

Gist of

KURUKSHETRA

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Organic Farming



ORGANIC FARMING AND
NATURAL RESOURCE
MANAGEMENT

BIO FERTILIZERS
AND GREEN MANURES

HEALTH BENEFITS
OF ORGANIC FARMING

NEW TECHNOLOGIES
IN ORGANIC FARMING

WOMEN IN
ORGANIC FARMING

CSE 2018 Results

11 Ranks in Top 50

28 Ranks in Top 100

183 Ranks in the Final List



Rank 11
Pujya Priyadarshni



Rank 16
Dhodmise Trupti Ankush



Rank 21
Rahul Jain



Rank 24
Anuraj Jain



RANK 31
Mainak Ghosh



RANK 32
Sameer Saurabh



RANK 33
Awhale Manisha
Manikrao



RANK 36
Deepesh Kedia



RANK 39
Patil Hemanta Keshav



RANK 41
Alok Kumar



RANK 43
Akshay Agrawal



RANK 52
Prateek Singh



RANK 53
Sumit Kumar



RANK 56
Dileep Mishra



RANK 59
Chahat Bajpai



RANK 60
Anya Das



RANK 61
Girdhar



RANK 63
Vishal Sah



RANK 65
Preeti



RANK 70
Suraj Patel



RANK 72
Dilip Pratap Singh
Shekhawat



RANK 76
Akash Bansal



RANK 77
Shivansh Awasthi



RANK 80
Khushboo Gupta



RANK 81
Jay Shivani



RANK 85
Smit Santosh Lodha



RANK 89
Sawan Kumar



RANK 94
Jivani Kartik
Nagjibhai



RANK 106
Sushil Kumar

Incredible Results Since 2013

CSE 2017

5 Ranks
in top 50

34 Ranks
in top 100

236 Ranks
in the final list



Rank 3
Sachin
Gupta



Rank 6
Koya Sree
Harsha



Rank 8
Anubhav
Singh



Rank 9
Soumya
Sharma



Rank 10
Abhishek
Surana

CSE 2016

8 Ranks
in top 50

18 Ranks
in top 100

215 Ranks
in the final list



Rank 2
Anmol Sher
Singh Bedi



Rank 5
Abhilash
Mishra



Rank 12
Tejaswi
Rana



Rank 30
Prabhash
Kumar



Rank 32
Avdesh
Meena

CSE 2015

5 Ranks
in top 50

14 Ranks
in top 100

162 Ranks
in the final list



Rank 20
Vipin Garg



Rank 24
Khumanthem
Diana Devi



Rank 25
Chandra
Mohan Garg



Rank 27
Pulkit Garg



Rank 47
Anshul
Agarwal

CSE 2014

6 Ranks
in top 50

12 Ranks
in top 100

83 Ranks
overall selections



Rank 4
Vandana Rao



Rank 5
Suharsha Bhagat



Rank 16
Ananya Das



Rank 23
Anil Dhameliya



Rank 28
Kushaal Yadav



Rank 39
Vivekanand T.S

CSE 2013

5 Ranks
in top 50

62 Ranks
in the final list



Rank 9
Divyanshu Jha



Rank 12
Neha Jain



Rank 23
Prabhav Joshi



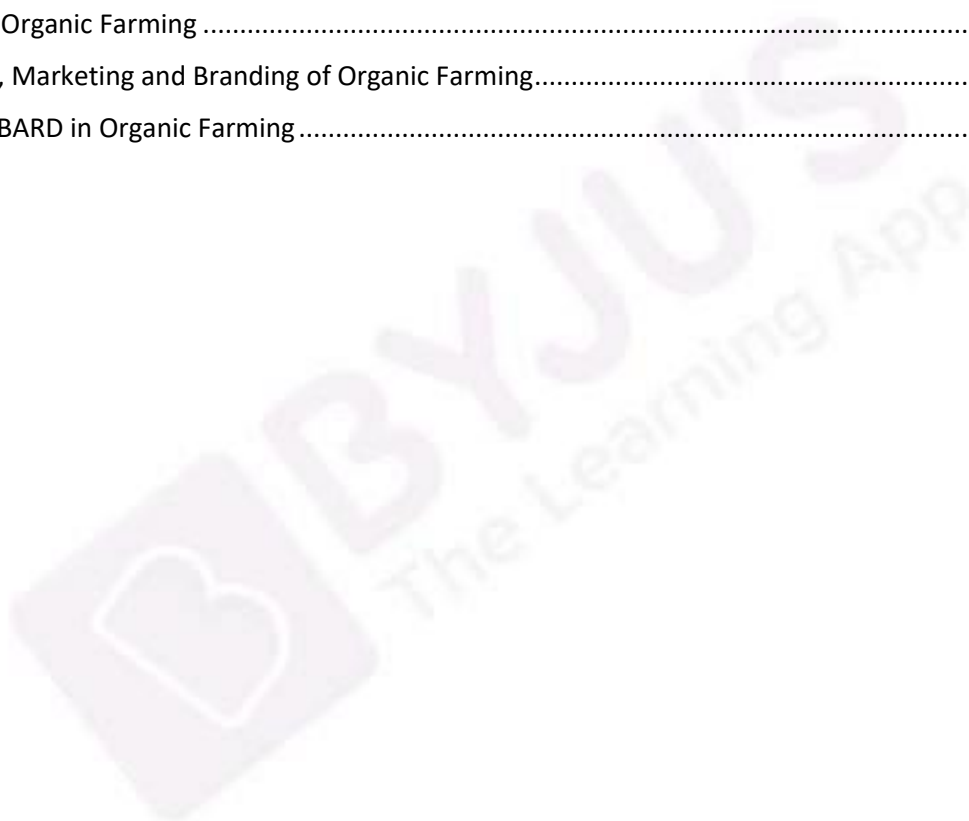
Rank 40
Gaurang Rathi



Rank 46
Udita Singh

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Chapter 1: Introduction

Green Revolution and the subsequent increase in grain productivity had a dramatic and far reaching impact. However, it led to an overuse of synthetic fertilizers and pesticides, and decreased the fertility of the soil gradually. Hence we are compelled to opt for 'organic farming' as a holistic production management system favourable to the environment.

- India has been following the system of organic farming since the ancient days.
- Organic farming is generally associated with a 'back to nature' movement.
- At present, organic farming has developed so much that it is not merely a throwback to previous eras but an alternative modern system of production. It relies solely on biological processes to obtain high quality produce.

What is Organic Farming?

- Organic farming involves various techniques such as crop rotation, vermicomposting, using green manure, biological pest control, etc. which are eco-friendly and enhance the fertility of the soil.
