Need For Sustainable Agriculture Development in India

Shivakumaraswamy
Assistant Professor
Department of Studies and Research in Economics
Karnataka State Open University Mysore
shivakumareconomics@gmail.com

Abstract

The necessity for sustainable agriculture, as well as the issues and difficulties associated with the development of sustainable agriculture in India, are the topics that will be investigated in this study. The term "sustainability" refers to a situation in which supply and demand for agricultural products are in a condition of stable equilibrium. The "Green Revolution" has led to a significant rise in the overall productivity of the agriculture sector. Agriculture's final performance may be understood by looking at how well its varied resources, as well as its chosen tactics and methods, have performed together. In order to combat each and every unfavorable circumstance brought on by natural disasters, agriculturalists need to implement all of the novel tactics available to them. The results of the study shed light on original approaches to problem solving and methods for advancing overall development. Agriculture is the primary sector that supports the Indian economy.

Keywords: *Sustainable, Agriculture**,** supply*

Introduction

The improvement of agricultural sustainability should work toward achieving four primary goals, including the protection of the environment and public health, the promotion of economic growth, and the maintenance of viable livelihoods. In general, sustainability is based on the premise that the demands of the present generation should be met without jeopardising the ability of future generations to do the same. As a result, making effective use of both natural resources and human resources is of the utmost significance. In the case of human resources, we may take into account social duties such as the means of subsistence for farming families, the necessities of rural communities, and the wellbeing and security of consumers, both in the here and now and in the future. When it comes to the stewardship of land and natural resources, it may encompass the long-term preservation and improvement of this essential resource base. Agriculture is one of the most important primary industries that drives the Indian economy. It is possible to get a sense of the significance of the agricultural sector in the Indian economy by looking at the contributions it makes to the country's Gross Domestic Product (GDP) and employment levels. In general, the key to achieving sustainable development in agriculture in any nation is to make strategic use of the natural resources that are now at their disposal.

In point of fact, agriculture determines the destiny of a nation such as India, where approximately two-thirds of the population still lives in rural India and relies on agriculture as its primary means of subsistence. This is the case in spite of the fact that urbanisation has been on the rise in India for many decades. If something goes wrong in agriculture, it will have a significant negative impact on the economy since a slowdown in agricultural growth not only has an effect on employment but also on GDP (thus increasing poverty). The greater goal of improving the agricultural sector may be accomplished by the rapid expansion of agricultural production, which is dependent upon expanding the area of cultivation,

ISBN: 978-93-83302-57-4

the cropping intensity, and the productivity. Increasing productivity, on the other hand, is of more significance for a country like India than any of the other two factors. This is due to the simple fact that there has been an increase in urbanisation and industrialization, in addition to the restricted amount of land space in the country. There are two different approaches that may be taken to boost productivity. First, boosting production by making more effective use of the resources that are now accessible. The second strategy is to boost output by adjusting the amount of input. The first approach is superior when compared to the others in terms of both production and sustainability. But because of rising population, this approach is not going to be able to give a long-term answer. Consequently, we have the option of going with the second technique, which has the potential to bring about environmental deterioration in the economy as well as damage the sustainability of the economy. As a result, it is necessary to address the challenges associated with the growth of agriculture that is more sustainable.

What is Sustainable Agriculture?

Environmental health, economic profitability, and social and economic equality are the three primary objectives that are included into sustainable agriculture. These objectives have been advanced by the application of a wide range of ideas, policies, and practises. This goal has been supported and advanced by individuals operating in a wide variety of roles, ranging from producers to end users. In spite of the wide variety of persons and points of view, the following topics consistently appear in discussions over what constitutes sustainable agriculture. The concept of sustainability is predicated on the idea that we should fulfil the requirements of the here and now without jeopardising the capacity of future generations to do the same for themselves. As a result, the responsible management of both natural and human resources is of the utmost significance. In order to properly manage human resources, one must take into account several aspects of social responsibility, including the working and living circumstances of workers, the requirements of rural communities, and the health and safety of consumers, both in the now and in the future. Land and natural resource stewardship entails either preserving or improving the existing level of these essential resource bases over the long term. To have a proper knowledge of sustainability, a systems approach is necessary.

