

**Sustainable Agricultural Growth in India -Issues and Challenges**

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**Introduction-**

What are the measures for sustainable agricultural growth in India. Sustainability is a practice that is free from all the ill effects of past and present agricultural systems. Sustainable agriculture involves the use of most preferable energy sources like hydropower, wind farms or solar power which are eco-friendly. You can use the solar panels for heating systems and also for run pumping. In addition, hydroelectric power derived from river water can be used for various agricultural machinery. Sustainable agriculture practitioners seek to integrate three main goals into their work: a healthy environment, economic profitability, and social and economic equity. Food processors, distributors, producers, retailers, consumers and waste managers can play a role in ensuring a sustainable agricultural system. In addition, it is helpful in reducing greenhouse gas emission and conserving energy. Sustainable Agriculture is farming in a way that allows for more effective use of natural resources, reduces the environmental impact of agriculture, and increases capacity for climate change and climatic variability adaptation without endangering the ability of present or future generations to meet their own needs. Understanding ecological services may serve as the foundation of sustainable agriculture.

**Objective-**

what is sustainable agriculture

What are sustainable agricultural methods

What are the benefits of sustainable agricultural methods

what are the issues regarding sustainable agricultural growth

- Sustainable agriculture is the practise of producing enough food to meet current needs without jeopardising future generations' ability to meet their own needs, such as by depleting soil fertility or irreversibly harming the environment.
- It combines three major objectives: environmental health, economic profitability, and social equity.
- It is regarded as a method of farming that uses manure, rotates the crops, uses little tillage, and relies as little as possible on artificial fertilizers, pesticides, and antibiotics.
- It is a well-balanced system of managing renewable resources, such as soil, wildlife, forests, crops, fish, livestock, plant genetic resources, and ecosystems, without compromising their productivity or ability to provide ecosystem services or food for present and future generations.
- Sustainable agriculture must stop soil erosion and land degradation. It must use biological and cultural techniques to

replace nutrients and manage weeds, pests, and illnesses.

- The biggest problem endangering agriculture's sustainable development is the degradation of natural resources.

**Definitions-**

**Sustainable**

Agriculture is farming in sustainable ways meeting society's present food and textile needs, without compromising the ability for current or future generations to meet their needs.

It can be based on an understanding of ecosystem services. There are many methods to increase the sustainability of agriculture. When developing agriculture within sustainable food services, it is important to develop flexible business process and farming practices.

Agriculture has an enormous environmental footprint, playing a significant role in causing climate change, are responsible for one third of the anthropogenic GHG emission, water scarcity, water pollution, land degression, deforestation and other processes, it is simultaneously causing environmental changes and being impacted by these changes. Sustainable agriculture consists of environment friendly methods of farming that allow the production of crops or livestock without damage to human or natural systems. It involves preventing

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adverse effects to soil, water, biodiversity, surrounding or downstream resources—as well as to those working or living on the farm or in neighbouring areas. Elements of sustainable agriculture can include permaculture, agroforestry, mixed farming, multiple cropping, and crop rotation.

**Sustainable agriculture methods-** There are many promising practices in Sustainable Agriculture-

1. Crop rotation
2. Permacultures
3. Cover Crops
4. Soil Enrichment
5. Natural Pest Predators
6. Bio intensive Integrated pest Management
7. Polyculture Farming
8. Agroforestry
9. Biodynamic Farming
10. Better water management
11. Floating Farming
12. Contour Farming
13. Conservation Agriculture
14. Precision Farming
15. System of rice intensification
16. Organic Farming
17. Crop rotation and intercropping
18. Rain water harvesting and artificial Recharge of Ground water

### **1. Crop Rotation**

Crop rotation is the most preferable technique of sustainable agriculture. However, its purpose is to avoid the consequences of planting the same crop in the same soil for consecutive years. This helps to combat pest problems, as many pests prefer specific crops. In addition, rotation breaks the insect's reproductive cycle. During rotation, farmers can plant certain crops that supplement the plant's nutrients. Rotation breaks the reproduction cycles of pests. During rotation, farmers can plant certain crops, which replenish plant nutrients. However, these sustainable crops minimise the need for chemical fertilisers.

