VOL.01 ISSUE.01

# JUST AGRICULTURE

THE FUTURE OF AGRI INNOVATION

## BETTER FARMING STRATEGIES

SEPTEMBER 2020

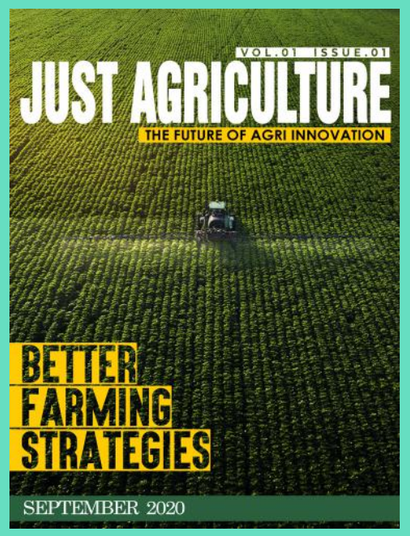
WWW.JUSTAGRICULTURE.IN



# FROM THE FOUNDER EDITOR'S DESK

**Dear Readers,**

The last six months in Indian Agriculture have witnessed paradoxical circumstances. Amid the COVID crisis, besides the uncertainty in health, economy and others sectors, Agriculture is the only bright spot with spike of 3% growth sector in India. The Inter-Ministerial Committee has the target of Doubling the Farmer's Income (DFI) by 2022 which uplift the agriculture sector and enormous e–commerce and agribusiness models have started during this pandemic period. The young professionals understand the potential of this sector. So, during this COVID, education and publishing sector effected. It will be difficult for the academicians to publish and get innovative knowledge about agriculture specialisation. So being as Young Agriculture Professional, I think about starting an e-magazine which provides platform to bound all the agriculture students, scholars and research oriented people.




We are glad to introduce the first issue of JUST AGRICULTURE e-Magazine, which also happens to be our first online publication. Carrying forward our vision of starting this agriculture e-magazine is to engage all the agriculture students, scholars and research oriented people and to increase the writing capacity of agriculture students. Our magazine features about agri innovations, farm ventures and agribusiness, success stories of progressive farmers in India are innovating conventional practices to become successful farm entrepreneurs.

The word "Just Agriculture" signifies the prominence given to the agriculture field and other allied sciences in today's era. Our magazine offers sufficient platform and broad coverage for agriculture researchers and scientists for deliberating connecting throughout India and globally.

For the agriculture students endowed with inquisitive mind and driven by professional goals, this magazine will be a voyage of discovery.

***Keep Reading….***

**D.P.S. BADWAL**
**Founder Editor,**
**JUST AGRICULTURE magazine**

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# FROM THE DESK OF CHIEF EDITOR

It is the great pleasure moment for me to introduce all of you with the agriculture magazine "Just Agriculture". In my concern this magazine just agriculture will provide you innovative research and recent trends of various field of agriculture.

In this magazine we will consider all the concern article related to agronomy, plant genetics & breeding, plant pathology, agriculture chemistry and soil, agriculture biotechnology and biochemistry, veterinary and Animal husbandry and other related fields of agriculture. As the chief editor I insure that you will get all the recent trends, development and innovative idea's in this magazine.

Finally, I would like to thank the editorial and reviewer's team, authors as well as publishers and team members for contributing to this first issue. Editors will welcome all constructive criticisms as well as new suggestions to improve the quality of the magazine.

**Mohit Bharadwaj**
**Editor-in-Chief**
**Just Agriculture-the Magazine**

JUST AGRICULTURE
THE FUTURE OF AGRI INNOVATION

North India's First Agriculture E-Magazine
WWW.JUSTAGRICULTURE.IN

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# Message

"There is enough on this planet for every one's needs, but not for every one's greed"-Mahatma Gandhi."If agriculture goes wrong, nothing else will have a chance to go right in the country"-M.S.Swaminathan."Coming age is the age of knowledge. However rich,poor or powerful a country be , if they want to move ahead, only knowledge can lead them to that path"-Narendra Modi. The above quotes speaks volumes on farming, food and nutrition security and use of science and technology in agriculture.