The system is envisioned in its fullest meaning, beginning with a single farm and extending all the way to the local ecology as well as the communities, both locally and worldwide, that are impacted by this agricultural system. Putting more focus on the system enables a broader and more in-depth examination of the effects that agricultural methods have not just on human populations but also on the natural environment. An approach based on systems provides us with the means to investigate the links that exist between farming and several other parts of our natural environment. A systems approach requires multidisciplinary work in both research and teaching in order to be effective. Not just scholars from a wide variety of fields, but also farmers, agricultural workers, customers, legislators, and other types of people are required to contribute to this effort. The process of shifting toward agriculture that is more sustainable takes time. The move from conventional farming to sustainable farming typically calls for the farmer to take a number of manageable, incremental steps.

Participants' ability to go quickly or far in the transition is impacted both by their family's financial situation and their own personal aspirations. Realizing that even seemingly little choices may have an impact and help move the entire system along along the "sustainable agricultural continuum" is an essential step that must not be overlooked. The determination to take the next step is essential to making progress in any endeavour. Last but not least, it is essential to emphasise the fact that achieving the objective of sustainable agriculture is the joint duty of all those involved in the system. This includes farmers, labourers, legislators, researchers, retailers, and consumers. Each organisation has its own distinct

ISBN: 978-93-83302-57-4

function to fulfil and contribution to offer toward the overall goal of bolstering the community of sustainable agriculture. In the next sections of this text, various solutions for achieving these overarching themes or aims will be discussed. The techniques may be broken down into three distinct categories, all of which are interconnected in some way: farming and natural resources; plant and animal production practises; and the economic, social, and political context. Each of these categories is broken down further into subcategories. They reflect a range of possible ideas for persons who are devoted to understanding the concept of sustainable agriculture within the context of their own particular circumstances.

Need for the Study

When we talk about agriculture's contribution to India's gross domestic product, it's clear that this sector occupies a significant and significant role. The performance of the agricultural sector throughout the 1990s was marked by irregular and widespread fluctuations, with a general downward tendency over the course of the decade. Due to the strong connection that exists between the performance of agriculture and that of the economy, it is self-evident that agriculture has to expand at a rapid rate in order for it to outpace the growth of the economy. However, in order for agriculture to expand at the rate that is anticipated, it is very necessary for high-quality investments to be made in critical sectors that have the potential for expansion. In the past three decades, the government has come to the realisation that investments in agriculture that are not specifically targeted may result in dissatisfying outcomes. Therefore, any future investments in agriculture need to have a clear focus in order to prevent disappointments of this kind and fulfil the goals that were originally outlined. For instance, despite the overall dismal performance of agricultural production, many sub-sectors, including horticulture and dairy, have fared quite well. Therefore, agricultural investments have to be concentrated on regions that have a good chance of achieving high levels of productivity.

Development of Sustainability in Agriculture

The challenges surrounding sustainable development may be examined in relation to three different types of farming systems: conventional production, contemporary agriculture, and sustainable agriculture. In addition, we may evaluate them based on three criteria: the ecological, the economic, and the social sustainability of their practises.

Ecological Sustainability: The majority of the conventional and traditional agricultural techniques do not promote ecological sustainability. They waste natural resources, which in turn decreases soil fertility, leads to soil erosion, and plays a role in the progression of global climate change. However, sustainable agricultural approaches provide a number of significant advantages over more conventional methods.

Soil Fertility: In many regions of India, one of the most significant challenges is a continuing decline in the fertility of the soil. Fertility and the structure of the soil are both improved by sustainable agriculture.

Water: The use of fertilisers and pesticides pollute both surface water and ground water, but irrigation is the sector that consumes the most potable water overall. The organic matter content of the top soil is increased through sustainable agriculture, which in turn increases the top soil's capacity to absorb and store the water that comes down 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: Both the local population and the local ecological are negatively impacted when chemicals, insecticides, and fertilisers are used. Problems with one's health might result from the careless

ISBN: 978-93-83302-57-4

or incorrect application of pesticides, storage, or other factors. The usage of potentially harmful chemicals and other forms of pest management are cut down in sustainable agriculture.