### **2. Permaculture**

Permaculture is a food production system designed for smart farming to reduce waste of resources and increase production efficiency. Also, these design techniques consist of growing grain without tillage, herb and plant spirals, keyhole and mandala

gardens, hoop culture garden beds, sheet mulching, each plant serving multiple purposes.

### **3. Cover Crops**

Many farmers choose to plant crops in one field at all times and never leave it barren; also, this may cause unintended consequences. The farmer can achieve his goals of preventing soil erosion, enhancing soil quality and also suppressing the growth of weeds through plant cover crops like clover or oats. The cover crop's use also reduces the need for chemicals like fertilisers.

### **4. Soil Enrichment**

Soil is a central component of the agricultural ecosystem. Good soil can help increase yields as well as produce stronger crops. It is possible to maintain and also helpful in enhance soil quality in several ways. Some examples include the release of crop residues into the field after harvest and also include the use of composted plant material or animal manure.

### **5. Natural Pest Predators**

To maintain effective control of pests, it is a core factor to view the farm as an ecosystem instead of a factory. For example, many animals and birds are natural predators of agricultural pests. Therefore, manage your farm so that it can harbour populations of these insect predators. However, chemical insecticides can lead to the indiscriminate killing of insect predators.

### **6. Bio intensive Integrated Pest Management**

Integrated Pest Management is an approach dependent on biological instead of chemical methods. The IMP also stresses on the importance of crop rotation to tackle pest management. Once the pest problem is identified, IPM will ensure that chemical solutions are used only as a last resort.

### **7. Polyculture Farming**

Polyculture farming technique is similar to crop rotation which tries to follow natural principles to get the best yield. Therefore, it engages in growing multiple crop species in one region. Also, these species generally complement each other and help bring out a greater variety of products on the same plot while fully utilising the available resources. The high biodiversity makes the polyculture sustainable farming system more flexible to seasonal fluctuations..

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### **8. Agroforestry**

Agroforestry has become a strong tool for farmers in arid regions with soils prone to desertification. Also, it engaged in the growth of trees and shrubs among crops or grazing land and agriculture. And it is forestry practices for long-lasting, productive and diverse land uses when approached sustainably.

### **9. Biodynamic Farming**

Biodynamic farming incorporates holistic and ecological growing practices based on the “anthropology” philosophy. In addition, it focuses on implementing practices like composting application of animal manure, supplementary crops or rotating cover crops. Also, these practices generate the soil fertility necessary for food production.

### **10. Better Water Management**

The foremost step in water management is the choosing of the right crops and also local crops are selected which are suited to the weather conditions of the area. In addition, crops that do not require a lot of water should be selected for dry areas.

**11. Floating Farming-** Floating agriculture is a way of utilizing areas which are waterlogged for long periods of time in the production of food .The technology is mainly aimed at adopting to more regular or prolonged flooding.The approach employs beds of rotting vegetation ,which act as compost for crop growth.

**12. Contour Farming-**Contour farming is the practice of tilling ,planting ,and other farming operations performed on or near the contour of the field slope. This method is most effective on slopes between two and ten percent .Tillage and planting operations follow the contour line to promote positive row drainage and reduce ponding.

**13. Conservation Agriculture-**Conservation agriculture is a farming system that can prevent losses of arable land while regenerating degraded lands. It promotes maintenance of a permanent soil cover ,minimum soil disturbance and diversification of plant species.

**14. Precision Farming-** Precision agriculture is the science of improving crop yields and assisting management decisions using high technology sensor and analysis tools. Precision farming is a new concept adopted thought the world to increase

production ,reduce labour time and insure the effective management of fertilizers and irrigation processes .

**15. System of rice intensification-**The system of rice intensification is the farming methodology aimed at increasing the yield of rice produced in farming. It is a low -water, labour intensive method that uses younger seedlings singly spaced and typically hand weeded with special tools.

**16. Organic Farming –** Organic farming is an agricultural system that uses fertilizers of organic origin such as compost ,manure ,green manure and bone meal and places emphasis on techniques such as crop rotation and companion planting .Biological pest control ,mixed cropping and the fostering of insect predators are encouraged.

**18. Rain water harvesting and artificial Recharge of Ground water-** Rain water harvesting is the simple process or technology used to conserve rainwater by collecting storing, conveying and purifying of rain water that runs off from rooftops ,parks, open grounds ,etc. For later use .The process of rain water harvesting involves the collection and the storage of rainwater with the help of artificially designed systems that run off naturally or man-made catchment areas like the rooftop ,compounds ,rock surface ,hill slopes, artificially repaired impervious or semi -pervious land surface.

