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AN ANALYSIS ON THE USE OF ORGANIC AGRI-BIOTECH IN GREEN TECHNOLOGY AND SUSTAINABLE AGRICULTURE DEVELOPMENT

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An Analysis on the Use of Organic Agri-Biotech in Green Technology and Sustainable Agriculture Development

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Abstract – The organic agro-biotech for green growth and sustainable development study is aimed to develop a conceptual framework that captures the relevant dimensions of livelihoods and adoption of innovation for the analysis of green growth and sustainable development. Study complemented the widely accepted sustainable livelihoods framework with the organic agro-biotech that allow addressing economic and non-economic aspects of rural households and the process of developing nature friendly livelihood strategies. The alternative organic farming is potentially a profitable enterprise, with a growing global market, already being supplied by more than 90 developing countries Entrepreneurs see a market for selling food that has been grown chemical free. Local consumers in India have a fairly well-developed perception about organic produce, are interested in buying certified organic foods, and even willing to pay more for them.

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INTRODUCTION

India is mainly an agricultural country, where agriculture contributes to about 14.6 percent in gross domestic product (GDP) and support over 58 percent of nation's population for livelihood (GOI, 2010). Promoting the organic agriculture is of paramount importance to protect biodiversity and cultural diversity of India. In most developing countries, agriculture continues to be the most important sector of the economy, accounting for the biggest proportion of employment (Båge, 2005). With increasing concern about the environmental, economic and social impact of chemical –dependent conventional agriculture, have led many farmers and consumers to seek alternative practices that will lead to green growth, agriculture profitability and livelihood sustainability(A.B., et.al.2005). The alternative organic farming is potentially a profitable enterprise, with a growing global market, already being supplied by more than 90 developing countries entrepreneurs see a market for selling food that has been grown chemical free(ADB, 2005). Local consumers in India have a fairly well-developed perception about organic produce, are interested in buying certified organic foods, and even willing to pay more for them. To gain access to this market, however, certification is a prerequisite. As such, unless effective strategies for agriculture development are successfully implemented, ending rural poverty will remain a distant goal. Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved. Organic production is both old and new in the India. Organic agriculture is one of ecological agriculture models with the specific definition and strict standards, which is an important aspect of sustainable agriculture(Fischer G, et.al.2002). Although organic agriculture is certainly growing in popularity, there are conflicting opinions about its potential and the benefits it can offer, in particular whether organic methods can actually improve the livelihoods of smaller farmers. Similarly, questions remain about what impact organic methods have on labor, soil quality, local economies, and risk. Two areas of debate are most prominent: the local risk-benefit ratio of organic adoption and the marketability of smallholder organic products. Organic agriculture is a production system based on an agro-ecosystem management approach that utilizes both traditional and scientific knowledge. Biodiversity also supplies indirect services to humans which are often taken for granted. These include drinkable water, clean air, and fertile soils. The loss of populations, species, or groups of species from an ecosystem can upset its normal function and disrupt these ecological services. Recent declines in honeybee populations may result in a loss of pollination services for fruit crops and flowers Biodiversity provides medical models for research into solving human health problems. For example, researchers are looking at how seals, whales, and

penguins use oxygen during deep-water dives for clues to treat people who suffer strokes, shock, and lung disease. India has a vast biodiversity and is a treasure house of bio-resources. India's biodiversity is the most significant in the world with 45,000 wild species of plants and over 77,000 wild species of animals have been recorded so far. India has great biodiversity mainly because of its unique bio-geographical composition(Bush M B, et.al.2004). With just 2% of the world's landmass, the country has about five percent (5%) of living resources, one third (1/3) of which are land bound.

But modern agri-business are only starting to recognize the benefits of obtaining organic certification, which will give them access to external markets and higher returns for their products. There are some differences in the existing organic agriculture standards; however all of organic farming practices share common characteristics in fighting against "energy agriculture, modern industry agriculture", like using chemicals such as fertilizer, pesticides and additives etc.

The organic agriculture in the nutshell concerns about human health, environment and sustainable development. Organic agriculture can help address many of the challenges facing the region. Organic agriculture emphasizes sustainable farming methods that enhance the health of ecosystems and produce safe, nutritious food. Farming methods such as slash and burn and heavy use of fertilizers and pesticides damage the long-term productivity of the land, undermine the sustainability of food production systems and will not support increasing populations as land availability decreases. Organic agriculture takes place in diverse environments that host a high level of biodiversity. However, many ecosystems are vulnerable and under pressure from increasing populations and higher levels of pollution and non-degradable waste. Organic agriculture protects and enhances biodiversity and soil and water conservation, and minimizes the impact of agriculture on downstream activities and aquatic ecosystems such as mangroves and coral reefs. Organic practices can also reduce the production of greenhouse gases from agriculture by rejecting the use of fossil-fuel and chemical inputs and encouraging carbon sequestration in soils.