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

Economic Sustainability: Long-term economic viability is a necessary condition for agriculture to meet the criteria for sustainability. In the long run, conventional agriculture is fraught with a greater potential for financial loss than sustainable agriculture. There are times when governments have a tendency to place a higher priority on export-oriented manufacturing systems than they do on satisfying domestic demand. This is not correct at all. When you only concentrate on exports, you run the risk of incurring hidden expenses in several areas, such as transportation and ensuring the safety of the local food supply. Domestic demand, and food security in particular, should be treated with the same importance as the apparent trade balance when formulating public policy.

Social Sustainability: The concepts of social acceptability and fairness are connected to the concept of social sustainability in agricultural practises. If poverty is not reduced, then development cannot be considered sustainable. The government has to devise strategies that will allow those living in poverty in rural areas to reap the benefits of agricultural expansion. When a certain segment of the population is denied access to possibilities for growth, this is an example of social injustice. However, a strong social sustainability system has the potential to bridge the gap between those who "have" and those who "have not." A significant number of recently developed technologies are unable to be used in the agricultural sector because the local society does not accept them. Because they are based on local social conventions, traditions, and other such things, sustainable agricultural methods are beneficial. They are more likely to be accepted and adopted by the local people as a result of the fact that they are already familiar with them. In addition, sustainable agricultural techniques draw from both long-held expertise and newly developed ideas at the regional level. The people that reside in the area have a wealth of information regarding their environment, agriculture, and cattle.

Impact of Economic Reform on Indian Agriculture

The Indian agriculture sector has been experiencing economic change since 1990s in an effort to liberalise the economy to profit from globalisation. India, which is one of the greatest agriculture based economies, remained closed until the early 1990s. In 1991, the new economic policies emphasized both external sector changes in the currency rate, trade and foreign investment policies and domestic reform in areas such as industrial policies, pricing and distribution regulations, and fiscal restructuring in the banking and public sector. India's economic reforms were initiated in June 1991, but it was observed that the expected increase in exports due to liberalization did not occur. In addition, the agriculture sector's output growth declined over 1992-1993 to 1998-1999. The reason for this was the reduction in the environmental quality of land, which reduced the marginal productivity of the contemporary inputs. Agriculture sector is the backbone of the Indian economy around which socio-economic advantages and deprivation revolve, and any change in its structure is likely to have a comparable influence on the present pattern of social equality. No plan of economic reform can succeed without sustained and wide based agriculture development, which is vital for boosting living standards, reducing poverty, insuring food security, making major contribution to the national economic growth. Since agriculture continues to be a tradable industry, this economic liberalization, and reform strategy has a broad reaching influence on

ISBN: 978-93-83302-57-4

1. Agricultural exports and imports
2. Investment in new technologies
3. Pattern of agricultural growth
4. Agricultural income and employment
5. Agricultural price
6. Food security

As a result of this reforms process and the recommendations of the Khusro Committee and the Narasimham Committee, commercial bank lending to agriculture was reduced, which led to a reduction in agricultural investment and damaged growth. Competition in "resource use" and "marketing of agriculture production" is increased as a result of liberalisation of agriculture and open market operations. This compels small and marginal farmers to engage in "distress sales" and look for work outside of farming in order to supplement their incomes.

Methodology

The growth rates of the agricultural sector throughout a variety of time periods or during a particular time period can be used to measure the state and performance of the agricultural sector. In a similar vein, the absolute value of the sector's production may be compared and contrasted over a certain time period. These will represent certain characteristics of the current state as well as the development that has been made in the field. If, on the other hand, a comparison is to be made between different states in a country like India, which has significant diversity in terms of agro-climatic situations, crops, and other allied activities, parametric values that will reflect the integration of all of these factors will need to be taken into consideration. The assessment of agricultural sustainability is one type of indicator that might point to these kinds of problems. The first thing that has to be done in order to evaluate the agricultural sector's long-term viability is to precisely pinpoint the indications of such viability. Several writers have come up with various sets of these indicators in order to assess the agricultural system's three-dimensional sustainability. The proposal was made by Rao and Rogers.