- In simplified form, it stays away from chemical fertilizers and pesticides and seeks to increase soil fertility through feeding the soil with residues such as garbage compost, sewage, manure, plant residues, food processing wastes, etc.

In India, there is a need to promote organic farming extensively by adopting strategies such as branding support, organic certification, etc. The market of organic produce is considered as a premium market which maintains high standards. These standards are to be followed in the entire value chain of production. India has the potential to become a major producer in terms of organic farming, given the global demand for our farm products, availability of different agro-climatic regions, huge domestic market and the long tradition of environment-friendly farming. There is also a wide scope for increasing organic practices in order to achieve the sustainable development of agriculture.

Chapter 2: Organic Farming

With rapid industrialization and exponential population growth, there has been a crunch for farmland in India. The proposition of organic farming in India's Rural Economy has the potential to arrest the problem.

Organic Farming:

- Definition given by the International Federation of Organic Agriculture Movements (IFOAM):
 - Organic farming is a production system that sustains the health of soils, ecosystems, and people.
 - It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects.
 - It combines tradition, innovation, and science to benefit the shared environment and promote fair relationships and a good quality of life for all the stakeholders.
- Definition given by the Codex Alimentarius Commission of the Food and Agriculture Organization (FAO):
 - Organic Agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity.

Principles of Organic Farming:

1. The Principle of Health: Sustain and enhance the health of soil, water, air, environment, animal, human and plant as one and indivisible.
2. The Principle of Ecology: Work with, emulate and help sustain the living ecological systems and cycles.
3. The Principle of Fairness: Maintain fair relationships with the common environment and life opportunities.
4. The Principle of Care: Manage, in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.

Characteristics of Organic Farming:

- Long term fertility of soils: Achieved by the addition of organic matter, enhancement of soil biological activity, and mechanical intervention in a cautious manner.
- Soil microorganisms: Help in providing crop nutrients from relatively insoluble sources.
- Self-sufficiency in Nitrogen: Achieved through biological nitrogen fixation by legumes and recycling of crop residues and livestock manure.
- Weed, disease and pest control: Achieved by crop rotation, introduction of natural predators, crop diversification, using organic manure, growing resistant varieties, and limited thermal, biological or chemical intervention.
- Livestock Management: Livestock is managed extensively with regard to their evolutionary adaptations, behavioural needs, and animal welfare issues.
- Conservation of Wildlife and Natural Habitats: Achieved by reducing the impact of farming on the environment.

Components of Organic Farming:

1. Crop Rotation: It involves growing of various crops in a more or less regular sequence, on the same land, covering a period of two years and more.
2. Crop Residue: It is used as feed for animals and input for nutrient recycling.