### **Benefits of Sustainable Agriculture**

- **Environmental Protection:** Sustainable agriculture places a strong emphasis on techniques and procedures that raise soil productivity while reducing negative effects on the environment, including the air, water, biodiversity, and climate.
- **Saving Energy:** It emphasizes minimizing the usage of petroleum-based products and other inputs and substituting them with those derived from renewable resources.
- **Food Security:** It aims to ensure that the basic dietary needs of the present and future generations are satisfied, both in terms of quantity and quality.
- **Economic Profitability:** It not only provides a sustainable rise in agricultural output, but also lessens the sector's susceptibility to perilous social and

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economic elements, such as sharp price swings, and other risks.

- **Economic and Social Equity:** It aims to provide those working in the agriculture value chain with stable employment, a living wage, and respectable living and working conditions.
- **public health protection:** Sustainable agriculture promotes public health protection, as it promotes less use of chemicals. Natural farming promotes organic farming which helps to protect public health of common man.
- **prevents pollution-** It aims to prevent pollution as real time monitoring on air parameters and air distribution systems to enhance air quality.
- **Stop air pollution-** Sustainable farming discourages the use of machinery, WHO (2002) estimates that 1.6 million people die each year globally, so it's very important for agricultural sector to adopt sustainable agricultural policies.
- **Stop soil erosion-** By eliminating tillage managing irrigation systems to reduce runoff, and planting more plants or mulch, it stops soil erosion.
- **Cost Reduction-** Instead of using pesticides and other harsh chemicals and synthetic fertilizers, manure and organic waste can be turned in to fertilizers, it reduces cost of farming.
- **Biodiversity-** Applying earth-friendly and sustainable farming practices like crop rotation helps enrich the soil and prevents disease and pest outbreaks.
- **economically beneficial for farmers –** It is a cost-effective farming solution. Hydroponics system allows farmers to maximise garden space and so the farmer can grow more and plant all around. With small farming and sustainable agriculture it develops social equality, improves food production, improves environmental health, high production benefits and low-cost production, optimized resources use and conservation and reduce environmental damage.

### Sustainable Agriculture - Principles

- **Environmental Sustainability:** Sustainable

environmental practices include safeguarding, recycling, replacing, and sustaining the natural resource base, which includes the land (soil), water, and animals.

- **Economic Sustainability:** Economic sustainability is achieved through enhancing crop rotation and soil management, which increases yields.
- **Social Sustainability:** Maintaining social justice and cultural unity is essential for achieving social sustainability.

### Sustainable Agriculture - Different Methods

- **Crop Rotation:** Crop rotation is the methodical planting of various crops in the same growing space over a period of years, in a specific order. It contributes to the preservation of soil nutrients, the reduction of soil erosion, and the prevention of pests and diseases in plants.
- **Planting Cover Crops:** Cover crops are planted in bare soils that could otherwise remain there throughout the lean seasons. By preventing erosion, restoring soil nutrients, and controlling weeds, these crops safeguard and improve soil health, lowering the demand for pesticides.
- **Biointensive Integrated Pest Management (IPM):** It focuses on the use of crop rotation to prevent pest issues, the reintroduction of disease-fighting, naturally occurring microorganisms into plants and soil, and the discharge of beneficial organisms that feed on pests. There is no use of chemical pesticides.
- **Agroforestry:** It entails the development of trees and shrubs alongside agricultural or grazing land. For long-lasting, fruitful, and varied land use, agroforestry systems can mix both agricultural and forestry techniques.
- **Permaculture:** The term "permaculture" refers to a planned system of farming and habitation that tries to emulate the interdependencies and sustainability of natural ecosystems. The goal of permaculture is to maximize the use of land so that it can be used productively.



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for food production or personal subsistence by future generations.