Table 1. Selected sets of variables for agricultural sustainability index

Economic variables	Social variables	Ecological variables
Productivity of food grains (kg/ha)	Community managed institutions (SHGs/ 10000 population)	Population density (#/sq. km) Forest cover (%)
Value of agriculture output (Rs/ha, crops only)	Area under marginal and small holdings (%)	Cropping intensity (%)
Per capita income (Rs/head) Female work participation rate (%)	Human development index (HDI)	Livestock density (per sq. km) Poultry (per sq. km) Groundwater draft (% of exploited and critical sources)

approach that is considered to be state-of-the-art in environmental, rural livelihoods, and agricultural sustainability assessments, as well as a framework for the evaluation of agricultural sustainability. The development of a three-dimensional agricultural sustainability index has already made use of a number of the elements that make up this index. The district-level sustainability indices in Odisha were analysed by Hatai and Sen, who used a variety of economic, ecological, and social factors in their research. This necessitates the utilisation of data derived from primary as well as secondary sources. The sets of variables

ISBN: 978-93-83302-57-4

that are shown in Table 1 were ultimately chosen for the purpose of calculating agricultural sustainability indices. This decision was reached after an examination of the relevant body of research as well as the availability of data at the state level. At the same time, some indicators such as soil health, the area of degraded lands, the level of mechanisation, agricultural labour supply, and others were not taken into account despite the fact that they are vital to the concept of sustainability. This was primarily the case because there was a lack of authentic disaggregated data. The specific importance, relevance, influence, and inter-relationship of each of the selected indicators within the complex agro-economic, geographic, and demographic environment across the states served as the basis for the selection of the indicators for the three-dimensional agricultural sustainability analysis. This was done to ensure that the most accurate results would be obtained from the analysis. The area under small or marginal holdings, human population density, animal density, and groundwater status were the only variables that were assessed to have a negative influence on sustainability. All other indicators were considered to have a positive affect on sustainability. The following are the specifics regarding the indicators:

Productivity of Food Grains

The food-grain productivity of a given household, area, or state will explain the economic autonomy of that family, region, or state in terms of the food that is available locally. In light of this, this unavoidably plays a part in the process of determining the sustainability indexes. The more the production on an ongoing basis, the greater the strength of the economic components will be. This is expressed as a number of kilos produced per hectare for the most important cereal grains in a certain state.

Value of Agricultural Output

The value of agricultural output (measured in rupees per hectare), which is used to determine profits from agriculture. These were taken into consideration for both time periods, namely 2001 and 2011, with prices held constant throughout (2004–05 base year). A higher rating often indicates stronger economic sustainability, and hence better agricultural sustainability. It has been amply demonstrated that the effect of this variable on agricultural stability, and therefore on rural poverty, is significant.

Per Capita Income

The state's gross domestic product for a given year is then divided by that state's population to get at an estimate of the average income of the people living in that state. Although agricultural revenue measured in terms of the value of production does contribute to the per capita income, this contribution is not as large as that made by the other two sources of income at the macro level, such as the money generated by the industrial and services sectors. Additionally, at the national level, the percentage of revenue from nonagricultural sources is about 86%; hence, the indicator of income per capita was also taken into account while doing the estimation. This was computed based on the two periods, with prices held constant throughout the calculations (2004–05). It is well established that non-agricultural industries, in addition to agriculture, play an important part in the fight against rural poverty. As a result, this was chosen to be one of the markers for the agricultural sector's long-term viability.

Female Work Participation Rate

The employment rate is a good indicator of the general status of a family or region as well as the overall health of a state. However, the employment rate of women, as measured by their work participation, is a better indicator of the strength of the economy. This is because women make up half of the population. In addition, an indicator of social development that fits into the overall agricultural sustainability and, consequently, general economic growth in a developing nation is the empowerment of women. This can

ISBN: 978-93-83302-57-4

be accomplished through better employment opportunities for women or through their participation as labour.

Community Managed Institutions

Self-help groups, often known as SHGs, have progressively developed into revolutionary organizations in India's social and economic landscape. They have been playing an important role in the field of microfinance, which is helpful for agricultural operations as well as the non-farm sector. In addition to this, the role that SHGs have been playing in the development of rural areas has been extremely important. It was determined that one of the social variables should be represented by the number of SHGs that existed for every 10,000 people in the population. SHGs that participate in development activities have the ability to empower their members by supplying them with the knowledge, skills, and motivation necessary to practise sustainable agriculture.