3. **Organic Manure**: It is derived from biological sources and it augments crop growth, crop protection and soil productivity. It also helps uptake of humic substances or its decomposition products.
 - **Bulky Organic Manure**: Farm Yard Manure (FYM), Compost Manure, Green Manure, etc.
 - **Concentrated Organic Manure**: Oilcakes, blood meal, fishmeal, meat meal, horn meal, hoof meal, etc.
4. **Waste as Manure**: Industrial waste such as distillery spent wash, molasses and press mud can be used as manure after proper decomposition.
 - But municipal and sewage waste is contaminated with heavy metals that pose hazards to plants.
 - Powdered rock phosphate, green sand, gypsum, dolomite, etc. can be applied as supplementary sources of nutrients.
5. **Bio fertilizers**: It is basically a culture of microorganisms capable of fixing atmospheric Nitrogen when suitable crops are inoculated with it.
6. **Bio-Pesticide**: Natural plant products that belong to the secondary metabolites such as alkaloids, terpenoids and phenolics can be used as bio-pesticide.
 - Ex.: botanicals (rotenone, neem and pyrethrum), biological (Nuclear polyhedrosis virus, Granulosis virus, Bacillus thuringiensis and Trichogramma), pheromones, minerals (clay based materials like surround), etc.
7. **Vermicomposting**: It is organic manure produced by the activity of earthworms that eat biomass and excrete it in digested form. It has much higher nutrient content than farmyard manure.
8. **Other Methods to Control Pests**: Manipulation of crop rotations (to minimize survival of crop-specific pests), growing pest resistant varieties, strip cropping, trap cropping, destruction of alternate host plants, stock burying, manipulation of planting dates and seeding rates, mechanical destruction, etc. can help control pests.
9. **Weed Management**: Tillage combined with irrigation timings, seeding rates and cultivate selection, use of weed-free seeds, foraging by cattle, flooding, mulching, composting, hand weeding and straw disposal are the methods to manage weeds.

Advantages of Organic Farming:

- Organic products attract a premium price due to the consumer demand.
- After a transitional period of 3 to 5 years, organic systems can produce up to 95% of conventional yields.
- Organic farming is less vulnerable to market fluctuations because it has less dependence on fossil fuels and expensive inputs.
- It is a low-waste system that emphasizes on quality over quantity.
- Flavouring ingredients, oils and other taste giving components are found to be higher in organic products.

Key Indicators of Organic Farming:

(Source: Research Institute of Organic Agriculture (FiBL)-IFOAM annual report, 2019)

	World (2017)	India (2017)
Land under Organic agriculture (including those being converted)	69.8 million hectares	1.78 million hectares (8 th Rank)

Compounded growth rate of land area (2005-17)	6.78 %	9.69 %
Share of the organic land to total agricultural land	1.4 %	1.0 %
Top producers	Australia (35.65 million hectares)	Madhya Pradesh (0.54 million hectares)
Highest share of organic to total production	Liechtenstein (37.9 %)	Sikkim (First state to convert entire cultivation into organic practices)
No. of organic producers	2.9 million	0.83 million (Largest in the world)
Organic retail sales	92074 million Euros (1 st : USA; 40011 million Euros)	186 million Euros
Per capita consumption	12.2 Euros	0.2 Euros

- In fourteen countries over ten% of the land is organic.
- Global Organic Market in 2016 was \$110.25 trillion and anticipated to develop at a Compounded Annual Growth Rate (CAGR) of 16.5 % to reach \$262.85 trillion by 2022.

History of Organic Farming in India:

- Ancient manuscripts such as Rig Veda (7th C. BC), Arthshastra (326 BC), Birhat Samhita (6th C. AD), Vriksha Ayurveda (6th C. AD), Sarngadhara Paddhati (13th C. AD), Babar Nama (15th C. AD), Jahangir's Memoirs (16th C. AD) and Dara Shikoh's treatise on Agriculture (17th C. AD) contain chapters on organic farming.
- These manuscripts cover the entire gamut of agriculture including prediction and measurement of rainfall, improvement of soil, formulation of non-chemical fertilizers and pesticides, preservation of seeds, promotion of plant growth, etc.

Conclusion:

Organic Farming has huge impact on issues such as malnutrition, food security and unemployment. A mission mode approach towards promoting organic farming is the need of the hour.

Chapter 3: Organic Farming and Natural Resource Management

Organic farming is based on nature's laws and rules. The system lays focus on the use of organic supplements that helps to establish a closed nutrient cycle for the sustainability of agro-ecosystems.

Negative Outcomes of Conventional Farming:

- According to M.S. Swaminathan, high input production systems are unstable.
- Usage of chemical fertilizers in incremental dose over the years led to the deterioration of soil character, made the plants - fertilizer sensitive and disturbed the pest-predator relationships.
- The excess and indiscriminate use of pesticides led to the entry of harmful compounds into the food chain and development of resistance to the pesticides itself.
- Conventional agriculture results in environmental damage including soil erosion, sediment damage, floods, over irrigation, agrochemical damage, soil compaction, deforestation, wetlands drainage and air pollution.
- Nitrogen fertilizer run-off from agricultural lands is largely responsible for the formation of dead zones in oceans (Ex.: Gulf of Mexico dead zone).
- Further, climate change is affecting crop production and water availability, causing hunger, malnutrition and social unrest.