- **Organic Farming:** Organic farming is a farming method that focuses on cultivating the land and raising crops in a natural manner. It aims to keep the soil alive and healthy by using organic wastes (crop, animal and farm wastes, aquatic wastes) and other biological materials, as well as beneficial microbes (biofertilizers), to release nutrients to crops for increased sustainable production in an environmentally friendly, pollution-free environment.
  - **LEISA (Low External Input Sustainable Agriculture):** Low-synthetic insecticides and fertilizers are used. By placing more focus on cultural practices, IPM, and the use of agricultural resources and management, yields are maintained.
  - **Zero Budget Natural farming:** Natural farming on a "Zero Budget" means that no credit is used and that no money is spent on input purchases. Natural farming entails using only natural methods and no chemicals.
  - **Biodynamic agriculture:** In biodynamic farming, the farm is viewed as a living system. The integration of animals to form a closed nutrient cycle, the impact of agricultural planting dates in relation to the calendar, and awareness of spiritual forces in nature are all highly valued components of the system.
  - **Conservation Agriculture:** Permanent organic mulch cover, a longer crop rotation, and a significant reduction in tillage are all components of this agricultural technique.
- Sustainable Agriculture - Challenges**
- **Organic Farming and Food Security:** As the world's population continues to expand, there is growing concern about our ability to support the current level of population. Switching to organic farming often results in a substantial decline in yields when compared to intensive farming. As a result, organic farming will need to be integrated with other sustainable production techniques in order to feed the globe in its current state.

- **Feasibility of Conservation Agriculture for Soil Management:** Since conservation agriculture does not include ploughing, it calls for modifications to weed control practices, the use of herbicides, and specialized equipment for sowing. The adoption of conservation agriculture by smallholders in developing nations is difficult. As a result, this practice has been mostly centered in North America, Europe, and Australia.
- **Issues with Small Land Holdings:** A lot of academics and environmentalists argue that cultivation based on small holdings is more environmentally friendly and sustainable than intensive, industry-based production models. However, smallholders can also harm the soil and the ecosystem due to a lack of knowledge and access to contemporary sustainable farming methods. These practices are not only typical of industrial or intense large agricultural operations.
- **Debate on High Yield Variety (HYV) Seeds Usage:** High-yielding hybrid seeds are recognized to be risky for both human and environmental health, as well as being unsustainable economically for farmers. However, given the growing worry about food security, these seeds are vital to boost output.
- **Use of Chemical Pesticides:** It might not be possible to totally abandon chemical pesticides given the rising frequency of insect infestations and resulting crop loss. Less toxic substances should be utilized instead of excessive amounts of chemical pesticides.
- **Rising Population and Degraded Ecosystems:** Growing populations and damaged ecosystems have made intensive, conventional farming (using HYV seeds and chemical fertilizers) and deforestation more resilient.
- **Lack of Capital:** Large portions of the agricultural community (small and medium farmers) lack the funds necessary to make the switch to sustainable agricultural production.
- **Lack of Access to Information & Technology:** There is a lack of access to information and technology to enhance

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agriculture practices, processing, and marketing of agricultural products.

- **Lack of Economic Incentives:** Farmers are uncertain of the benefits of switching to sustainable farming due to a lack of economic incentives.
- **Lack of Public Policy & Infrastructure:** Public policies and fundamental infrastructure are insufficient to encourage the use of sustainable agriculture methods.
- **Drop in yields in initial years:** As farmers shift from “conventional” farming that involves use of synthetic chemical nutrients and plant protection measures to sustainable agricultural practices, which depend on natural inputs, crop yields tend to drop in the initial years. New practices are emerging to ensure multi-season and diversified cropping, which would reduce the economic impacts of a yield drop. However, these are still in the nascent stage.
- **Increased drudgery :** Sustainable practices increase the workload of farmers considerably. There is increased drudgery in collecting materials for preparing natural nutrients and natural plant protection materials. Sustainable farming may increase the workload on women and older workforce. Agriculture is already rapidly relying on women and older labourers. Thus, the burden of drudgery falls heavily on them when households adopt sustainable practices. Currently there are no systems in place for collective manufacturing of these materials. And it's a moot point if the efforts to promote more sustainable practices which are more labour-intensive lead an already-reluctant young man to enthusiastically take up farming.
- **Availability and access to necessary materials :** Natural nutrients and plant protection materials require animal waste, cow urine, leaves of certain plants and trees and other “waste” vegetative matter. Increasing mechanisation has resulted in smaller animal herds in villages, leading to scarcity of animal waste. Such is this scarcity, that cow urine markets are emerging in many regions. In vast tracts of dry land in the

country, vegetation is scarce. So the availability of leaves or other plant protection materials is a problem. Even vegetation for mulching is becoming hard to find. Increasing dairy production means that farmers use every possible piece of crop residue tends as dry fodder. Only the regions with extreme crop intensity experience the problem of surplus crop residue. And, for reasons explained later, farmers in these regions are the least likely to shift to sustainable practices .

