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Different Green Technologies for Farmers in Sustainable Agriculture Scenario in India

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ABSTRACT

India is known to be the seventh largest economy in the world. Its developmental activities not only aim at economic progress but also encompass the overall well-being of the humans. Agricultural sector in India plays a crucial role, as it contributes 20% of the overall country GDP. Agricultural development is said to be sustainable when it produces high quality of food without degrading environmental quality. "Bio-fertilizers and bio-control agents" are the biotechnological interventions tried to improve crop production and protection for sustainable agricultural development. This paper highlights the various green technologies for farmers to cultivate crop with sustainable, pollution free, eco-friendly and environmental friendly ways.

1. Introduction

Agricultural development is said to be sustainable when it produces high quality of food without degrading environmental quality. In this regard, sustainable agriculture by the use of locally available resources by without harming the environment and it offers to meet the present agricultural needs and make it available for the future generation. The present topic is aim to describe the role of green technology in achieving the goal of sustainable development in agriculture. It is also an attempt to elaborate the role of green technology and related terms along with it in achieving sustainable development for present generation and future as well. To identify the potentiality of green technology in the field of agriculture sector and thereby enhancing sustainable growth in India (Ghadiyali, and Kayasth Manish, 2012).

2. Different Green Technologies for Farmers

The farmers' difficulty in avoiding GM (genetically modified) seeds, hybrid seeds, in-organic and chemical fertilizers, pesticides, fungicides and other chemicals that are all harm to the environment. They concentrate on getting higher yield and without bother about the harming environment and degradation of soil fertility. The government and green lovers insist the farmers to adopt the green technologies that are not harm to the environment by using traditional seed varieties, organic fertilizers, bio-fertilizers, organic pesticides and fungicides etc. Here discussed about some green technologies to the farmers with protection of environment by sustainable way.

a) Biogas technology

Biogas is a term produced by anaerobic digestion of organic waste comes from domestic and agriculture output by methanogenic bacteria. It involves mainly there steps.

(i) hydrolysis
(ii) acidogenesis
(iii) methanogenesis.

It is the mixture of methane, carbondioxide, hydrogen, nitrogen and oxygen in the proportion of 50-68%, 25-35%, 1-5%, 2-7% and 0-0.1% respectively.

The advantage of biogas is that this technology produces fuel in the form of methane gas simultaneously with high quality manure. It is also used for cooking and lightning in rural sector. It is evident that biogas has a great eco-friendly potential because it is odourless and smokeless, a solution for indoor air pollution and improves household or communal sanitation. Biogas technology has been successfully fulfilling the constant energy needs for rural areas where about 70% of India's population lives. The waste products of biogas plants are used as organic fertilizer to farmlands (Dhussa, 2004).

b) Bio-fuel

In India, the vast energy demand is currently derived from fossil fuels such as lignite, petrol, diesel, kerosene , which are limited in stock, non-renewable and polluting resource. In this regard, biofuels (bio-ethanol and bio-diesel) are the alternative energy sources produced. Bio-fuels are derived from biomass resources to meet the ever increasing fuel demand of the nation associated with high economic growth. India being an agricultural country has enormous potentials for the development of bio-energy sector and this will path way to achieve sustainable development in the coming years. (Aradhey and Wright, 2011).

c) Organic farming

Organic farming means the farming without using chemical fertilizers and pesticides by using traditional seed varieties, organic fertilizers, bio-fertilizers, organic pesticides and fungicides etc. In this farming system the aim is to cultivate crops in such a way that increases the soil fertility without harming the environmental quality. FAO (Food and Agriculture organization) suggested that "organic farming is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity". In organic farming the farmers getting lesser in yield as compared to the inorganic and chemical method of farming, but the produces get more price as they sale in the form of organic products in the markets. Now the farmers get awareness about the organic farming and they put pathway to future generation farming (TNAU Agritech-portal, 2018).

d) Permaculture

Permaculture uses the locally available plants and animals combined with the natural characteristics and structure to generate a supporting system for world by using the smallest area. This technique has been first developed in 1978 by Mollison, an Australian ecologist. According to him it is a combination of 'permanent agriculture' and 'permanent culture' therefore gaining huge appreciation from agriculture sector. This is following in the hills, forest and tribal areas where the animals and plants combined in their farming. This is one of the green technologies to the farmers without using chemicals in agriculture.

e) Wind Energy

Energy plays an important role in agriculture in terms of crop productivity and other applications such as agro-processing. The energy demand in the agricultural sector can be obtained from different renewable sources and wind is one of them. Wind power is defined as the electricity generated by converting the rotation of turbine blades into electrical current by use of electrical generator Wind energy contributes approx. 1% of global electricity generation whereas India has total installed capacity of 67% out of which it produces up to 20% for the overall contribution of the country (Madsen and Natarajan, 2011).

f) Solar Energy

Photovoltaic (PV) systems can be a cheaper option than installing power lines in agricultural applications. Solar energy in the form of PV cells can be used for water pumping to irrigate the crops. The second most widely used application is in the form of solar thermal which produces heat and can be used in drying crops and grains. India is endowed with huge solar potentials which can be harnessed for sustainable agriculture. Till now a cumulative total of 30,256 solar powered water pumps and drinking water has been installed in India (Chel and Kaushik, 2011)

g) Bio-fertilizers

The bio-fertilizers like azospirillum, rhizobium, azotobactor, azolla etc which are produced from the beneficial microorganisms such as algae, bacteria etc that are all used for the farmers which is organic, eco-friendly and non-polluting the soil, crop, environment etc. Instead of using inorganic fertilizers like urea, DAP, potash etc., the organic bio-fertilizer safe to the environmental sustainability. In organic farming the bio-fertilizers used for crop cultivation by two methods such as seed treatment and direct field application. Azolla the algal bio-fertilizer applied in paddy field by flooded conditions. This is one of the components of biological method of control of pest and disease in IPM (Integrated Pest Management).

h) Bio-control agents

In modern agriculture, after green revolution farmers are using inorganic pesticides and fungicides and phyrithroids for control of pest and diseases in agricultural crops. In organic farming use of bio-control agents such as thuricide (bacillus thringensis), crysopha (predators), trichogramma egg card, trichoderma bio-fungicide etc have effectively control the pest and diseases in agricultural crop without harming the environment and maintain sustainability in agriculture. This is also one of the components of biological method of control of pest and disease in IPM (Integrated Pest Management) practices.

i) Soil solarization

This is one of the methods of control of pest and disease in the field by using sunlight by exposing the soil during un-cropped lands. Summer ploughing is an important method of solarization in which the land is plough during summer season without crop in the field, by exposing the under beneath soil in the sunlight. Normally the harmful pest and insects egg, larvae, pupa etc are living in under beneath of soil with moist condition. When expose the soil through summer ploughing the sunlight kill the harmful pest and diseases in the soil. This method of control by natural and organic way in which without harming the environment with sustainable and eco-friendly agriculture.

3. Conclusion

Though the concept of sustainable development in agriculture is a new concept but it is the need of the hour. For an agricultural economy like India, sustainable approach towards agricultural practices will help to strike a balance between maximizing crop yield and economic growth. The application of green technology in the pursuit of sustainable agriculture can provide opportunities to increase yield, improving product quality, retention of soil fertility, and adoption of eco-friendly techniques. This will bring challenges and paradigm shift in the research field and related policies of the developing countries. Hence, there should be an integration of research, awareness and application of the green technologies in order to strive towards attaining sustainable development in the agricultural sector.

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