International Journal of Modern Agriculture, Volume 10, No.2, 2021
ISSN: 2305-7246

Management Practices for Sustainable Crop Production

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Abstract

In all developed and many developing countries, sustainable crop systems, sustainable soil super vision, sustainable farming all receive considerable consideration. Sustainable growth is progress that encounters the requirement of the current without cooperating the facility for upcoming generations to encounter their personal necessities. Agro-food structures that are financially feasible, offer healthy nutritive foods, and allow preservation or improvement of land, water and air is sustainable agriculture. The conservation of human natural resources is no longer enough to ensure sustainability. Only the developed countries are practicing sustainable agriculture for crops. There is a requirement to reform agricultural practices that ensure sustainability. For the sustainable practices new advance genetic engineering techniques and equipment should be used to provide nutritional benefits all over the world weather it is a developed or developing country. Policies should be there to provide a combined set of practical services for Small and Medium Enterprises like technological investments, training, and sustainable management practices should be developed. Appropriate economic funding should be given to all the developing countries to enhance the chances of sustainable development all over the world and in future the world sustainable development will start then problems related to crops and livings of human being will also get resolved.

Keywords: Agriculture, Crop, Development, Environmental, Food, Management, Production, Sustainable.

Introduction

Currently, sustainable development becomes a buzzword in a variety of deliberations about financial, social, and environmental concerns, especially when it comes to large duration worldwide growth. The term "sustainable farming" has also come into the discussion, especially in relation to evaluating the adverse effects of definite crop cultivation process. The term "sustainability" has its roots in forestry, and it was first used in the 18th century to describe the use of wood at the rate at which it regrows. At the UNCED (United Nation Conferences on Environment and Development) in June 1992 at Rio de Janeiro, sustainable growth was proclaimed the overarching goal of domestic and global development and environmental strategy[1]. Agriculture faces immense challenges as the human population increases. More nutritious food must be required to nourish the expected world inhabitants of 8 to 10 billion peoples by 2050[2]. Plants have a wide variety of necessary minerals, amino acids, vitamins, and fatty acids, for human intake. Plants too include a wide range of phyto-nutrients, which are not essential but have been connected to improved human health[3].

The need to implement innovations and practises that do not have negative effects on the environment, as well as products and amenities that can be simply available and most efficient, are key concerns regarding sustainability in farming structures and agri-business. In the last half-century, the global agriculture has undergone a green revolution, with a major growth in agricultural output because of the extensive utilization of HYV seed, fertilisers, pesticides, irrigation, improved management practises, and machineries. It also underwent a livestock revolution as a result of the introduction of improved breeds, feedstock, artificial impregnation facilities, mechanisation, and better managing practises, among other things. Over the last half-century, global food production increased by 145 % on average, with some regional variations[4].

Mostly, sustainable development is a long-lasting method to in what way we make our unspecified improvement in the upcoming future without creating harm to the ecosystem in order to assure a steady habitation for the subsequent age group, and remain to build financial prudence, philosophies, and maintenance for the surroundings with a parallel perfect in thoughts. It encounters our requirements without jeopardising the probabilities of others. The definition encompasses a wide range of issues, including social, economic growth,

and environmental and it lasts to demonstrates its significance in our existence by affecting all sides of our lives[5].

Extra resources would be required in the upcoming future to support increasingly populations, and sadly, the assets that are currently used are not all can be renewed. Considering this into account, the technical business will need to adjust for upcoming future conditions, as per rare metal and mineral utilizes in industry, like palladium, commonly used in customer electronics development, are becoming progressively rare metals. Additional consideration to remember is that currently China develop 97% from the worlds' rare earth matters, and if it were to put a barrier on its distribution, technical products would become extremely difficult to manufacture. Since some companies are increasingly investing in and depends on techniques, if scarce earth metals were to gradually vanish, cost and inflation rates will spike, rendering it difficult to work for at least a short period of time. As a result, emerging technologies and advances in the technical industry are critical to long-term growth in this area without depending too heavily on finite resources[5].

Figure 1: All the Different Constituents of Sustainable Agriculture

From the Figure 1, all the different constituents for sustainable farming are- healthy soil (suitable for crops), water quality should be suitable and should be conserved for future references, a suitable waste management system for proper decomposition of waste, adapted crops , biodiversity, ecological pest management, energy conservation and profitability[6]. Some of the major differences in Industrial and Sustainable Agriculture is given below from the subsequent Figure 2. Figure 2, illustrates general understandings of industrial agriculture and all the knowledge of sustainable agriculture[7].