Ecological Benefits of Organic Farming:

- Soil fertility: Organic supplements are easily colonized by microorganisms and help stabilize soil fertility.
 - One acre of living topsoil contains 900 pounds of earthworms, 2400 pounds of fungi, 1,500 pounds of bacteria, 133 pounds of protozoa and 890 pounds of arthropods and algae
 - Soil building is enhanced by crop rotations, cover crops and organic fertilizers.
 - Green manures help in mobilizing nutrients, enhancing growth promoting substances, suppressing soil-borne pathogens, avoiding soil acidification, supporting crops to out-compete weeds and preventing soil erosion.
- Biodiversity: Organic farming practices support vulnerable species in the following ways:
 - Promotion of habitat heterogeneity (Ex.: field margins and non-crop habitats)
 - Introduction of a variety of seeds and breeds for greater resistance to diseases, climate, and pests.
 - Employment of diverse combinations and rotations of plants and livestock.
 - Maintenance and planting of natural areas within and around organic fields.
 - Creation of suitable habitats important pollinators and beneficial insects.
 - Reduction of toxic influences from synthetic inputs.
- Water Conservation: Soils in the organic system gradually becomes looser, more porous and holds more water.
 - Risk of groundwater pollution is reduced by enhanced soil structure, water infiltration and nutrient retention.
- Carbon sequestration: Accumulation of carbon in the soil is enhanced by crop rotations, cover crops and compost manures.
 - Soil carbon sequestration is cost effective and contributes to 89% of total carbon mitigation.
 - Conversion to agricultural land use may lead to loss of Soil Organic Carbon (SOC) pool by 60% in temperate soils and by 75% in the tropical soils.

- An increase of 1 ton of SOC pool of degraded crop land may increase crop yield by 10 to 20 kg/ha for maize, 20 to 40 kg/ha for wheat and 0.5 to 1 kg/ha for cowpeas.
- Reduced energy dependence: Overall energy input required by organic farming is very low.
- Reduced emission levels: Carbon dioxide emissions are 40-60% lower per hectare than conventional systems.
 - CO₂ emissions and non-renewable energy use associated with the production of synthetic inputs is also prevented.
 - Organic farming significantly reduces methane emission as well.
- Risk Management: Organic Agriculture is more capable of withstanding drought and flood conditions.
- Natural capital: In terms of natural capital values, organic farming becomes the clear winner for long-term profitability. (It is a new branch of economics that recognizes and quantifies the benefits from natural systems in terms of capital.)

Constraints:

- Water quality: Wastewater irrigation may cause the accumulation of heavy metals in the ground water.
- Atmospheric deposition: High atmospheric deposition and accumulation of heavy metals in crops and vegetables have been reported in India. It can affect human health and soil microbial activity.
- There is a scarcity of organic manure due to:
 - Decline in the cattle population and natural pasture cover.
 - Removal of crop residue from the fields as fodder and fuel.

Future prospects:

- There is the need for an ecologically, socially and economically sustainable production system called as the 'Evergreen Revolution'.
- The use of agricultural bio stimulant may be an effective tool in making agricultural production more sustainable and resilient.
- Promotion of the concept of 'Sustainable Agriculture' which integrates cautious use of natural resources with due consideration of economic profitability and social equity.

Conclusion:

In India, agriculture (19%) is the second highest emitter of greenhouse gases, after the power sector. Organic farming has the potential to change the scenario by reducing the impacts on environment.

Chapter 4: Bio fertilizers and green manures

The availability of organic plant nutrient sources is crucial for organic farming. Bio fertilizers and green manures are sustainable and cost effective nutrient sources to overcome this challenge.

1. Bio fertilizers:

- Bio fertilizers are products of beneficial microorganisms which increase agricultural production by supplying nutrients.
 - Capable of fixing atmospheric nitrogen and mobilising unavailable phosphorus and potassium pools.
 - Simple to use, cost-effective and environment friendly.
 - Enhances soil health and productivity.
 - Allows the reduction of dosage after 2 or 3 years of application.

Advantages of Bio fertilizers:

- Provides various nutrients to the plants either by fixing the elemental form or by solubilizing the unavailable nutrients.
- Protects plants from diseases as they secrete many antibiotic compounds which suppress the growth of disease-causing pathogens.
- Secretes plant growth promoting hormones like auxin and gibberellic acid.
- Helps plants in avoiding water stress by secreting polysaccharides which supports soil aggregation and conservation of moisture for longer times.

Types of Bio fertilizers:

- **Microbial inoculation:** The concept started with legume Rhizobium inoculant, patented by Nobe and Hiltner in 1896. In India, it has been diversified to a large number of bacteria, fungi and actinomycetes.
- **Nitrogen-fixing Bio fertilizers:** Organisms that can fix atmospheric nitrogen are broadly grouped as symbiotic and non-symbiotic (free-living). The symbiotic nitrogen fixers undertake the fixation in association with plants whereas non-symbiotic organisms do not require any associate.
 1. **Rhizobia:** Forms a symbiotic association with pulses, legumes, oil seeds, and fodder crops.
 2. **Azotobacter:** Non-symbiotic bacteria.
 3. **Azospirillum:** Most abundantly found in association with the roots of millets and grasses.
 4. **Blue Green Algae:** It belongs to a class of prokaryotic photosynthetic microorganisms also known as cyanobacteria, capable of fixing atmospheric nitrogen aerobically. Most commonly found blue-green algae in Indian rice fields are Anabaena, Nostoc, Cylandrospermum, Colothrix, Scytonemo, Tolypothrix, etc.
- **Phosphate (P), Potassium (K) and Zinc (Zn) solubilizing microorganisms:** Phosphorus and Potash are mostly unavailable to crops because of lower levels of solubility. Arbuscular Mycorrhizae is a symbiotic microorganism that can dissolve P, K and Zn by the production of an organic acid.
- **Plant Growth Promoting Rhizobacteria:** It is a group of beneficial bacteria that can improve plant growth by the production of plant hormones such as auxins, gibberellins and cytokinins. They also suppress bacterial, fungal and nematode pathogens by the production of siderophores, cyanide, ammonia, antibiotics, volatile metabolites, etc.
- **Azolla:** It is a free-floating water fern which contributes to nitrogen fixation through a symbiotic association with Anabaena azollae.

