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The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; SP-10(6): 52-56

www.thepharmajournal.com
Received: 17-04-2021
Accepted: 09-05-2021

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Challenges of sustainable agriculture development in India

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Abstract
The objective of this research is to study the Challenges of Sustainable Agriculture in India. The role of agricultural sector in Indian economy can be seen through its contribution to gross domestic product and employment. Agriculture sector also contributes significantly to sustainable economic development of the country. The sustainable agriculture development of any country depends upon the judicious mix of their available natural resources. In spite of fast growth in various sectors, agriculture remains the backbone of the Indian economy. Agriculture has changed dramatically, food and fibre productivity raised due to new technologies, mechanization, increased chemical use, specialization and government policies that favoured maximizing production. Sustainable agriculture is a subject of great interest and lively debate in many parts of the world. Most agriculturalists agree that the concept of sustainable agriculture is of paramount importance to the sustainability of our Biosphere and its ever increasing human population.

Keywords: Sustainable agriculture, economy, domestic product and employment, India

1. Introduction
The role of agricultural sector in Indian economy can be seen through its contribution to GDP (Gross domestic Product) and employment. Agriculture sector also contributes significantly to sustainable economic development of the country. In fact agriculture determine the fate of a country like India where about two-thirds of the population still lives in rural India with agriculture as its livelihood, in spite of the increasing urbanization that has been taking place since many decades. Therefore, if agriculture goes wrong, it will drastically change the economy it will not only affect the employment but GDP too (thus increasing poverty) [1, 2]. The larger objective for the improvement of agriculture sector can be realized through rapid growth of agriculture, which depends upon increasing the area of cultivation, cropping intensity, and productivity.
The productivity can be increased by two ways. First, increasing output by efficient utilization of available resources. Second, increasing output by variation of input. The first method is better with respect to productivity and sustainability. But due to increasing population, this method cannot provide a permanent solution. Thus, we can go for the second method, which may potentially cause environmental degradation in the economy and affect its sustainability [3]. Therefore, there is need to tackle the issues related to sustainable agriculture development.

2. Material and Methods
The issues of sustainable development can be discussed under three broad types of farming systems *viz*. conventional production system, current agriculture system and sustainable agriculture system. Further, it can compare them across three dimensions, conservation, economic, and social sustainability [4-6].

2.1 Principles of sustainable development
Harmony between man and nature is prerequisite for sustainable development. It depicts that development of humanity should not be on cost of environmental health. Thus, whatever the path of development is adopted does not matter but it should always within such limit nature allows penetrating beyond that will ultimately cause a threat of survival. For the sake of universe and humanity following are the principles of development with no damage i.e. Sustainable Development:

1. **Holistic Development:** Considering all the biotic and abiotic material while planning for development. It should have holistic View.

2. **Development within the boundary of environment:** Equilibrium among various eco-systems can resist only to certain amount of pressure in form of natural resource use. Thus, prior to go for exploitation of natural resources, do have adequate knowledge about composition and interrelation between and among the constituent factors of environment.
3. **Development within socio-cultural and traditional-knowledge base:** In the era of scientific revolution, the world of social value, norms and traditional knowledge cannot be denied by saying that, it became out dated because these are irrational.
4. **Enhance quality of life:** Not only human life but life of other living macro and microorganism because they contribute according to their capacity for balanced growth of environment.
5. **Promote collectiveness:** The development strategies should enumerate the facts and do plan for promotion of work for all.
6. **Needs of the future generation:** Development should not be at the expense of for the coming generation. Here the share fairly and care' need to be materialized. All the benefits and costs incurred in resources use and management must be equitably distributed among poor and affluent, concerned and non-concerned and among various subgroups and communities. Therefore, this principle leads us towards socially just and equitable distribution of benefits and costs.

2.2 Environmental sustainability

Environmental sustainability and sustainable development are one in the equal; there are quite some approaches wherein they diverge in their goals. They do have the identical standard aim that of retaining herbal resources and creating extra energy efficient initiatives and practices [7, 8].

The goal of environmental sustainability is to preserve natural resources and to develop exchange resources of strength while lowering pollution and harm to the environment. The various initiatives that are rooted in environmental sustainability will involve replanting forests, keeping wetlands and protective natural regions from resource harvesting [9]. The most important criticism of environmental sustainability tasks is that their priorities may be at odds with the needs of a growing industrialized society.