Congratulations and the best of wishes to the "Just Agriculture Magazine" for publishing technical and popular articles to boost the writing skills of researchers to empower farmers,farm trade-both domestic and export- and consumers. Indian agriculture is in cross roads with increase in population and unemployment leading to low purchasing power .A second Green Revolution using technologies and developing value added products is in the anvil.

Space saving, energy conserving and water saving agriculture including Horticulture are emerging with young IT professionals turning to farming. Biotechnology-biofortification,gene editing, single cell suspension technologies ,nano-technology-is widely used in seed and seedling production, developing high yielding varieties and hybrids and in minimising harvest and post harvest losses. Nutri-cereals- millets- and underexolited and underutilized horticultural crops are getting attention.Greens, Sprouts and Edible flowers are transforming carbohydrate rich Indian diets to protein and mineral rich diets. Horticulture-fruits, vegetables, tubers, spices and plantation crops, medicinal and aromatic plants, ornamentals, mushrooms and bamboos are receiving better attention in the context of export earnings and products development for industry. I believe that the term "Just Agriculture" carries all the innovative ideas which come under the Agriculture, Horticulture and Forestry. The "Just Agriculture magazine" will have sufficient scope in broad coverage to meet the needs of the society at large and scientists deliberating in connected science in network mode.

I wish the magazine all the very best in achieving its goal of A ZERO HUNGER INDIA and a nation enjoying NUTRITION SECURITY. I congratulate Mr.Ankur Sharma and the team of "Just Agriculture Magazine".

**KV Peter**



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## संदेश

शोधकर्ताओं के लेखन कौशल को बढ़ावा देने के लिए तकनीकी और लोकप्रिय लेख प्रकाशित करने हेतु 'जस्ट एग्रीकल्चर' पत्रिका की टीम को बहुत-बहुत बधाई। मेरा मानना है कि 'जस्ट एग्रीकल्चर' शब्द में वे सभी नवीन विचार समाहित हैं जो कृषि के अंतर्गत आते हैं। 'जस्ट एग्रीकल्चर' पत्रिका (मैगज़ीन) में व्यापक स्तर पर कृषि सेक्टर के कवरेज की गुंजाइश होगी ताकि बड़े पैमाने पर कृषि से संबंधित सामाजिक, आर्थिक आवश्यकताओं को पूरा किया जा सके और वैज्ञानिकों को परस्पर नेटवर्क में जोड़कर विचार-विमर्श किया जा सके।

उच्च गुणवत्ता और अंतर्राष्ट्रीय प्रभाव को प्राप्त करने हेतु 'जस्ट एग्रीकल्चर' पत्रिका के सफल प्रकाशन की शुभकामनायें।

24/08/2020

(संजीव कुमार)
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# SOIL HEALTH CARD - A SAVIOUR FOR FARMER

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## *"Swasth Dharaa. Khet Haraa."*

**- Healthy Earth, Green Farm**

India is now eyeing second Green Revolution in eastern India. The need for enhanced investment in agriculture with twin focus on higher quality productivity and welfare of farmers is rightly emphasized from time to time by the Prime Minister Narendra Modi.

Soil health and soil fertility is the basis for sustainable profitability of the farmers all over the world. And utilizing optimum doses of fertilizers and cropping pattern according to the scientific recommendation is the initial step towards sustainable farming

In the entire scenario, importantly the Narendra Modi government has laid emphasis on the awareness campaign and enhanced agri-knowledge for the farming community. But besides the measures to improve minimum support price and assistance like improved irrigation and rural electrification, the incumbent NDA regime has laid emphasis on the **Soil Health Card Scheme.**

## Soil Health Card Scheme

The Soil Health Card scheme launched by the Modi Government during the financial year 2014-15 with a view to address the decline of soil nutrients, has started reaping fruit. In the second phase of the scheme 11.69 crore soil health cards have been distributed to farmers in the last two years. Soil Health Card (SHC) is a Government of India's scheme promoted by the Department of Agriculture & Co-operation under the Ministry of Agriculture and Farmers' Welfare. It is being implemented through the Department of Agriculture of all the State and Union Territory Governments.

