

# Research and Development For Sustainable Development of Agriculture

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India has become one of the world's major producers of food grains, milk, spices, etc. though this has helped ensure physical food security to India, the progress remains prone to disruptions given the unsustainable agriculture practices.

About 54.6% of the total workforce in the country is still engaged in agriculture and allied sector activities, the share of agriculture and allied sectors in Gross value added of the country is 17.8% in 2019-20. These reflect what the importance of agriculture lies for the country, the sustainable development of agriculture will ensure steady progress.

The emerging issues for sustainable agricultural development include resource degradation and water security, increasing pressure on diminishing natural resources, low level of investment in agriculture R&D, growing population pressure on land leading to fragmentation of land etc.

The agriculture sector's future depends on how climate smart and sustainable agriculture practices are, and how the country prepares itself for adopting climate resilient varieties, improved agriculture practices and technologies through enhanced research and development interventions.

**Keyword:** Sustainable Development of Agriculture, Research and Development on Agriculture, Smart Agriculture, Sustainable Agriculture Process, AI, R&D.

## Introduction

According to Ashok Dalwai committee report on Doubling farmer income released in 2018 India expenditure on agriculture has remain historically low especially compared to other developing countries such as china, brazil and even lower than Bangladesh on the percentage of GDP expend on research and development on agriculture, India expenditure on agriculture research and development has revolved around 0.50% of the agriculture GDP of this about 90% is spend on day to day expenditure and salaries of institution related to research organization and universities.

As millions of indian depends upon agriculture for there livelihood either directly or indirectly, expenditure on research and development on agriculture requires special significance, To ensure sustainable agriculture development there is requirement of special importance given to technological aspect of agriculture and in other ancillary sector of agriculture like agriculture inputs and agriculture tools.

## Aim of The Study

The Objective of the study is to analyse the impact of research and development on production & productivity of agriculture and how it helps in sustainable process adoption and sustainable development of agriculture. Sustainability of agriculture stands on three pillars viz. Economic, environment and social development.

## Introduction

### Research And Development In The Agriculture Input Sector

The transition of the country from the stage of food deficit to food surplus has been possible only because of continuous focus on R&D in the agriculture input sector.

**SEED-** Production of breeder, foundation and certified seeds, drought resistant and hybrid seeds to sustain and improve agriculture.

**FERTILIZERS-** Neem coated urea, production of bio-fertilizers increased the area under organic farming, Nano fertilizers.

**AGRO CHEMICALS-** R&D has resulted in the manufacturing of various herbicides, pesticides and insecticides to protect the agriculture yield, integrated pest management has provided wider scope for sustainable agriculture process.

**IRRIGATION-** Focussing on new and innovative irrigation and fertigation techniques. Eg- Drip irrigation, sprinkler irrigation etc.

FARM MACHINERY AND EQUIPMENT- Balers, combines, Plows, power fillers, tractors, harvester, sprayers and planters etc have been highly helpful in increasing assertiveness of agriculture and subsequently higher production and productivity.

**Sustainable Agriculture Process**

The important word should be written so that your paper can be traced on internet on the basis of those words. (In case of Hindi papers, Keywords must also be given in English Language)

PILLARS OF SUSTAINABLE AGRICULTURE		
ECONOMIC	SOCIAL	ENVIRONMENT
<ul style="list-style-type: none"> <li>• High yield, productivity</li> <li>• Income generation</li> <li>• Reduced cost</li> <li>• Profit, GDP</li> <li>• Employment, Industry &amp; Trade</li> </ul>	<ul style="list-style-type: none"> <li>• Collaboration</li> <li>• Local Market</li> <li>• Community Development</li> <li>• Price Protection</li> <li>• Energy Saving</li> <li>• Transparency</li> <li>• Youth development</li> </ul>	<ul style="list-style-type: none"> <li>• Food Security</li> <li>• Food Quality</li> <li>• Food waste</li> <li>• GHG Emissions</li> <li>• Energy Saving</li> <li>• Water Footprints</li> <li>• Nutritional Security</li> </ul>

This would involve factors which will improve the shelf life of agriculture goods which will leads toward reduction in wastage of agriculture produce, it will not only enhance and strengthen agriculture goods issue but as well as help in the addressing burning issues like environmental and ecological degradation , land degradation, population growth and the threat emerging out due to resource scarcity.

There is requirement of adoption of innovative agriculture practices as these will led to reduction in wastage of agriculture produce ensuring higher livelihood generation, rural employment generation and help in maximizing the profit which will help in ambition of doubling farmer income by 2022.

**Smart Agriculture Practices For Sustainable Development of Agriculture**

Smart agriculture promotes sustainable agriculture, it is a global initiative to maintain sustainable agriculture through judicious use of improved and updated technology.