- Some Bio fertilizers like Rhizobium, Acetobacter and Blue-green algae are crop specific while others can be used for all crops.

Types of Bio fertilizers based on formulation:

- Carrier-based formulations: For bacterial bio fertilizers, the carrier may be peat, lignite, peat soil, humus or talc. For mycorrhizal inoculants, the base material may be fine powder, tablets, granules or root biomass mixed with the growing substrate. For the application of carrier-based formulation, the seed has to be treated with some sticky liquid like jaggery solution.
- Liquid formulations: These are prepared by mixing bacteria with nutrients, additives, and stabilizers. Liquid formulations can be directly applied to the seed and require less storage space, compared to carrier-based formulations.

Method of Application:

- When bio fertilizers are applied closer to the planting material, the results improve.
- Seed application with bacterial inoculant is the most common practice.
- Seeds should be sown as soon as possible after treating with cultures or inoculants.

Quality control of Bio fertilizers:

- Many important Bio fertilizers (Rhizobium, Azotobacter, Azospirillum, etc.) have been included under the Fertilizer (Control) Order, 1985, since 2006.
- Quality standards have been set by the government.
- Expiry period of 6 months for carrier-based formulations and 12 months for liquid formulations have been set under the order.
- Earlier, under the Bureau of Indian Standards (BIS), product certification marks and scheme licenses were granted to the manufacturers of bio fertilizers.

Constraints:

- Lack of timely supply in the remote corners of the country.
- Lack of knowledge of the farmers and the failure of extension departments in demonstrating the benefits of inoculants to farmers.
- Lack of a well-equipped quality control mechanism.

2. Green Manuring:

- It is the practice of ploughing (turning into the soil) undecomposed green plant tissues grown in-situ or sourced from outside.
- It improves the physical structure as well as the fertility of the soil.
- The procedure utilizes the lean period between two main crops.
- It can be practiced in between crop rows too.
- The seeds of the green manure crop is broadcasted preferably with higher seed rate followed by tillage.

Types of green manuring:

- In situ green manuring: Crops are grown in the desired field and buried in the same field. An ideal in situ green manure crop need to be fast growing and requiring minimum nutrients and water. In situ green manure suitable for different crop seasons are:
 - Rabi: Senji, Berseem and Khesari
 - Kharif: Cowpea and Guar
 - Zaid or Kharif: Dhaincha, Sun hemp and Mung

- Green leaf manuring: Leaves and tender green twigs grown in a field are incorporated in the soil of a different field. The species commonly used are Subabool, Glyricidia, Wild Dhaincha and Karanj.

Advantages of Green manuring:

- It adds organic matter to the soil which helps in maintaining the activity of beneficial soil microorganisms.
- The physical structure and water holding capacity of the soil is improved by an increased content of humus and organic matter.
- Leguminous green manuring crops like Dhaincha provides nutrients as well.

Disadvantages of Green manuring:

- If the green manure crop is not properly decomposed, it may restrict the germination and growth of subsequent crops by immobilization of plant nutrients.
- An improper decomposition may also lead to an increase in the occurrence of diseases, insects and nematodes.
- Green manure crops compete with cash crops for space, time, water and other inputs.

Conclusion:

Many farmers are not aware of the benefits from bio fertilizers and green manuring. Extensive training and timely availability of high quality bio fertilizers and green manure crop seeds need to be ensured.

Chapter 5: Health Benefits of Organic Farming

The principle of organic farming points out that the health of individuals and communities cannot be separated from the health of the ecosystem. Apart from that, consumers of organic products tend to be more concerned about the negative impacts of pesticides and genetically modified organisms on their health.

Conventional Farming - Impact on Health:

- Every year, pesticide poisoning causes about 1 million deaths and chronic diseases worldwide (Environews Forum, 1999).
- Developing countries and high risk groups within the countries are particularly affected.
- Antibiotics or hormones used in livestock rearing may also have negative health impacts.

Health Benefits of Organic Farming:

- Harmful pesticides, fungicides, herbicides or chemical fertilizers are avoided.
- Intake of antioxidants is increased by around 20-40%.
- Diseases, pests and weeds are managed through good soil health and makes the plants healthy.
- Quality parameters such as nutrients, proteins, polyphenols, vitamin C, total soluble sugars, ascorbic acid, dehydrogenase, phosphatase, tryptophan activity are increased.
- Aroma, essential oil content, texture, taste and shelf life are improved by a balanced nutrient supply.
- Pathogens present in milk and meat are lowered as the organic livestock production systems have higher animal welfare standards.
- Mercury content is lowered by 29%.

Conclusion:

A conclusive evidence to support the perceptions regarding health benefits of organic foods is not available. A well planned research is required to arrive at valid and acceptable conclusions on the health benefits of organic food.