Organic farming is not new to Indian farming community. Several forms of organic farming are being successfully practiced in diverse climate, particularly in rain fed, tribal, mountains and hill areas of the country. Much of the forest produce of economic importance like herbs, medicinal plants, etc., by default come under this category. Renewed interest in organic farming among farmers, entrepreneurs, policy makers and agricultural scientists is due to reasons such as it minimizes the dependence on chemical inputs (fertilizers; pesticides; herbicides and other agro chemicals) thus safeguards/improves quality of resources, and environment. It is labour intensive and provides an opportunity to increase rural employment and achieve long term improvements in the quality of resource base. Exports also played a role but perhaps lesser than in other countries.

Modern organic production systems are based on specific standards precisely formulated for food production and aim at achieving agro ecosystems, which are socially and ecologically sustainable. The four pillars of modern organic farming are-Organic standards, Certification/Regulatory mechanism, Technology packages and Market network.

As per a report of International Federation of Organic Agriculture Movements (FiBL-IFOAM, 2012) the total organically managed area is more than 37 million hectares world-wide. Organic farming is practiced in approximately 160 countries of the world and the area under organic management is continually growing. Although production of organic crops is increasing across the globe, sales are concentrated in the industrialized parts of the world. Worldwide there are 1.6 million producers .India ranks number one in organic producers with 400,551 followed by Uganda (188,625) and Mexico (128,826).Organic market has increased to 70.1billion dollars and per capita organic consumption to 8.6 US dollars with the highest in Switzerland (213USD). Organically produced agricultural products have received global attention in the last four years especially due to their being a multi-billion trade. Of the total 135 products in organic products portfolio, India exports 86 products worth over 100 million dollars to the global market of 60 billion dollars which is growing by 5 billion dollars annually. The global market for organically produced foods is likely to increase to USD 102 billion by 2020. Currently, India ranks 10th among the top ten countries in terms of cultivable land under organic certification. The certified area includes 10% cultivable area with 0.50 million Hectare and rest 90% (4.71 million Hectare) is forest and wild area for collection of minor forest produces. The total area under organic certification is 5.21 million Hectare (2012-13).In the last decade, an increasing number of companies, NGOs, farmer organizations, and government agencies have been promoting organic agriculture in India. The growth in organic production has been driven mainly by the increasing international demand, but the domestic market is also strengthening due to a large population, awareness and increasing wealth in the middle class society.

ORGANO- AGRI BIOTECHNOLOGY

The present level of agricultural production has not reached the optimal stage because of series of hurdles. Major bottlenecks among them, are lack of resources such as water nutrient and good quality planting material, improper management of pests and diseases and poor harvest management of the produce. Biotechnologies have acted as a major pillar in the development and modernization of agriculture.

With natural bio-based organic agriculture now gaining momentum, biotechnology has a lot to offer in this field also. For crops where fertilizer application is very low, bio-fertilizers can fix atmospheric nitrogen and provide micro-nutrients useful to plant growth. Use of blue-green algae has also been beneficial to rice crop. Microbes such as mycorrhizae have been helpful to overcome the stress from drought and diseases. Biotechnology also has tremendous scope in plant protection. Biotechnological application has a maximum role for the Organic Input providers. It includes the products ranging from those used in maintaining and increasing soil fertility, in pest management, veterinary feed additives or supplements and nutraceutical products.

LITERATURE SURVEY

During this period, the path breaking literature on the subject published by J.I. Rodale in the United States, Lady Balfour in England and Sir Albert Howard in India contributed to the cause of organic farming. Lambkin (1994), summarized various studies conducted on economics of organic farming in different crops in South and West of England and parts of Scotland and Wales. They concluded that the organic farming systems were more diverse in terms of enterprise. Padel and Uli (1994), reviewed several studies on costs and returns of organic farming in various crops in Germany. Their study revealed that the organic farming under German conditions was equally profitable with conventional farming. Lal, R. (2010), reviewed the various field experiments conducted on organic farming in India. Many sample farms recorded yields that were the same or slightly below conventional farms. Overall, the study concluded that 72 per cent of farmers strongly convinced that „organic farming is as profitable as conventional'. Anderson (2006), examined different research studies conducted on organic farming in USA.