The scheme has been approved for implementation during the 12th plan with an outlay of Rs.568.54 crore. For the financial year (2015-16) an allocation of Rs.96.46 crore – only for Zthe central government share has been made. The scheme is to be otherwise implemented on 50:50 sharing pattern between Government of India and state Governments.






## Importance of Soil Health Card

A Soil Health Card is used to assess the current status of soil health and when used over time to determine changes in soil health that are affected by land management.

Soil Health Card is basically a printed report that is given to a farmer for all his land or holdings. It contains the status of soil considering 12 parameters - N, P, K (Macro-nutrients), S (Secondary- nutrient), Zn, Fe, Cu, Mn, Bo (Micronutrients) and pH, EC, OC. Based on all this, the Soil Health Card will also specify fertilizer recommendations and soil changes required for the farm.


## Importance of Soil Health Card

The SHC will have an advisory based on the soil nutrient status of the farmer's holding, which will tell about the recommendations on the dosage of different nutrients required. After that, it will advise the farmer on the how much fertilizer he/she should apply and what soil amendments he/she should adopt. The SHC will be made available once in every 3 years to the farmers and this will indicate the status of soil health of his land for that particular period. Farmers would understand the fertility factor of the land better and can be attracted towards value added newer crops. This would help in reducing risk in farming and also the cost of overall cultivation process would get reduced.

### Cost of Soil Sampling

The State Government collects soil samples twice in a year, after harvesting of Kharif and Rabi Crop or when there is no standing crop in the meadow. Then the samples sent to the various soil testing laboratories in the state or country.

A sum of Rs. 190/soil sample is given to State Governments, which covers the entire cost of collection of sample, testing, generation and distribution of Soil Health Card to the farmers.

## Present Scenario of Soil Health Card

The country wide application of soil health card has led to a decline in the use of chemical fertiliser by 10%. A study conducted by the National Productivity Council (NPC) says that application of Soil Health Card recommendations has led to a decline of 8-10% in the use of chemical fertilizers. "It has also raised the productivity by 5-6%," the study said.

| Soil Sample Details | | | | |
|---|---|---|---|---|
| Date of Sample Collection | 10/09/2017 | | | |
| Survey No., Khasra No./ Dag No. | 88 | | | |
| Farm Size, Irrigation Status | 2.16 Acre Irrigated (Bore well) | | | |
| Geo Position (GPS) | Latitude 16.117223°N Longitude 75.800556°E | | | |
| **Soil Test Results** | | | | |
| **Soil Health Centre, Bagalkote** | | | | |
| **Soil Type: Black Soil** | | | | |
| **Parameter** | **Test Value** | **Unit** | **Rating** | **Normal Level** |
| 1 pH | 7.70 | | Moderately alkaline | 7, Neutral |
| 2 EC | 0.04 | dS/m | Normal | 0 - 1 dS/m |
| 3 Organic Carbon (OC) | 0.35 | % | Low | 0.51 - 0.75% |
| 4 Available Nitrogen (N) | 200.63 | kg/ha | Low | 280 - 560 kg/ha |
| 5 Available Phosphorus (P) | 4.19 | kg/ha | Very Low | 23 - 57 kg/ha |
| 6 Available Potassium (K) | 122.85 | kg/ha | Low | 145 - 337 kg/ha |
| 7 Available Sulphur (S) | 26.50 | ppm | Sufficient | > 10 ppm |
| 8 Available Zinc (Zn) | 0.27 | ppm | Deficient | > 0.6 ppm |
| 9 Available Boron (B) | 0.63 | ppm | Sufficient | > 0.5 ppm |
| 10 Available Iron (Fe) | 0.71 | ppm | Deficient | > 4.5 ppm |
| 11 Available Manganese (Mn) | 6.41 | ppm | Sufficient | > 2.0 ppm |
| 12 Available Copper (Cu) | 1.65 | ppm | Sufficient | > 0.2 ppm |

This has enabled the farmers to understand the soil health parameters and improve its productivity by judicious application of soil nutrients. Under the Central Government's Soil Health Card Scheme Phase-I (Years 2015 to 2017) 10.74 crore cards were distributed, while under the Phase-II 11.69 crore cards have been given away during the period 2017-19.