Chapter 6: New Technologies in Organic Farming

Organic Farming in India faces several bottlenecks at the production and marketing levels. New technologies and Package of Practices (PoP) are the way forward to tackle the issues. Following are some of the latest technologies in the field of organic farming:

1. Inhana Rational Farming (IRF) Technology:

- It is developed by an Indian Scientist, Dr. P. Das Biswas based on 'Trophobiosis' theory of F. Chaboussou.
- It blends ancient wisdom with scientific knowledge.
- It provides a nature receptive pathway for crop production, taking into account the relationships of all the components of the ecosystem.
- It allows for the reduction of pesticide load.
- It mitigates GHG emission and improves adaptation potential, soil resource regeneration, high energy use efficiency and plant resilience.
- The technology has been successfully tried out in different crops like tea, paddy, baby corn, green-gram, cabbage, okra, tomato, potato, brinjal, etc.

2. System of Rice Intensification (SRI):

- Under this system, the requirement of seed is only one-eighth (1/8) and the requirement of water is reduced by 80%.
- Standing water is not required and consequent methane emission is avoided.
 - Carbon footprint of growing 1 kg of rice in conventional method is 902 grams.
- The yield is also increased by 96% (According to the trials conducted in Uttarakhand).
- In Andhra Pradesh, the government has introduced and trained the farmers in SRI.
- About 100,000 farmers in Nalanda district of Bihar were trained in SRI and System of Crop Intensification (SCI) in 2008 and recorded an 86% increase in overall yield in a single year.
 - Nobel laureate Joseph Stiglitz along with the President of the World Bank visited the farms in 2013.

3. Aquaponics:

- It creates a symbiotic ecosystem that combines growing fish with soil-less farming.
- Red Otter Farms, an Uttarakhand based start-up use water as a medium to grow over 20 varieties of organic vegetables.
- The farm has subscription based sales in South Delhi and Gurugram.

4. Solar Energy:

- Ecolen Solutions, a Pune based start-up, lays focus on solar irrigation and solar powered cold storage.

5. Digital Interventions

- Internet and Communication Technology (ICT) could address the challenges of traceability of organic produce, linking farmers to markets and providing timely information across the value chain.

6. Combination of Organic Inputs:

Following combination of techniques have proven records of success:

- Vermi compost + Herbal concoctions
- Indigenous compost + Herbal concoctions
- Vermi or indigenous compost + Bio fertilizers + Herbal concoctions
- Vermi or indigenous compost + Bio fertilizers + Herbal concoctions or Bio-pesticides
- Vermi or Indigenous compost + Herbal concoctions or Bio-pesticides.

Conclusion:

Organic farming is the prerequisite for securing livelihood of farmers and ensuring affordability at the consumer's end. Innovative technologies can popularize the practice even among the resource poor farmers.



Chapter 7: Women in Organic Farming

Women are at the centre of implementing the objectives of organic farming initiatives. Women become critical agents of change in the local communities by strengthening livelihoods, ensuring a steady supply of quality seeds for cultivation and increasing the availability and access to pesticide-free food.

Women in Agriculture:

- According to the 2011 census, agriculture employs 68.5% of women in India.
- 81% of the female agricultural labourers belong to SC, ST and OBC communities.
- Women contribute the largest share of casual and landless labourers in agriculture.
- Despite such high numbers, both the sector and the macroeconomic policy framework are yet to recognise them as farmers.

Case Studies:

1. Sundargarh, Odisha:

- More than 2000 tribal farmers of the Oliva Women Farmers Collective grow about 12 crops in a single season by dedicating a row to each crop.
- They follow the model of zero budget natural farming which entails producing crops at zero or near zero cost.
- Farmers prepare organic fertilisers using cow dung, cow urine, jaggery and lentil powder, and organic pesticides using the leaves of neem, karanj and calotropis, garlic, jaggery, cow dung and cow urine.
- Molasses rich mahua is often used in the place of jaggery, as the former is easily available in the vicinity.
- The tribal women prefer growing food crops rather than cash crops because their primary aim is to meet their family's nutritional requirements.
- They have formed groups bringing together landholders and landless farmers in order to lease out patches of land for organic farming.

2. Janadhanya, Ramanagara, Karnataka:

- The association of women farmers seeks to protect agro-biodiversity.
- Representatives from a cluster of five to seven villages are nominated to form the Board of Directors.
- They make decisions, monitor and evaluate the activities of the groups and ensure that members receive information and services on time.
- The association also facilitates linkages between government agricultural departments and other institutions, trains Community Resource Persons and assures the quality of the products through a decentralised organic farming certification, the Participatory Guarantee System.
- Smaller Producer Groups are formed to manage seed banks, processed grains, and produce organic inputs.

3. Bhimdhunga, Odisha:

- In the village, women have been the traditional custodians of seeds.
- Seed banks have been established for the short-grained kalajira (white baby Basmati), an aromatic rice variety which gives a higher yield in a shorter time span.
- Organic farming is extended to cotton cultivation as well.