Area Under Marginal/Small Holdings

The bulk of India's land is held by marginal and small farmers, who tend to have smaller plots. The degree of social equality and safety may be inferred from the territory that they hold and/or operate. Because of this, the percentage of agricultural land area that was possessed by these types of farmers was taken into consideration in the research. This was considered to be a variable that has the potential to have a negative affect on sustainability due to the rise in the number of holdings as a result of fragmentation and subdivision, which makes agriculture even less scale-optimal.

Human Development Index

The life expectancy, literacy, and income indices are the three components that go into the calculation of the human development index (HDI), which is then used to rank nations. As a result, the HDI was utilised in the context of the social component of agricultural sustainability. This indication works in both directions. It functions as both a causative and a consequent indicator, given that having access to more viable means of subsistence, such as agriculture, would lead to an increase in HDI. On the other side, the influence on sustainability would also be better with a better baseline HDI, and as a result, the same was taken into account as a social component of agricultural sustainability.

Population Density

The amount of ecological demand and stress placed on any given region's ecosystems may be directly correlated to the human population density in that region. Therefore, the population density (number of people per square kilometre) was taken as one of the ecological variables and as a variable that has a negative influence on agricultural sustainability in the Indian context. This is due to the fact that India already has a higher density than the rest of the world, which only has 47 people per square kilometre on average.

Forest Cover

Forests are the primary biological systems that are responsible for determining the overall health of dependent systems such as agriculture because of the ecosystem services that they provide. As a result, the proportion of land covered by forests relative to the total land area was selected as a factor that favourably influences agricultural sustainability.

ISBN: 978-93-83302-57-4

Cropping Intensity

The many kinds of crops that are cultivated in agriculture will reveal whether or not there is a balance and whether or not there is room for adaptation to natural risks and climate change. This is expressed as a percentage of the total cropped area relative to the total area that was farmed. In addition to this, it shows the sequence of crops that are grown on the same plot of land over the several growing seasons. As a result of the fact that it takes into consideration crop diversity, balance, and succession plans, it is regarded as an ecological dimension indicator that has a favorable influence on agricultural sustainability.

Results and Discussion

Growth Rates and Value Of Output

The agricultural growth rate, which takes into consideration the incremental advancement in the value relating to contribution from various agricultural sub-sectors, is one of the indicators that may be used to determine how healthy the agricultural sector is. During the first reference period, which ran from 1996–1997 to 2000–2001, the total growth rate of Indian agriculture was 2.79 percent per year. During the second reference period, which ran from 2006–2007 to 2010–2011, that rate improved to 3.89 percent per year (Table 2). Bihar had the greatest growth rate among the states during the first reference period with 11.62 percent, while Rajasthan had the highest growth rate during the second reference period with 9.42 percent. Some states' economies shrank during the first reference period, but then rebounded to post positive growth during the second period. Under the two time periods in question, Kerala's economy saw a growth rate that was first flat, then declining. Only Andhra Pradesh (undivided), Himachal Pradesh, Karnataka, Maharashtra, and Uttar Pradesh had sustained positive development, which is an indication of the sector's vitality. When compared to the first reference period, the results for the second reference period showed a rise of 12% in absolute terms (value of agricultural output at constant prices). This increase was pan India-wide (Table 3). During the period from 2001 to 2011, the economies of Gujarat, Jharkhand, Andhra Pradesh, Madhya Pradesh, Odisha, Himachal Pradesh, and Chhattisgarh all grew by more than 20%. Uttarakhand grew by more than 30%. However, the per capita values were the greatest in Punjab, followed by Haryana; both of these states' values were more than 20 times greater than the average for the country.