They concluded that the lower yields on organic farms contrasted with conventional farms were balanced by lower production costs. Wynen (1994), carried out a review study on organic farming in Australia. He concluded that the wheat yields were almost similar between organic and conventional farms. These highly profitable companies are using greenery to reduce costs, motivate workers and forge relationships. The most salient quality of these companies is that they turn limitations (of resources, labor and infrastructure) into opportunities. Organic and biodynamic farming systems have soils of higher biological, physical, and in many cases chemical quality than that of conventional counterparts. When productivity in terms of inputs applied and outputs obtained and social costs of conventional farming are accounted organic alternative has also been found to be economically competitive (Reganold,2000).. Bhattacharyya, et al (2005), estimated size of global organic market to be U.S. $ 26 billion.

The Foundation of Ecology and Agriculture (SOEL) in 2004 reported global organic area to be 24 million hectare. Of each nation's total agricultural land 0.03% in India, 0.06% in China, 0.65% in Sri Lanka and 0.08% in Pakistan was under organic management. In 2005 SOEL reported 10% increase in area under organic farming. According to the latest FiBL-IFOAM (2010), survey on certified organic agriculture worldwide data on organic agriculture are available from 160 countries. Livelihood status is poor and also faces various socio-economic and environmental constraints for sustainable development due to the stagnating and / or declining resource use productivity, increasing degradation of natural resources, particularly soil, water and nutrients, and declining land-man ratio.

To improve the livelihoods status in these regions the concept of sustainable livelihoods is increasingly gaining ground important in research and development initiatives for poverty alleviation, rural agriculture development and rural resources management. Broad sustainable livelihood principles underpin application of the sustainable livelihood approach and most of them draw on some form of livelihoods analysis to assess how development activities fit with the livelihoods of the poor. Some criticize organic farming movement as a return to the exhausting workload, and doubt that organic farming cannot feed the world population. With regards to the latter argument, studied past reports on yields of both organic and conventional farming, and found that the average yield of organic farming is 92.2% of conventional farming in “developed countries”, and 180.2% in the “global south”, Thus, concluding that the organic farming can feed the world. A co-operative model for the development of organic farming can enable poor individual farmers to become established; whereas this would be quite impossible on their own.

SUSTAINABLE AGRICULTURE DEVELOPMENT

The issues of sustainable development can be discussed under three broad types of farming systems viz. traditional production system, modern agriculture system and sustainable agriculture system. Further we can compare them across three dimensions, ecological, economic and social sustainability.

Ecological Sustainability -

Most of the traditional and conventional farm practices are not ecologically sustainable. They misuse natural resources, reducing soil fertility

causing soil erosion and contributing to global climatic change. But sustainable agriculture has some major advantages over traditional practices:

Soil Fertility: Continuous fall in soil fertility is one of the major problems in many parts of India. Sustainable agriculture improves fertility and soil structure.

Water: Irrigation is the biggest consumer of fresh water, and fertilizer and pesticides contaminate both surface and ground water. Sustainable agriculture increase the organic matter content of the top soil, thus raising its ability to retain and store water that falls as rain.

Biodiversity: Sustainable agriculture practices involve mixed cropping, thus increasing the diversity of crops produced and raising the diversity of insects and other animals and plants in and around the fields.

Health & Pollution: Chemicals, pesticides and fertilizers badly affect the local ecology as well as the population. Indiscriminate use of pesticides, improper storage etc. may lead to health problems. Sustainable agriculture reduces the use of hazardous chemical and control pests.

Land use Pattern: Over-exploitation of land causes erosion, land slides and flooding clogs irrigation channels and reduces the arability of the land. Sustainable agriculture avoids these problems by improving productivity, conserving the soil etc.

Climate: Conventional agriculture contributes to the production of green house gases in various ways like reducing the amount of carbon stored in the soil and in vegetation, through the production of Methane in irrigated field and production of artificial fertilizers etc. By adopting sustainable agriculture system, one can easily overcome this problem.

Economic Sustainability-

For agriculture to be sustainable it should be economically viable over the long term. Conventional agriculture involves more economic risk than sustainable agriculture in the long term. Sometimes governments are inclined to view export-oriented production systems as more important than supply domestic demands. This is not right. Focusing on exports alone involves hidden costs: in transport, in assuring local food security, etc. Policies should treat domestic demand and in particular food security as equally important to the visible trade balance. It is a popular misconception that specific commodities promise high economic returns. But market production implies certain risks as markets are fickle and change quickly. Cheap foreign food may sweep into the national market, leaving Indian farmers without a market. As a World Trade Organization signatory, the Indian government is under pressure to deregulate and open its economy to the world market so it cannot protect its farmers behind tariff walls. The main source of employment for rural people is farming. Trends towards specialization and mechanization may increase narrowly measured "efficiency", but they reduce employment on the land. The welfare costs of unemployment must be taken into account when designing national agricultural support programs. Sustainable agriculture, with its emphasis on small-scale, labor-intensive activities, helps overcome these problems.