4. Pitchandikulam Bioresource Centre (PBRC), Kazhuveli, Tamil Nadu:

- The centre works with women's Self Help Groups (SHGs) within the bio region along the Coromandel Coast.
- The groups act as platforms for conducting training sessions.
- Plantation of tropical dry evergreen tree species and setting up indigenous nurseries improves the conservation of biodiversity.
- The centre also helps the groups in accessing government and micro-credit schemes.

Conclusion:

The emphasis on small-scale integrated farming systems has the potential to revitalize rural areas and their economies. Women, individually or collectively must be encouraged to pursue organic farming as a livelihood option.

Chapter 8: Economics, Marketing and Branding of Organic Farming

Organic Farming has a premium market which has high standards in the stages of crop planning to post production. The approach to the marketing of organic products must consider both farmers and consumers.

Status of Agriculture in India:

- According to the Agriculture census 2015-16 prepared by the Department of Agriculture Cooperation & Farmers Welfare, out of the 145727 farmer holdings in India, there are 99885 marginal holdings (less than 1 hectare) with an average size of 0.38 hectares and 25777 small holdings (1.0 to 2.0 hectare) with an average size 1.41 hectares.
- Marginal and small holdings comprise 76.21 % of the total holding but contributes to only around 40% of the total production.
- Most of the marginal and small holdings are located in rain fed areas and suffer from the vagaries of monsoon and loss of crop.

Status of Organic Farming in India:

- There is a steadily growing market of organic products in India.
- Oilseeds are the single largest category grown organically, followed by sugar crops, cereals, millets, fibre crops, pulses, medicinal, herbal and aromatic plants, and spices and condiments.

Initiatives by the Government:

- National Programme for Organic Production (NPOP) regulates the accreditation of Certification Bodies, standards for organic production, etc.
- NPOP standards for production and accreditation is recognized by European Commission and USDA.
- The government has formulated different subsidies, funds, incentives, etc. for the incorporation of natural as well as organic inputs in the regular cultivation system.
- Bio-villages (Jaivik Gaon) initiatives have been undertaken by many states like Bihar and Madhya Pradesh.

Domestic Market for Organic Products:

- In India, the organic market is considered as a niche market segment.
- Increasing per capita income and growth in the e-commerce sector are supportive factors for the growth of the organic market.
- Several private players also have entered this segment.
- All major hypermarket and supermarket chains have dedicated areas for organic products.
- The organic products market in India has been growing at a compounded annual growth rate of 25%.
- It is expected to touch Rs 10,000-12,000 Cr. by 2020 from the current market size of Rs 4,000 Cr.

International Market:

- According to Agricultural and Processed Food Products Export Development Authority (APEDA), India produced around 1.35 million tonnes of certified organic products in 2015-16.
- Out of this, we exported 263,687 tonnes worth \$ 218 million.

- The export increased to \$ 515 million in 2017-18.
- Organic products are mainly exported to European countries followed by U.S.A and Middle East countries.

Disadvantages of Green Revolution:

- Crop production system has become completely dependent on the external financial support system, at the same time input-output ratio is going low with time.
- It may cause long-term economic risks influencing the overall balance of trade.
- Crop productivity has been going downhill as the use of fertilizers follow the 'Law of Diminishing Return'.
- The law of diminishing returns states that as one input variable is increased, there is a point at which the marginal increase in output begins to decrease, holding all other inputs constant.

Economic Impacts of Organic Farming:

- Organic farming system is labour intensive and boosts employment opportunities.
- Many farmers are motivated to adopt organic farming based on the benefits related to the health and safety of their families, consumers, and livestock.
- As costs of chemicals and credit have increased and commodity prices have stagnated, thousands of conventional farmers have begun to search for ways to decrease input costs.
- Model estimates show that organic farming can reduce pesticide use by 50% to 65% without compromising crop yields and quality together with 50% lower expenditure on fertilizer and energy use.
 - Central Institute for Cotton Research, Nagpur have found that organic cultivation brings down the cost by 21%.

Challenges to Organic Farming:

- Low crop yield during conversion: The productivity of organic cultivation is lower than conventional practices during conversion period of 3 years and there is no premium price for the produce.
- Inadequate Quality Standards: Lack of awareness and difficulty in ensuring a continuous market leads to a deficiency in following quality standards.
- Policy support: The complexity of the organic certification system with a high cost as well as time delay is one of the major challenges faced by small and marginal farmers.
- Inadequate Agriculture Marketing Infrastructure: Lack of sufficient transportation, cold storage and processing facilities reflects in the wastage of products.
- Inadequate Market Research: Majority of the farmers have only vague ideas about organic cultivation and marketing of organic produce and its benefits. A fragmented and unorganized management of the entire value chain also causes problems.
- Limited availability of Organic Food Products: There are very few retail shops in India that store and sell organic food items. Many fake organic products are also available in the markets which diminish the profits of genuine vendors.
- Certification: A delay in obtaining valid certification from the Director General of Foreign Trade (India) negatively impacts the export of organic produce.
- Export orientation: The Indian organic produce market is export-oriented and involves hidden costs such as transport and risks to local food security.
- Market risk: Narrowing down farming to a few commodities may lead to market risks. Further, the government, being a signatory of WTO, is bound to open its economy to the global market.