ISBN: 978-93-83302-57-4

Table 2. Growth rate of agriculture across states in India: 1996/2011

State	Average growth/year (%)	
	1996/97–2000/01	2006/07–2010/11
Andhra Pradesh	5.11	5.06
Assam	−0.55	3.27
Bihar	11.62	6.14
Gujarat	−1.22	4.35
Haryana	2.8	5.01
Himachal Pradesh	3.09	2.93
Karnataka	3.18	6.41
Kerala	0.82	−2.69
Madhya Pradesh	−2.21	3.77
Maharashtra	2.26	6.22
Odisha	−1.58	3.62
Punjab	2.86	2.01
Rajasthan	1.13	9.42
Tamil Nadu	3.41	4.07
Uttar Pradesh	3.43	2.81
West Bengal	2.79	2.16
Jharkhand	2.75	6.6
Chhattisgarh	−7.13	6.77
Uttarakhand	2.02	3.42
India	2.79	3.89

Source: Authors' calculations from Planning Commission data, Government of India.

The agricultural production growth rates and absolute values of numbers provide some indication of the comparative position, vividly portraying the resource base and the factor productivity. However, in order to include the long-term viability of the sectors, it is necessary to get an understanding of the many components and the relative positions they hold.

Sustainability

Tables 4 and 5 give the values of various indicators considered under three components of sustainability index for 2001 and 2011 respectively.

Ecological Indicator

West Bengal, Bihar, and Kerala had a greater population density in 2001 than the other major states for which the research was done. This meant that there were more people living in each square kilometre. By 2011, Bihar has surpassed West Bengal as the state with the greatest population density. According to the National Forest Policy, the states of Uttarakhand, Chhattisgarh, Kerala, and Assam all had forest cover in the year 2001 that met the criteria for being desirable (one-third of geographical area). On the other hand, during that year, less than 10% of the land area of six different states, including Haryana, Rajasthan, Punjab, Uttar Pradesh, Bihar, and Gujarat, was covered by forests. Even after a decade, in 2011, the situation was more or less the same, although there was a slight improvement in some states.

ISBN: 978-93-83302-57-4

Table 3. Per capita annual average value of agricultural output (Rs 2004–05 prices)

State	1999–2000 to 2003–04	2006–07 to 2011	% Change
Andhra Pradesh	7312	10119	28
Assam	5540	5961	7
Bihar	3532	3398	–4
Gujarat	5993	9040	34
Haryana	11913	12793	7
Himachal Pradesh	8627	11029	22
Karnataka	7973	7845	–2
Kerala	7588	7024	–8
Madhya Pradesh	5472	7105	23
Maharashtra	6975	7685	9
Odisha	4962	6441	23
Punjab	15703	16184	3
Rajasthan	7004	8207	15
Tamil Nadu	4943	5683	13
Uttar Pradesh	5386	5935	9
West Bengal	7338	7541	3
Jharkhand	2465	3757	34
Chhattisgarh	5697	7247	21
Uttarakhand	6189	7870	21
India	6277	7169	12

Note. Estimates arrived based on secondary data of the planning Commission, GoI.

Intensity of cropping: In 2001, states like as Punjab, Haryana, West Bengal, Himachal Pradesh, Uttarakhand, and Uttar Pradesh had a greater intensity of cropping than other states, with over 150% of their land under cultivation. A higher intensity indicates efficient use of land area, which may be accomplished by covering the land with at least one crop and making effective use of the water that is available. This had greatly grown in these states during the course of the subsequent 10 years, and there was also a general growth across the entirety of the other states.

West Bengal had the greatest livestock density in the country in 2001, with the most animals crammed into each square kilometre of land there. This was followed by Bihar, Uttar Pradesh, and Haryana. In the subsequent ten years, there was a little shift in this circumstance as the states of Andhra Pradesh, Assam, Tamil Nadu, and Jharkhand joined the ranks of other states that had a population density of 200 or more. The density of poultry may be broken down into two categories: the backyard and the commercial. During the year 2001, the total poultry population (number of birds per square kilometre) in the states of Kerala, Tamil Nadu, and Andhra Pradesh was greater than in other parts of the country. This pattern continued in 2011 with some slight improvements. The state of the groundwater The level of groundwater in an agricultural region reflects the net balance that is available after exploitation for agricultural and other purposes, as well as the recouping that takes place as a result of rainfall in that area and subsurface flow from other places. It is possible to deduce, on the basis of the data published by CGWB in the states for the two time periods and the overexploitation and critical nature categories of groundwater status, that the situation is alarming in Rajasthan, Punjab, and Haryana, particularly as a result of the use of groundwater without discrimination in the most recent ten years. This conclusion is based on the data that was collected in the states by CGWB. This observation has been supported by a number of research as well.