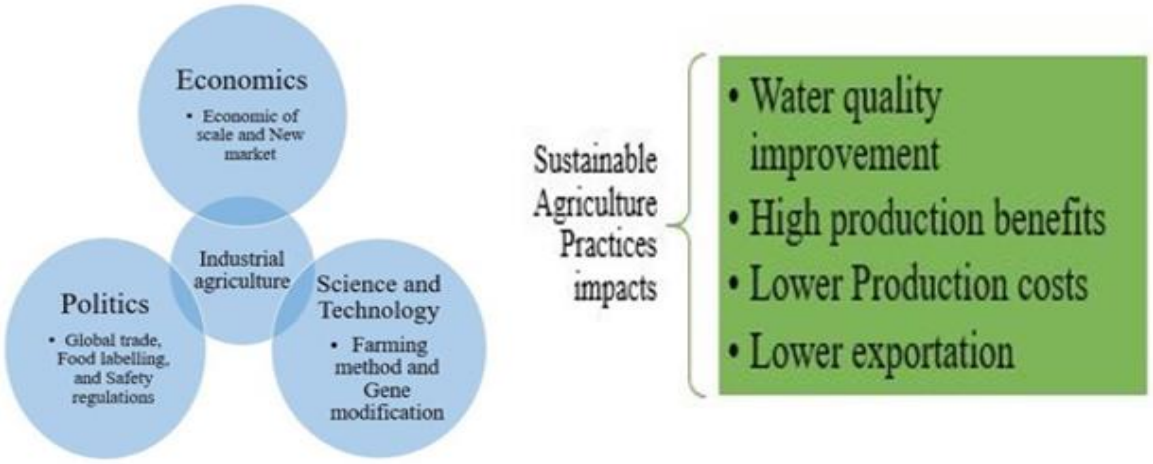

Figure 2: Difference between Industrial Agriculture and Sustainable Agriculture

Plants play an important fragment of human nourishment since they offer a better source of natural resources. They also provide nourishment by supplying macronutrients such as starch, protein, and lipids. Vitamins A, Vitamin B, Vitamin C, Vitamin K, and Vitamin E; essential amino acids ; and essential lipids are micronutrients that are moveable in quantity in plants and, in some cases, inadequate to provide a nutritious dose. Humans are unable to synthesise these vitamins, so they must be obtained from dietary sources.

1. Nutrients Obtained from Plants

Figure 3 is representing all the nutrients that can be obtain from plants:

Figure 3: Some of the Different Components Produced a) Carotenoids, b) Vitamin B, c) Vitamin C, d) Vitamin K, e) Phenolic Compounds, f) Vitamin E by Plants

1.1. Carotenoids:

Plants produce a variety of carotenoids that aid in growth and provide protection against harsh environments. Plant carotenoids are important sources of provitamin A and carotenoids in the human diet.

1.2. Vitamin B:

It is a group of 8 water soluble vitamins that perform as precursors or cofactors for enzyme comprises in key metabolic procedures. The distinctive chemistry produced through the amino acid functional set of enzymes is supplemented by these cofactors.

1.3. Vitamin C:

Vitamin C (ascorbate) act as the richest antioxidant present in plant cells, and can be exist in all subcellular sections, comprising the apoplast. Oxidation of ascorbate to the monodehydroascorbate (MDHA) radical by hydrogen peroxide, superoxide, oxygen, and singlet oxygen detoxifies these compounds. Many enzymes, including ascorbate peroxidase, need ascorbic acid as a cofactor.

1.4. Vitamin K:

In photosystem I, vitamin K (phylloquinone) is needed for electron transport. It can be found inside leaves and, to a smaller extent, seed. While Vitamin K has antioxidant capability, its function in plant anti-oxidant protection is unknown.

1.5. Phenolic compounds:

In plants, phenolic compounds play a crucial structural function, supplying the majority of the mechanical power of cell wall. Furthermore, a wide range of vegetal phenolic play critical parts in plant evolution and existence.

