulps havebeen to prepare drugs as capsules and tablets, bakery items, chocolates, gels and cosmetics, etc. *Alo*e leaf fleshy parts have easy to eat and cure digestive distress, acne, constipation and poor immunity.(Figure 8).Tulsi plant is considered as queen of medicinal

plants and god favorite garland with maintain good aroma inside the temple to induce the brain and metabolic functions. It provide strength ti fight stress, promotes longer life, treats indigestion, anticancer, treat cough, diabetes, heart disease, wound healing and hair loss by action of secondary metabolites like Linalool, Geraniol, Linalyl, Camphor, Safrol, Thymol, Apigenin, Eugenol, Citral, Ursolic acid and Taxol. Tulsileaves, roots and stems used to prepare hot drinks, biscuits, chips, salad and other foods[26].

Mint leaves used toproducecandy, flour, buns and other food products is induce good digestion, boost immunity, keeps mosquitoes away, enhance respiration in body.Fenugreek seeds and leaves is suddenly reduce body heat keep cooling effect in body, control cholesterol levels, reduce hair loss, lower blood pressure, remove body pain &diabetes, enhance milk production for feeing mother, enhance digestion and cosmetic industries.Fennel seeds are common spice material for all kind of foods like vegetarian and non vegetarian, the seeds is mainly dissolve body cholesterol and also treat cough. Coriander seeds and leaves is excellent food for cure piles, improve and protection foods from spoiling, treats acne and regulates menstruation cycles.Ginger is rhizome have high digestive ingredients, treats cold, asthma, flu, cough, headache, pains, cramps and control blood pressure [27].

Aloe Tulsi Mint Fenugreek Fennel Ginger Coriander

Figure: 9. Human daily life food products obtained from medicinal plants

BIOTIC AND ABIOTIC STRESS RESISTANT PLANTCULTIVATIONFOR BETTER FOOD PRODUCRTION

Now a days the crop plant is resistant to pathogens is challenging one, the pathogens should affect the crops by means of reduce growth and altering metabolism and minimize the yield. In order to find the complete solution for this problem is primary importance. Yang *et al*, 2012 reported that *Gumei4* gene for *pigm* resistant, nucleotide-binding leucine-rich repeats (NLR) receptors and other genes their receptors [28].

Different abiotic or biotic stresses can also improved using gene alteration using gene manipulation technology and increase the diseases or stress resistant crop varieties for beneficial food production (Figure 10), for example specifically the R genes, EPSP synthase genes, HAL genes or cry1Ac genes for pathogens, herbicide, salt tolerant or pest resistant respectively for excellent food production.