- **Overall food sufficiency :** For decades, the national priority to achieve food security has driven the agriculture policy. However, we realised this goal at the cost of extremely unsustainable farming practices in the granaries of Punjab, Haryana, Western UP and North Rajasthan. If there's a large-scale shift to sustainable farming, or even a shift away from their paddy-wheat-paddy crop cycles, the current food surplus could evaporate in a few years. The essential foodgrain requirement has reduced over the years. This is mainly due to the reduction in manual labour from mechanisation, easier modes of transportation and other such conditions.
- **Political economy :** Even if the contours of this balancing act were understood and converted into actionable policies, the daunting compulsions of the political economy of very perverse policies that currently haunt Indian agriculture would need to be understood. While groundwater needs to be conserved and recharged, unchecked subsidies on farm electricity lead to extremely irresponsible water-drawl from aquifers. Subsidies on chemical fertilisers are both very expensive to the economy and deleterious to the goal of sustainable agriculture. Yet there is no way any government can actually reduce them. Efforts so far have been only to check misdirection of these subsidies. Most sensible economists will agree that the best way to help farm households is through direct income transfer schemes. Neither minimum support price on crops or waiver of loans or subsidies on inputs make economic sense.

***Agriculture Development towards Sustainability*****Sustainable Agriculture in India-Government Initiatives**

- **National Mission on Sustainable Agriculture:** One of the eight objectives listed in the National Action Plan on Climate Change (NAPCC) is the National Mission on Sustainable Agriculture. Its goal is to increase agricultural productivity, particularly in rainfed regions, by emphasizing integrated farming, managing soil health, and coordinating resource conservation.
  - **Paramparagat Krishi Vikas Yojana (PKVY):** The PKVY program intends to encourage commercial organic production by involving a group of farmers certified in organic farming (cluster farming).
  - **Network Project on Organic Farming of ICAR:** The Network Project on Organic Farming of the ICAR aims to compare the performance of significant agricultural systems that are peculiar to a given place under organic and conventional farming and evaluates the agronomic effectiveness of various production methods.
- Other Initiatives
- **Sustainable Sugarcane Initiative (SSI):** The Sustainable Sugarcane Initiative is a strategy for increasing sugarcane yields by using fewer seeds, less water, and the best possible use of fertilizers and land.
  - **System of Rice Intensification (SRI):** This agro ecological methodology alters how plants, soil, water, and nutrients are managed to increase the yield of irrigated rice. It is a time-consuming, low-water approach that uses younger seedlings spread apart. In the Indian Cauvery delta region, a variation of SRI known as the Kadiramangalam System of Rice Intensification is used.

**Strategies for Making Agriculture More Sustainable**

- **Appropriate production systems:** A shift in agricultural policy to match the agro-ecological resources is critical for sustainability. For example, in arid and semi-arid areas, promote dry land agriculture rather than input-intensive farming, and promote less water-intensive crops such as pulses and millets. Similarly, crops that require a

large amount of water, such as rice, can be relocated to other regions that are relatively more water-rich.

- **Polycultures and Crop Rotation:** Shifting farmers from monocultures to polycultures and crop rotation can reduce the need for fertilisers and pesticides. Such diverse systems are likely to be more productive, labour intensive, and provide enhanced ecosystem services, making them much more sustainable.
- **Emphasis on nurturing the soil:** Greater emphasis on soil nurturing rather than plants will provide greater benefits in terms of sustaining yields, improving ecosystem health, and carbon sequestration.
- **Promotion of Zero Budget Natural Farming:** Initiatives such as Zero Budget Natural Farming, with low external input and production costs, could help restore ecosystem health and diversify smallholder farmers' livelihoods.
- **Reducing food waste and promoting sustainable consumption patterns:** To reduce food waste, more investments are needed in post-production infrastructure, such as storage space in rural areas, as well as improved harvesting techniques and transportation.
- **National Mission on Sustainable Agriculture (NMSA):** In 2021, the Government announced that the National Mission on Sustainable Agriculture (NMSA) will make agriculture more productive, sustainable and lucrative. The National Mission on Sustainable Agriculture (NMSA) has a vision, "NMSA will cater to key dimensions of 'Water use efficiency', 'Nutrient Management' and 'Livelihood diversification' through adoption of sustainable development pathway by progressively shifting to environment-friendly technologies, adoption of energy efficient equipment, conservation of natural resources, integrated farming, etc." NMSA's vision also states, "NMSA aims at promoting location specific improved agronomic practices through soil health management, enhanced water use efficiency, judicious use of chemicals, crop diversification, progressive adoption