1.6. Vitamin E:

Tocochromanol is lipid-soluble antioxidant similar to vitamin E that are essential in human nutrition. A polyprenyl side chain which is hydrophobic in nature derived from plastidic isoprenoid biosynthetic passageway from plants and a chromanol ring derived from the shikimate path are polar in nature to make up these compounds. Tocotrienols have geranylgeranyl-derived side chains, while tocopherols have phytyl-derived side chains[8].

2. Essential factors for agriculture

Farmers should consider some essential factors for agriculture to be truly sustainable, such as:

2.1. Environment:

Farmers should participate in farming practises that encourage sensible resource management of local resources, promising no harm to the ecosystem and enhancing biodiversity.

2.2. Profitability:

Agriculture must be profitable for farmers in order to be truly sustainable providing for a future generation. Seven different crop practices for sustainable agriculture is listed in the Figure 4, that are –Mulching, Crop rotation, Diversified farming, Agroforestry, No-till farming, Counter farming, and Organic animal raising[9].

Figure 4: Seven Different Crop Practices for Sustainable Agriculture

2.2.1. Mulching:

Mulching is the method of covering the ground with a layer of material to inhibit gully erosion and keep temperature of the soil and moisture constant. Mulching can drastically reduce the growth of weeds. Mulching will often get rid of even the toughest weeds.

2.2.2. Rotation of Crops:

Crop alternation is just rising diverse crop varieties in different seasons on the same place. This is extremely successful at preserving soil fertility. Crop rotation can be very beneficial to farmers because it eliminates the need for pesticides.

2.2.3. Diversified farming:

Diversified farming encourages farmers to help sustain productivity by promoting the growth of a diversity of species on a particular part of land by treating the whole region as one. This will improve the health of all soil species and increase soil fertility.

2.2.4. Agroforestry:

Growing trees on grazing lands and in between trees is what agroforestry is all about. This will help to keep the soil moist and fertile. Furthermore, the soil temperature is preserved, which decreases soil erosion during rain and wind. Finally, the soil quality is preserved, and nutrients are preserved.

2.2.5. *No-till farming:*

No-till farming is a form of farming that prevents tillage of the soil. This boosts water infiltration, protects soil nutrients, and maintains the soil's organic existence.

2.2.6. Counter farming:

Contour cultivation reduces soil erosion while also increasing water absorption and crop yield. The ruts are rendered perpendicular in contour farming. This enhances soil nutrient retention and encourages environmental sustainability.

2.2.7. Organic animal raising:

Allowing animals to graze in open fields can be extremely beneficial to both the soil and the animals. Confining animals to a specific area may be detrimental to their welfare. This would ultimately lead to an improvement in the quality of the goods we receive from them. Animal manure also improves the soil's health[9].

Water and land problems, traditional farming practices, a deficiency in marketing knowledge, scarcity, depletion of normal assets and environmental problems, growth in population, insufficient social facilities, institutional and framework restrictions, and absence of agriculture and rural growth strategies are among the major challenges[10].

LITERATURE REVIEW

C. A. Campbell et al.[11] discussed the effect on sustainable farming in moderate/boreal bionetwork (in Canadian grassy region as an example) and in the moist, sub-humid or half-arid tropical regions of Nitrogen resources (Fertilizer, Legumes, and Soil) (demonstrated by South-east Asia, Central, and South America). A financially feasible, harmless, and healthy food systems and environmentally friendly agriculture system. As a result, they discussed the effects of nitrogen on crop production, Nitrogen Usage Efficiency, excellence of food and ecological factors as well as social and economic factors. In the temperate regions, much more long-term research was undertaken, so that the greatest amount of information was made available. But in all ecosystems the behavioral principles of N was very similar. The rates and socioeconomic constraints of nutrient cycling are mainly different. Controlled vegetables and N fertilizers will enhance offer excellence food, upsurge net returns, crop generation, decrease the threat of budgetary loss, expand the class of soil, and decrease N depletion through lixiviation and gases. N must be synchronized with N use by crop as a key to sustainable management. As societies are more affluent in most temperate ecosystems, can be well placed to inspire the introduction of sustainability managing technology. On the contrary, most tropical manufacturers are existence growers; their instant objective, therefore, is financial continued existence and not environmental protection.