1. Geographical Information system- GIS is a system of capturing , storing , analyzing and managing data related attributes, It examines and analyses the wider range of agricultural related resources which are important parameters of crop productivity.
2. Artificial Intelligence & Automated equipment- The modern agriculture practice were well adopted by the ue of Artificial Intelligence, AI help in capturing images and identifying pest and plant disease for better administration of agriculture land, it sustainability led to reduction of workload on farmers reduction in fatigue of farmer etc in all it led to higher gain from agriculture activity. Robotics were also important sector for agriculture field which is employed highly in developed counties in developing countries too it getting adopted though slowly.
3. Farm Management Information System (FMIS)- Provides various information e.g.- data on soil sample, weather condition, sensor, data, maps, etc.  
 Analysis of such a detail information provided by FMIS is helpful in arriving at right farming decision and adoption of appropriate agricultural practices which helps in rising profit and reducing unremunerative nature of agriculture.
4. Blockchain technology- It is highly useful for agricultural trading and selling, resource management etc. It can be used in decentralized transactions , smart control and effective resource management like tracking , machinery maintenance or tracking other sensors and equipment.
5. Cloud based solutions- It help companies remotely monitor farms, interact with farmers , and make every crop transparent and traceable, It also help farner in learning and adoption of modern and advanced agriculture practices and improving production and productivity of farm goods subsequently leading to sustainable agriculture practices.
6. Mobile technology- Various mobile apps have been developed by government and independent agencies to provide real time information to farmers they are highly helpful in quick accessibility to information. Eg apps lile Trringo have brought revolution in farm equipment renting

process in India other apps are eg- Agri app , Iffco kisan app, agri media, farmBee, kisan yojana etc.

7. Virtual aggregators- Farmers can use the mobile platform for aggregation, and then leverage the volume to negotiate better prices with suppliers.
8. Dron technology – Drone perform multifarious work like application of pesticide , fertiliser, crop estimation, crop management, damage assessment of crop and prevention from hazards by ensuring availability of real-time information , today it's use of intensity is high in developed countries and getting steady acceptance and use in developing countries. However there are several limiting factor which prohibiting wider use of drone technology penetration , lack of skilled and qualified workers at the rural area , majority of farmers are small and marginal land holders which is further getting aggravated due to rising population and law of inheritance. The small size of farm holding make use of drone uneconomical at individual level.
9. Automated Equipment – Modern and automatic watering and irrigation system, precision agriculture, it will help in preventing wastage of water , under or over application of water issues can be addressed, the ground water level depletion concern can be addressed upto great level, it will also help in reduction of labour input these will led to development of sustainable agriculture process and subsequently sustainable development of agriculture.
10. IT based Network Aggregator – These are highly useful as they provide range of services to farmers like application of agriculture inputs, financial and government assistance. Technology advancement in agriculture re an important element to increase production and productivity there is requirement to enhance R&D share for agriculture by the government of India. The participation of private sector needs to be promoted for availability of higher fund and emplotment of new tools and practices which will accelerate the pace of development of sustainable agriculture.

However adoption of smart agriculture practices for development of Agriculture faces challenges these are:-

1. The capital intensive nature of Robotics.
2. High cost of procuring imported hardware components as well as training personnel.
3. Unavailability of skilled labour and sluggish adaptation of technology: most of Indian agriculture is carried out in the rural dominated regions which entail difficulty in convincing the farmers to trust the technology over traditional farming.
4. Repair and maintenance become an issue, especially in India, where reach of AI knowledge has not penetrated across the country.
5. Loss of various traditional, yet effectively resilient methods suitable for Indian agriculture.
6. Substitution of technology may put farmers out of their jobs and render difficulties to the already suffering state of unemployment.

### **Clean And Green Agriculture For Sustainable Agriculture Development**

Significant losses from vegetable and fruits processing industries have become a serious cause of concern for sustainable agriculture development, it has adverse effect on the environment. Agriculture research has paved the way for recycling, reduction and reuse of agriculture by products and wastes for sustaining the environment and social aspects.

Large scale waste are generated by agro based industries these waste can be utilised either for disposal to avoid contamination of both surface and ground water or they can be transformed in a bio-methane plant that needs additional input and generates compost which will be supplied to farmers promoting utilisation of biofertilizer leading to development of sustainable agriculture practices and promotion

**Conclusion**

Sustainable development of agriculture depend upon how government ensure the outreach of R&D in agriculture, how farmers quickly adopt and get sensitized about the modern R&D of agriculture technology.

Natural resources management, building climate resilience in agriculture, input use efficiency and transformation through technology intervention are important guiding lights for the agriculture sector going forward. Agriculture modernization can be effectuated only through research and education, sustainable development of agriculture depends on how well our farmers are sensitised about the recent advances in the R&D of Agri-Technology and their just applications towards efficient and effective management of agriculture inputs.

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