of crop-livestock farming systems and integrated approaches like crop-sericulture, agro-forestry, fish farming, etc.”

**Case Study-**

Within a year of using natural agricultural methods, villagers noticed a number of positive impacts. Previously reported health issues vanished. Farms practicing non-pesticide management boasted higher profits and fewer expenses. Sourcing, grinding and mixing natural repellents like neem seeds and chili peppers also created more jobs in the village. As farmers cultivated more land, technology like backpack sprayers helped them tend to crops more efficiently. Residents reported an overall improvement in their quality of life, from health to happiness to finances. As word spread, more and more farmers decided to shun chemicals. In 2004, Punukula became one of the first villages in India to declare itself completely pesticide-free. The village council even went so far as to request that pesticide salesmen stop soliciting. Soon, other towns and villages in Andhra Pradesh started practicing natural farming.

In the Krishna District of the state, Narala Rajashekhar Reddy became an organic farmer two years ago after observing his fellow villagers' health problems, which he attributed to chemical pesticides. Rajashekhar supports his household of eight financially by selling items from a makeshift shop in his home. He studied organic farming techniques from morning agricultural television shows and YouTube videos. Currently, only two crops (chili and cotton) grow in his village, but his goal is to start growing vegetables.

Even so, not all of his fellow villagers have taken up organic farming. “Since organic farming requires more attention, time and work, villagers find it difficult to keep up and opt for pesticides,” he explained. In 2012, the state government ran a local training program on zero budget natural farming techniques. For the last seven years, Veerabharao has

run a fully organic farm, growing sugarcane, turmeric and chili.

“Organic farming has a market. I get to decide the price of my products, unlike in chemical farming where the price is decided by the buyer,” Veerabharao explained.

It took three years for K. Narasimha Rao to start seeing comfortable profits from his organic farm, but now he is able to fix his price and sell directly to customers instead of relying on the markets. His belief in his organic mission kept him going through that initial difficult period. Narasimha's organic farm is now 90 acres. He grows gourds, coriander, beans, pulses, turmeric, eggplants, papayas, cucumbers, chili peppers and a variety of vegetables. He divides his land in half and grows marigold and castor as trap crops alongside his produce. In collaboration with the Food and Land Use Coalition (FOLU), CEEW (council for energy, environment and water), has given an overview of the current state of sustainable agriculture practices and systems (SAPSs) in India. India is aiming to scale-up SAPs, through policymakers, administrators, philanthropists, and other which represent a vital alternative to conventional, input-intensive agriculture. In idea these efforts identify 16 SAPSs – including agroforestry, crop rotation, rainwater harvesting, organic farming and natural farming – using agroecology as an investigative lens. In a conclusive understanding it is realised that sustainable agriculture is far from mainstream in India. Further proposals for several measures for promoting SAPSs, including restructured government support and rigorous evidence generation for benefits and implementation of sustainable farming are ongoing progress in Indian Agriculture. An example of initiatives in India towards exploring the world of sustainable farming has been set by the Sowgood Foundation. (WIKIPEDIA, 2022) It started by teaching primary school children about sustainable farming by helping them farm on small farm strips in suburban farmhouses and



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gardens. Today many government and private schools in Delhi, India have adopted the sowgood foundation curriculum for sustainable farming for their students. It is small hope to encourage sustainable farming, we have to go back our roots like zero waste, digging more ponds in villages, promotion of village industries will make possible sustainable growth of economy.

**Conclusion**

Sustainable agriculture must incorporate social, economic, and environmental sustainability, which is essential. With a growing population, depleting resources, and the growing threat of climate change, it will be impossible to meet future needs unless we transition to sustainable food and agricultural systems that ensure global food security, provide economic and social opportunities, and protect the ecosystem services on which our future depends.

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