I. Lewandowski et al.[1] explained further interdisciplinary research is needed and the methodological approach must be looked at in more detail. In addition, before the approach certain methodological problems must be resolved can be used extensively for successful implementation in practice, sustainable cultivation. This also refers to considering how social and economic demands can be further integrated, although stage 8 (An evaluation process should take place for each potential crop production option) already allows for this. The suggested method two different processes one is to examine and administrating sustainability in crop harvesting by using originated approach for the growth that can help to overcome the requirements of the existing rising condition without cooperating the requirements of upcoming generation.

Daniel P. Roberts and A. K. Mattoo [8] discussed that there is an urgent need to redesign agriculture to ensure its sustainability and to use modern genetic manufacturing tools to supplement nutritive benefits for the diverse population of humans. Plant foods collectively contain most of the mineraux, macronutrients and micronutrients needed to feed people. These foods comprises a variety of bioactive materials which may show a key role in the precautionary of chronic disease, like cardio-vascular disorder, cancer disease, stroke, Alzheimer disease, and functional age disorders. However, in terms of human nutrition/disorder prevention, these nutrient containing substances are frequently found in minimal levels in fit for human consumption plant tissues. The amount of these nutrients is largely dependent on crop genetics in edible plant material and controlled by compound and overlying method in reaction to growing and ecological problems. Ecological factors are of course present – or result from components of crop production systems – temperature, light intensity or other stressors — fertilizer, labor, etc. Policy for sustainable crop growth for the next generation is the design of crop systems with minimal or less environmental impacts to boost crop nourishing contents through genetic approaches. This plan is interesting as crop heredities are the main drivers of plants nutrients and since it is very problematic if not

difficult to manage crop generation areas to boost nutrient content in crops. An example is the development of a sustainable tomato production system of the next generation by useful effects on tomato composition and tomato's fruit nutrition. Examination of the tomato cultivar study in these and extra cultivation structures shows the necessity for vigorous farmers that constantly show nutritious and further desirable features through crop structures and below various environmental circumstances.

P. J. Gregory and T. S. George [12] discussed that the growing demand for crops in the future would last to be largely encountered by growing returns. The yield and output of cereal products have grown 3 times in the last 50 years and in the next 40 years will have to remain to grow at the same absolute rate. As has happened in the past, several approaches will be needed to understand and how the yield gaps in specific areas and farms could be reduced. The attendant condition to usage all assets more professionally will present a major problems when potential returns are approached more closely. The Scottish Government provides SCRI (Specialty Crop Research Initiative) with program funding. We are grateful for the improvements to a previous draught, Geoff Squire, Philip White, and two nameless arbitrators.

S. M. Fakhrul Islam and Z. Karim [4] developed an understanding of climatic variation susceptibilities in different parts of the world, current developments, problems, and opportunities in climate-smart agriculture, skills, efficacy, and sustainable administration practises of SME (small and medium enterprise) around the world in the framework of climatic variation, talking the desire of developing industries, regional trades, and markets by technological advancements, value chains, social and environmental risk supervision in stock chains, food class and safety protocols enforcement, smallholder business connections, business social duty, and institutional development. Food safety regulation and certification are becoming increasingly important as fragment of sustainable managing practises that businesses and commerce must address. Sustainable business managing strategies are more successful because they adapt and expand with evolving markets, giving them a cut-throat edge above other companies. It was also dedicated on the difficulties related to sustainable corporate practises along with the suggestion of a number of growth choices, official and strategy matters.

DISCUSSION

Sustainable agriculture is described as "agro-food structures that are financially feasible, offer healthy, nutritious foods, and allow for soil, air, and water conservation or enhancement." The discussed methodological approach aims to make the word "sustainable agriculture" more useful and meaningful. Improved substructure and retrofit businesses to create them further sustainable till 2030, through increase resource utilization and increased adoption of inexhaustible and environmentally comprehensive technology and developing methods, with every nations acting in accordance with their particular abilities.