Social Sustainability –

Social sustainability in farming techniques is related to the ideas of social acceptability and justice. Development cannot be sustainable unless it reduces poverty. The government must find ways to enable the rural poor to benefit from agriculture development. Social injustice is where some section of the society is neglected from development opportunities. But having robust system of social sustainability can bridge the gap between “haves” and „have-nots”. Many new technologies fail to become applicable in agriculture sector due to lack of acceptability by the local society. Sustainable agriculture practices are useful because it is based on local social customs, traditions and norms etc. Because of being familiar the local people are more likely to accept and adopt them .Moreover, sustainable agriculture practices are based on traditional know-how and local innovation. Local people have the knowledge about their environment crops and livestock.

Traditional agriculture is more gender oriented, where woman bear the heaviest burden in terms of labor. Sustainable agriculture ensures that the burden and benefits are shared equitably between man and woman. While conventional farming focuses on a few commodities, sustainable agriculture improves food security by improving quality and nutritional value of food, and also by producing bigger range of products throughout the years. Traditional farming was also driven by the caste and wealth oriented people. The rich and higher castes benefitted more, while the poor and lower castes are left out. Sustainable agriculture attempts to ensure equal participation which recognizes the voice and speech of every people.

GREEN TECHNOLOGY AND THEIR INTER-LINKAGES

Studies have shown that energy costs would become the second highest cost in 70% of the world's data centres by 2009. In tomorrow's world, businesses that ignore environmental impact and don't reform business processes and working practices will be less credited.

For several environmentally-sensitive projects, the environmental impact assessment have been made mandatory by the respective governments to identify, estimate, evaluate and mitigate the biophysical,

social, and other relevant effects of development projects.

The wastewater and sewage disposal has been major threat to human health in developing Asia. The liquid waste discharged by domestic residences, commercial properties, industry or agriculture generates potential contaminants and concentrations that to some extent is minimized or recycled in the developed world. It necessitates the adoption of available and affordable technology for renewable energy including sunlight, wind, rain, and geothermal heat, which are naturally replenished. The technologies that are available are solar power, wind power, hydroelectricity/micro hydro, biomass and biofuels for transport. The importance for considering primary energy use (includes both renewable and non-renewable energy contained in raw fuels) is because about 13 per cent of world's primary energy comes from renewable sources, most of which comes from traditional biomass like wood-burning. The understanding of these energies helps us devise policies for sustainable development, which includes environmental sustainability, economic sustainability and socio-political sustainability.

Environmental technology is the key to conservation ecology, a science of protecting biological diversity. Conservation ecology also termed as conservation biology refers to the application of science to the conservation of genes, populations, species, and ecosystems. The laws and regulatory measures are in operation to restrict activities that causes damage to habitat or wildlife by setting aside wildlife reserves, parks and other conservation areas. In conservation, sustainable development is allowed, however, under preservation, it is completely the restriction.

CONCLUSION

Since the organic farming has just started in India, we need to address the production as well as marketing problems simultaneously. Also India's domestic market is quite big and if genuineness and quality is guaranteed there is no dearth of buyers; the demand for organic foods in the metros is on the increase. Jammu and Kashmir can be regarded as a promising state for organic production. Organo-Agri-units set up with the technological support of biotechnology for domestic as well as global market holds tremendous scope.

The agricultural technology needs to move from production oriented to profit oriented sustainable farming. The conditions for development of sustainable agriculture are becoming more and more favorable. New opportunities are opening the eyes of farmers, development workers, researchers and policy makers like agri related businesses, dairy farming, poultry farming castle farming and fisheries. Now the time is to see the potential and importance of these practices not only for their economic interest but also as the basis for further intensification and ecological sustainability.

The above studies simply demonstrate that organic farming and agri-biotechnology are playing a vital role in promoting green growth and sustainable development at the global level and to small farmers and rural poor in particulars. The organic farming is low cost, eco-friendly, livelihood security and employment oriented activity (Dubey Kumar Rajesh 2013). Though there are a number of studies which are related to functioning of organic farming but only a few studies have been taken so far to assess the impact of organic farming &agri-biotechnologies on the green growth and socio-economic empowerment and sustainable development.

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