ISBN: 978-93-83302-57-4

Conclusion

It has been observed that the practice of sustainable agriculture is of quite significant importance for a developing nation like India because it increases productivity, efficiency, and employment while also providing guidance to reduce the practices that degrade other natural resources and cause damage to the quality of the soil and water resources. Its primary objective is to implement specialisation and make use of tools that are kind to the environment in order to both protect and maintain the environment and raise the level of production in a manner that does not cause damage to the environment. When we look at the performance of India's agricultural sector, it will be very easy for us to observe that the country's agricultural output has significantly improved over the course of the past few years. The ecological, economic, and social indicators of a number of distinct states that are part of the Indian Union over a couple of different time periods The entire agricultural sustainability index may now be calculated thanks to the newly created technique. In 2001, it was discovered that Himachal Pradesh came in first, followed by Punjab in second place. The states of Bihar, Uttar Pradesh, and Jharkhand rounded up the bottom three positions. Himachal Pradesh was able to secure the number one spot once again in 2011. The states of Kerala and Punjab, in that order, took the second and third places, respectively. The final three spots were exactly the same as they were in 2001. Although worries are arising due to the indiscriminate exploitation of some natural resources that harm the agriculture sector in the long term, sustainability did not worsen in general throughout the 19 major states of India that were evaluated over the 10-year period of reference in India. This points to two different things: either the reference period is too short, or the worries about sustainability are probably unwarranted and need to be investigated further. Both of these possibilities warrant additional investigation.

Reference

Dev, S. Mahendra (2008), Inclusive Growth in India, Agriculture, Poverty and Human Development, Oxford University Press, New Delhi.

Mishra, V.N. and Rao, Govinda (2003), Trade Policy, Agricultural Growth and Rural Poor: Indian Experience, 1978-79 to 1999-00, Economic and Political Weekly, October 25, 2003.

Food and Agriculture Organization (FAO) (2010), "Payments for Environmental Services within the Context of the Green Economy," Background Report No. 3.

Bosshaq, M. R., Afzalinia, F. and Moradi, H., Measuring indicators and determining factors affecting sustainable agricultural development in rural areas – a case study of Ravansar, Iran. Int. J. Agric. Sci., 2012, 2(6), 550–557.

Roy, R. and Chan, N. W., An assessment of agricultural sustainability indicators in Bangladesh: review and synthesis. Environmentalist, 2012, 32, 99–110.

Lin, Z. and Routray, J. K., Operational indicators for measuring agricultural sustainability in developing countries. Environ. Manage., 2003, 32(1), 34–46.

Pretty, J., Agricultural sustainability: concepts, principles and evidence. Philos. Trans. R. Soc. London, Ser. B, 2008, 363, 447–465.

Rasul, G. and Thapa, G. B., Sustainability of ecological and conventional agricultural systems in Bangladesh: an assessment based on environmental, economic and social perspectives. Agric. Syst., 2004, 79, 327–351.

ISBN: 978-93-83302-57-4

Van Cauwenbergh, N. et al., SAFE – a hierarchical framework for assessing the sustainability of agricultural systems. Agric. Ecosyst. Environ., 2007, 120, 229–242.

Nambiar, K. K. M., Gupta, A. P., Fu, Q. and Li, S., Biophysical, chemical and socio-economic indicators for assessing agricultural sustainability in the Chinese coastal zone. Agric. Ecosyst. Environ., 2001, 87, 209–214.

Karami, E., Agricultural extension: the question of sustainable development in Iran. J. Sustain. Agric., 1995, 5(1/2), 61–72.

Hayati, D. and Karami, E., A proposed scale to measure sustainability at farm level in socio-economic studies. In Paper presented at first agricultural economic conference, Zabol, Iran, 5–7 April 1996.

Herzog, F. and Gotsch, N., Assessing the sustainability of smallholder tree crop production in the tropics: a methodological outline. J. Sustain Agric., 1998, 11(4), 13–37.

ISBN: 978-93-83302-57-4