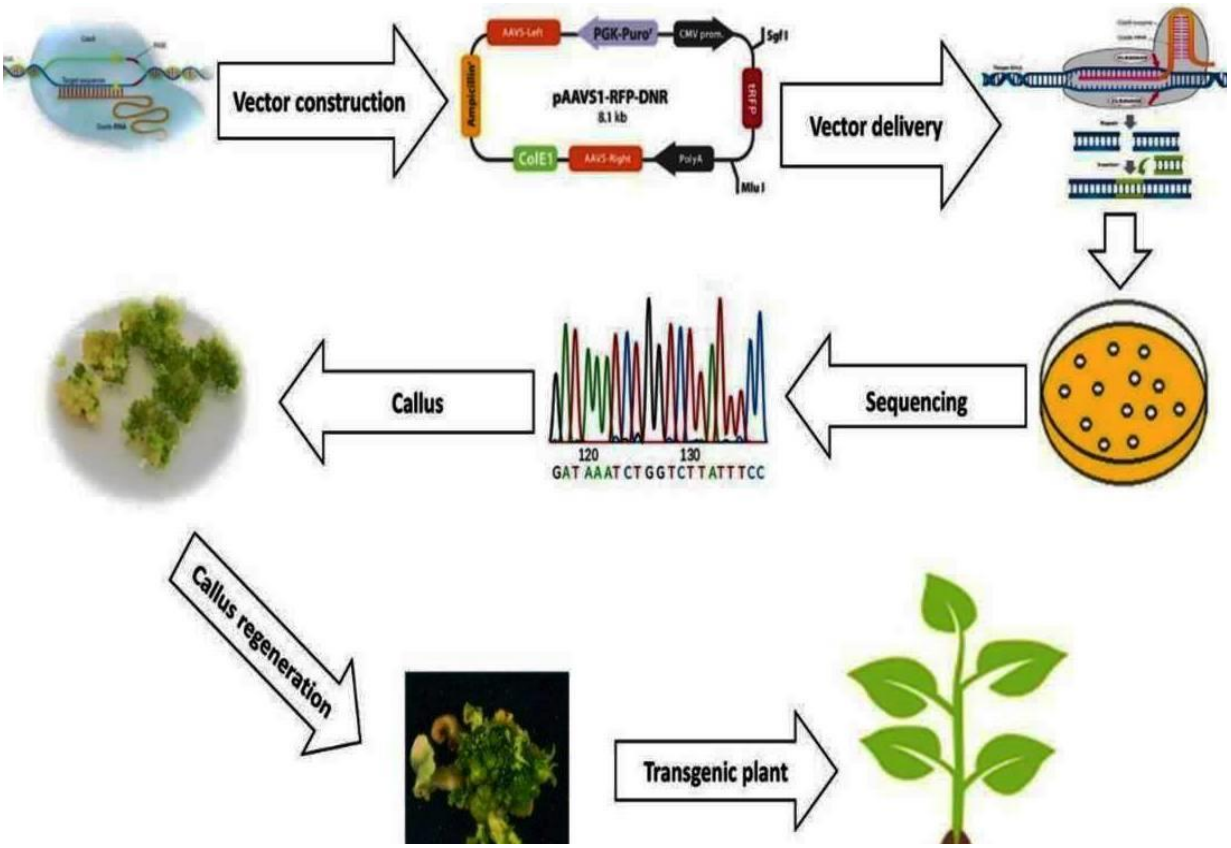

Figure: 10. Disease or stress resistant crop varieties production using genetic engineering.Courtesy: Ali Anwar and Ju-Kon Kim, 2020 – International Journal of Molecular Sciences

CONCLUSION

The food scarcity and poverty is major problems in world. In order to rectify by the applications of food biotechnology is enormous. But the techniques are applied to development of sustainable agriculture, nutritious vegetables and fruits production and diseases and stress resistant crop production for increasing population. The safetycrops production of genetically modified crops monitored by the Food and Drug Administration, Environmental Protection Agency and United States Department of Agriculture before for any genetically modified crops is allowed to be grown and sold in the society.

SUMMARY

In worldwide there are many problems are associated with deforestation, natural calamities, unemployment, indiscipline activities, etc. but the hungr is one of the major problems in the world due to poverty and environmental disturbances. The sustainable agriculture development with food biotechnological methods is to solve these problems and these are ultimately considered and develop the green revolution in the society. So the green revolution may change the polluted environment to save and utilize the higher renewable natural resources, which provide pollution free environment. The different agricultural instruments developed for farmers are working on their agricultural lands for higher production of agricultural products with high nutritional value. Here soil quality also improved by the applications of natural biofertilizers, natural compost, green manures, etc to apply in the soil to enhance soil porosity and increase the water holding capacity.

The green vegetables and fruits have rich in all nutrients and have the higher amount of medially important compounds treat against many diseases and improve body immune systems. The food ingredients were improved by the various foods processing process and improve natural food texture, taste, flavor, etc. by using various food additive methods.The innovative agriculture technology provides well crop production is to reduce the global environmental food scarcity. Farmers also get advantages and easy to use agricultural devices through agricultural technology.The crop varieties also produced by the disease or stress-resistant or tolerant varieties through the use of genetic engineering. The Food and Drug Administration specifically monitors and approves genetically modified crops and make directly available to people. All people must always think green, use and conserve our wonderful natural resources for future better agricultural development.

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