2.3 Methods of sustainable agriculture

Most of the traditional and conventional farm practices are not cost-effectively 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. Two of the various possible practices of sustainable agriculture are crop rotation and soil modification, every designed to make targeted that vegetation being cultivated can acquire the important vitamins and minerals for healthful expand. Soil amendments would encompass utilizing locally to be had compost from neighborhood recycling facilities [10-12]. These neighborhood recycling facilities aid produce the compost wished by way of the regional organic farms [13, 14].

a. **Crop rotation:** Crop rotation is likely one of the most effective procedures of sustainable agriculture. Its rationale is to maintain away from the consequences that include planting the equal plants throughout the equal soil for years in a row. It allows deal with pest troubles, and chooses distinctive crops. If the pests have a consistent ingredients they may be able to widely broaden their population dimension.
b. **Cover crops:** Many farmers select to have crops planted in a discipline always and by no means depart it barren, this can purpose accidental results. By way of planting cowl plants, which include clover or oats, the farmer can achieve his desires of stopping soil erosion, suppressing the increase of weeds, and improving the great of the soil. Using cowl vegetation also reduces the want for chemicals consisting of fertilizers.
c. **Natural pest predators:** So as to maintain powerful control over pests, it's far vital to view the farm as surroundings as opposed to a factory [29, 30]. Coping with your farm in order that it is able to harbor populations of these pest predators is an effective as well as a complicated method. The usage of chemical insecticides can result in the indiscriminate killing of pest predators.
d. **Integrated pest management:** This is an approach, which simply relies on organic instead of chemical techniques. IMP also emphasizes the importance of crop rotation to fight pest control. Once a pest problem is recognized, IPM will mean that chemical solutions will most effective be used as a closing resort.
e. **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.
f. **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.
g. **Climate:** Conventional agriculture contributes to the production of greenhouse 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.

2.4 Benefits of sustainable agriculture

There are many blessings of sustainable agriculture, and standard, they may be divided into human fitness benefits and environmental benefits [15-17].

a. **Crop production:** Crops grown through sustainable agriculture are better for human fitness because of the shortage of chemical insecticides and fertilizers, humans are not being exposed to or eating synthetic materials.
b. **Conserving the environment and preventing pollution:** By adopting sustainable practices, farmers will reduce their reliance on nonrenewable energy, reduce chemical use and save scarce resources. Keeping the land healthy and replenished can go a long way when considering the rising population and demand for food.
c. **Reducing costs and focus on profits:** Farming smarter and moving food from farm-to-fork in a more efficient manner will be beneficial for anyone involved with the agriculture industry. IoT data from sensors installed in everything from seed drills, sprayers, and spreaders to drones, satellite imagery, and soil make it so surprises become rarities.
d. **Improving food production without being wasteful:** As we have explained, the anticipated population increase is cause for concern. Today, there is an opportunity to develop agricultural practices from a pure production

standpoint, and sustainable agriculture is the route with the most opportunity.

3. Sustainable agriculture in India

The sustainable agriculture can be described as any set of agronomic practices which can be economically viable, environmentally safe, and socially proper. If a cropping device calls for big inputs of fertilizer that leak from the device to pollute ground water, drinking components and remote coastal fisheries, the device can be sustainable economically because the long-time period supply of fertilizer is stable and the economic price of fertilizer is without difficulty borne with the aid of large grain manufacturing however it isn't sustainable environmentally or socially, because it does not cover the cost of environmental harm or social prices [18-21]. The organic agriculture makes a specialty of "living soil", on optimizing using organic techniques and on keeping off using synthetic chemicals and fertilizers. The Indian authorities' rules have always emphasized meals grain self-sufficiency, which has no longer always coincided with agricultural sustainability. A few viable moves of sustainable agriculture in India are [22, 23]:

1. Advent of regenerative branches of enterprise (e.g. horticulture or aquaculture).
2. Advent of a new manufacturing detail in current businesses (which include fruit trees to stabilize terraced fields, fish-farming in rice fields).
3. Optimization of put up-harvest structures (e.g. garage).
4. Boom the cost of agricultural merchandise through in addition processing (e.g. production of yoghurt from milk).
5. Improvement of channels of distribution (e.g. marketplace get admission to, transport).
6. Get right of entry to loans and different monetary services.

4. Indian agriculture

Agriculture in India is livelihood for a majority of the population and can never be underestimated. Although its contribution in the gross domestic product (GDP) has reduced to less than 20 per cent and contribution of other sectors increased at a faster rate, agricultural production has grown [24, 25]. This has made us self-sufficient and taken us from being a begging bowl for food after independence to a net exporter of agriculture and allied products. Total food-grain production in the country is estimated to be a record 291.95 million tonnes, according to the second advance estimates for 2019-20 [26-28]. This is news to be happy about but as per the estimates of Indian Council for Agricultural Research (ICAR), demand for food-grain would increase to 345 million tonnes by 2030 [29]. Increasing population, increasing average income and globalization effects in India will increase demand for quantity, quality and nutritious food, and variety of food. Therefore, pressure on decreasing available cultivable land to produce more quantity, variety and quality of food will keep on increasing.