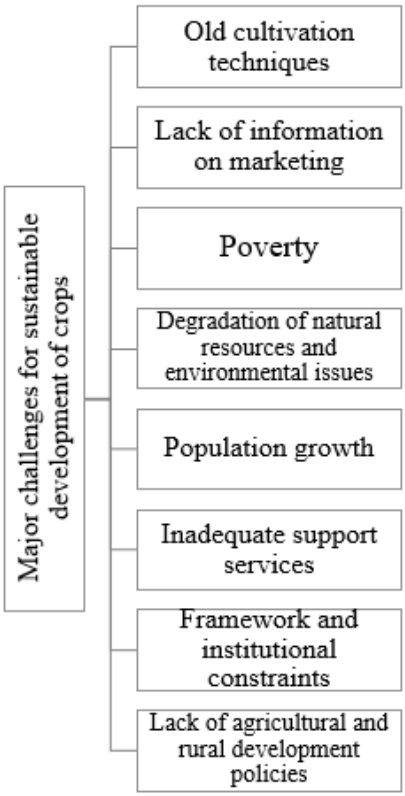

Figure 5: Major Challenges for Sustainable Development of Crops

From the Figure 5, some of the major challenges associated with sustainable development of crops is discussed. Major drawbacks are- Most of the developing countries are still using their traditional agricultural practices because they cannot afford the new advancement tools, absence of statistics on promotion, scarcity, regular depletion of natural assets and ecological problems, rise in population extent, insufficient support facilities, outline and official restrictions, Absence of agriculture and rural growth strategies. A large amount of options for growth may be proposed:

a) Promotion of good farming and agricultural practises and conservation

b) promotion of robotic and ICT mechanisation

c) Development of value chains and agribusiness processing

d) Increasing the class and security of food by official growth and worldwide ability building collaboration to resolve SPS norm compliance

e) The generation of information and development of technology.

Climate-smart agro-technology with a focus on productivity improvements and resource efficiency must be created. There may be a variety of technological and institutional solutions that can rise in food generation by approx. 50% till 2050 so as to nourish the populace, decrease hunger and mitigate depletion of the world's natural assets and habitats. The strategies, organizations and methods of application must be adapted at the global, national and local level to improve the expertise and financial capital capacities of organisations and farmers. The growing future desire for crop will chiefly remain to be encounter with higher returns. In the last 50 years the yields of cereals and production have increased 3 times. For the next 40 years, the absolute rate would continue to increase. As in the past, several approaches are needed to recognise yield gaps immediately and, in some regions and farms, to minimise them. Several agriculturalists cannot have enough money to

purchase fertilisers and wastes like cow dung might be further useful as energy resource or for business purposes in India than for increasing soil organic material while the second section will emphasis on nitrogen utilization efficacy rather than nitrogen's ecological effects.

With respect to sustainability, care of output shows an important role in most of the methods. Surveying approaches examine previous agricultural performs and therefore categorize valued performs that have prepared farming sustainable. Co-evolutionary method focuses at monitoring the corresponding development of socio and ecosystem from the previous to the current to examine sustainability. The various methods offer a wide-range of working tools for considering sustainability are- LISA Program (Low-Input Sustainable Agriculture), SARE (Sustainable Agriculture Research and Education), USTED (Uso-sostenible-de-Tierras-En-el- Desarollo) i.e. an approach for Sustainable Land Use in Development.

CONCLUSION

Plants have a wide variety of crucial amino acids, fatty acid, vitamins, and mineral for human consumption. Vegetation also include a wide range of phytonutrients, which are not important but have been linked to improved human health. Human health benefits from increased intake of green vegetables, and food with high in phytonutrient, proteins, and fibres. However, when eaten in a typical serving size, the existing amount of phytonutrient in widely mature crops, such as vegetable, is under the Recommended Daily Allowances (RDA), which is possibly due to how and where these crops are grown. "Agro-food system that are financially viable, offer clean, nutritious foods, and enable preservation or enrichment of land, water, and air" is what sustainable agriculture refers to. Sustainable agriculture is on the rise, and with climatic change and environmental degradation at an all-time high, its past time for farmers to get involved. Sustainable agriculture is described as farming that does not use pesticides, conserves energy and resources, is environmentally friendly, and utilises locally available resources. Policies should take into account the environmental and social impacts of global agro-food systems. Emphasise for better output instead of considering quantitative increases in volume. Strategies to provide an integrated package of proactive services for SMEs (Small and Medium Enterprises) such as training, technological investments and sustainable management practises should be developed. Proper economic support should be provided to all the developing countries to enhance the chances of sustainable development all over the world and once the world sustainable development will start then problems related to crops and human living will also get solved.

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