Strategies for the Promotion and Branding of Organic Farming:

- Direct Marketing: It creates a win-win situation for the producer as well as the consumer.
- Promotion of High Value Crops: The lower yield in the initial years can be compensated with a high value high price crop such as western vegetables, medicinal and aromatic plants, superfoods like millets, basmati rice, etc.
- Crop Planning and Diversity: Agri-enterprises set up by farmers collectively or individually need to cultivate a diverse set of products.
- Capacity Building: A large number of small and marginal farmers follow the tribal and rural technology. They require knowledge and training in organic inputs like soil preparation with 'Amrit Paani', vermicompost, growth promotion and pest control with 'Panchgavya' mixture, etc.
- Contract Farming: It can provide support in terms of input-output management to producers and create a win-win situation for everyone.
- Collectivization of Farmers: The collectivization of small and marginal farmers into Producers' Organizations is an effective way to address various challenges such as access to credit, investment and technologies, knowledge support, farmer-to-farmer extension support, creating market linkages, etc.
- Promotion of Input Based Enterprises: Organic based input enterprises at the local level can play a crucial role to generate momentum in the conversion towards organic farming.
- Agri-preneurs: e-commerce based Agri-start-ups need to be promoted through agribusiness incubators.
- Linking farmers to Processors and Exporters: The gap between expectations of buyer and farmers capacity need to be identified and filled through skill training, infrastructure, and technology.
- Widespread Extension: State wise intensive campaign on Organic farming like "Bio-Village" has to be adopted by all the states.
 - The certification process, its procedure, formalities, and practices with market linkages need to be taught to farmers/FPOs.
 - Extension functionaries must ensure the availability of required inputs such as bio fertilizers and bio-pesticides.
 - Agriculture Extension Institutions have to arrange customized training programmes in consultation with National Institute of Agricultural Marketing (NIAM) and National Institute of Agricultural Extension Management (MANAGE).
- Standardization: The quality standards for organic inputs need to be standardized as per the market requirements.
- Promotional Activities: Agriculture being a state subject, the respective State Government has to take firm decisions to promote organic farming in their states.
- Agri Tourism: Pluck and pay model of Agri Tourism may be promoted in organic farms.
- Professional Branding: It will enhance the value of organic products in the market.
- Organic Certification: It permits a farm to sell, label, and symbolize their products as organic and thereby build trust among users. It also protect them against frauds.
 - In India, 29 Organic certificate accreditation bodies are authorized by APEDA to certify organic farms and products.
- Retailing, Packaging, and Labelling: Dressed Fruits or Vegetables in an attractive packaging and labelling gives better branding in the market.

- Fairs and Exhibitions: Kisan Mela, Agri Expo, Agri Exhibitions, Agri trade show, etc. provides an opportunity to promote the product to a large set of audience.

Availability of inoculants:

- Rhizobium, Azotobacter, Azospirillum and PSB inoculants of popular brands of various companies and corporations (IFFCO, NFL, KRIBHCO, etc.) are generally available at the agency shops.
- Every State Agriculture Departments, research institutes and agricultural universities also enhance the availability of organic inputs.
- Many private companies are also coming up in the production of Bio fertilizers, especially liquid inoculants.

Conclusion:

With the sizable acreage under naturally organic cultivation, India has tremendous potential to grow crops organically and emerge as a major supplier of organic products in the world market. Proper marketing and branding of our farmers' produce is utmost important for ensuring both domestic and international markets.

Chapter 9: Role of NABARD in Organic Farming

National Bank for Agriculture and Rural Development (NABARD):

- NABARD is an apex development financial institution in India.
- It aims at promoting sustainable and equitable agriculture and rural development through participative financial and non-financial interventions, innovations, technology and institutional development.

Initiatives by NABARD in Organic Farming:

- NABARD Consultancy services for Organic Farming (NABCONS):
 - NABCONS is a repository of knowledge on practices followed in organic farming.
 - Key areas of knowledge are organic manure production, waste management, etc.
- Capital Investment Subsidy scheme:
 - The capital investment subsidy scheme for commercial production units of organic inputs is being implemented by the Department of Agriculture and Cooperation through the National Centre of Organic Farming (NCOF) in collaboration with NABARD.
 - The scheme provides credit linked and back-ended capital investment subsidy.
 - New and existing units engaged in the production of organic fertilizers or bio fertilizer and waste compost units are eligible for the subsidy.
 - There are no specific requirements regarding project locations under the scheme.
 - The estimated total cost for establishing a new bio fertilizer or bio pesticide production unit is about Rs.1.6 Cr. (200 ton/year capacity) and for a fruit and vegetable waste compost unit is Rs.2 Cr. (100 ton/day capacity)
 - Bio fertilizer and bio-pesticides unit are provided with a capital subsidy of 25% of the total project cost, subject to a maximum of Rs.40 lakhs per unit.
 - Fruit and vegetable compost units are provided with a capital subsidy of 33 % of the total project cost subject to a maximum of Rs.60 lakhs per unit.
 - The subsidy will be released to the units through Commercial Banks, Regional Rural Banks and other institutions which are eligible for refinancing from NABARD.

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