India is blessed with large arable land with 15 agro-climatic zones as defined by ICAR, having almost all types of weather conditions, soil types and capable of growing a variety of crops. India is the top producer of milk, spices, pulses, tea, cashew and jute, and the second-largest producer of rice, wheat, oilseeds, fruits and vegetables, sugarcane and cotton. In spite of all these facts, the average productivity of many crops in India is quite low [30, 31]. The country's population in the next decade is expected to become the largest in the world and providing food for them will be a very prime issue. Farmers are still not able to earn respectable earnings; also India has upgraded their rank in global hunger index from 97 to 100 in last year. Hunger is serious problem in India, out of 119 countries India is behind the North Korea, Bangladesh and Iraq. India's requirement for food grains in order to provide for population is projected to be 345 million tunes by 2030 [32-34]. The estimate of food grains production in 2017-18 is 277.5 million tones. This implies that the crop output needs to grow more than its annual average. There is marginally increase in the area under food grain production compare to change in total food grain production in India. The average yield agriculture increases because of productive capacity of agriculture sector has uplift during the study period. The following table describes the actual situation of food grain production and area under food grain production in India [35, 36].

Table 1: The actual situation of food grain production and area under food grain production in India

Year	Total food grain Production (Million tons)	Area under food grain production (Million hectares)
2000-01	196.87	121.05
2001-02	212.85	122.77
2002-03	174.87	113.87
2003-04	213.19	123.45
2004-05	198.36	120.08
2005-06	208.60	121.60
2006-07	217.28	123.70
2007-08	230.78	124.06
2008-09	234.47	122.83
2009-10	218.11	121.33
2010-11	244.49	126.67
2011-12	259.28	124.75
2012-13	257.13	120.70
2013-14	265.04	126.04
2014-15	252.0	122.00
2015-16	251.6	123.21
2016-17	275.68	128.02

Source: Economic survey of India 2001 to 2017

The first and second green revolution has largely influenced on food grain availability in India. In 2001, the total food grain availability was 196.87 mt. The bad monsoon session adversely influenced on availability of food grain in year like

2002-03, 04-05, and 2014-15. After 2015 the trend became positive and gradually increased. In the present year 2020-21 expected total food grain availability will be 300 MT. The area under food grain production has shown 6.63% increase in total area under food grain production in India. This fact explore the need and opportunity of agriculture sector to expand [37].

5. Challenges before Indian agriculture

The agriculture sector has the most challenging sector in respect of economically, environmentally and socially. The Indian agriculture sector faced various traditional as well as new global challenges the key challenges addressed as follows [38, 39].

1. The 80 percent farmers in India having small size of land. They are not economically sound and lack of market attachment.
2. The net income from agriculture of small and marginal farmer's quite low or some time it become negative. Because of large increase in production cost in agriculture sector.
3. The contribution of private sector in agriculture investment quite low and declined trend of public investment in agriculture after 2000.
4. The agriculture productivity is very low and hampers income of the farmers. The per unit area productivity also low in case of major crop producing in countries.
5. The fall in the ground water level generate more pressure on other irrigation facilities and create hurdles in the way of agriculture development in India.
6. Lack of competitiveness in Indian farmers is another hurdles rise in between improve agriculture development. The farmers are less risk bearing and unskilled which adversely impact on their income from agriculture.
7. Natural risk in agriculture is a common phenomenon but most of the farmers not get benefits of crop insurance scheme. The agricultural insurance schemes are inefficient to overcome various risk in agriculture sector.
8. Low profitability is a main cause behind the farmer's indebtedness and suicide problem existed in many state of India in the last few years.
9. The spending on agriculture subsidy has increased year by year but problem remains same and continuously grow-up.
10. Climate change is often regarded as one of the most profound global problems which is mainly due to the sheer scale of climate change impacts - both in terms of its global and temporal spread and of the variety of sectors affected by it. It has potential to impact global water supplies, agricultural production, human health, and our energy infrastructure.

6. Conclusion

Environment has emerged as a dominant force influencing development planning efforts. Sustainable development is the process of judicious use and conservation of natural resources for the overall improvement in the quality of life for the present and future generation on long term basis.

It should be based on principles like Development for all which must be within the limits of environment, having respect for quality of life, taking into account the socio-cultural and traditional knowledge base which promote collectiveness global diversity, people's participation in natural resources management and need for future generations. It should be placed at the top priority while formulating plans for development [40].

Principles of sustainable development require the current generations to meet their own needs without compromising the ability of future generations to do the same toward a more sustainable future. Now it is time for humans to proceed with the remaining steps to truly achieve sustainability for both current and future generations.

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