In the previous financial year, a pilot project "Development of Model Villages" is being implemented under which the sampling and testing of cultivable soil is being encouraged in partnership with the farmers. Under this project a Model Village has been selected for aggregation of soil samples and analysis of each agricultural holding. As part of the scheme 13.53 lakh Soil Health Cards have been distributed during the year 2019-20.

For setting up of soil health laboratories under the scheme, the states have been sanctioned 429

static labs, 102 new mobile labs, 8,752 mini labs, 1,562 village level labs and strengthening of 800 existing labs. The scheme provides for the analysis of soil composition by the State Governments once in every two years so that remedial steps can be taken to improve soil nutrients status. Farmers can track their soil samples and also obtain their soil health card report. Under the scheme village youth and farmers up to the age 40 years are eligible to set up soil health laboratories and undertake testing. A laboratory costs up to Rs 5 lakhs, 75% of which can be funded by the central and state governments.

## Advantages of Soil Health Card

There are many benefits of having a Soil Health Card and the farmers need to understand it:

- The soil health card scheme will properly e xamine the farmer's soil and accordingly give them a for matted report so that he/she can decide upon which types of crops to be cultivated for higher income.
- The appointed authorities will also monitor the soil on a regular basis and will give a report to the farmers once in every 3 years. Also the farmers will be regularly updated about their soil.
- Under the scheme, the government will also employ professionals to help the farmers in adopting remedial measures.
- With the help of Soil Health Card Scheme, the farmers can plan the future of their crops as well as land.
- The best thing about the scheme is that Government pays utmost attention that same individual conducts soil analysis for a farmer, furthe r enhancing the effectiveness of the scheme.
- The SHC gives the farmers a clear idea of which nutrients are lacking in their soil. So that he/she can decide that which crops they should grow for maximum benefit.





# Impact of COVID-19 (Corona Virus) On Indian Agriculture

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## Introduction

Covid-19 (China Originated Virus in December 2019) or Corona Virus has affected whole world to a great extent and has been turned out to be a pandemic and its cure has not been found yet. The whole economical activities of world have been put to break. It has caused a lot of damage to the life and economy of the whole world. If we talk about India, the country might have tackled the widespread of this virus quite effectively but it has caused lot of loss to the economy of the country especially to the agriculture. Due to this virus, farmers has faced many problems related to the sale of their produce of the rabi crops like Wheat and Mustard. The vegetable growers, dairy and poultry farmers have been worst affected by this pandemic because of the lack of demand and supply due to the problem of transportation, they are not getting the right prices for their produce and could be left with a debt after the season and pandemic comes to an end.

## Effect of COVID-19 on Various Agricultural Enterprises

### Effect on Agronomic Crops

The lockdown imposed due to corona virus has affected the purchasing process of the rabi crops like Wheat and Mustard. The worst affected farmers are from the states of Punjab and Haryana which are also said as 'food bowl of India' due to their bumper production of Wheat. The produce of farmers is not being purchased at all once instead it is being purchased in different terms and parts. Many farmers do not have proper storage facility to store their produce at home and thus the produce has to be kept in the field under the mighty Gods. It is also increasing the other problems of farmers as like increased labor and cost in handling the produce i.e. unloading and loading of harvest and also affecting the sowing of cotton (delay in sowing).

### Effect on Vegetable Growers

The vegetable growing farmers are one of the worst affected due to the Novel Corona Virus as the lockdown is imposed all over the country the price of vegetables has been lowered to a great extent due to the retardation in the demand and supply chain. The farmers has to feed the vegetables to their cattle as the markets are not either opening or if opening are offering a very low price. Due to this the farmers have been come to a stage where they could be left with a lot of debt after the season ends.

### Effect on Dairy Farmers

Dairy farmers have been also hit worst due to the Novel Corona Virus because of the shortage or reduced transport facilities of their dairy products mostly milk. The transporters found it very difficult to get the pass to various districts and states of the country and due to this the supply has been reduced and the dairy farmers are unable to sale their produce and due to this the prices of milk also has been reduced.

### Effect on Poultry Farmers

Poultry farmers are also affected badly due to the COVID-19 widespread and this has been mostly due to the rumours that consumption of chicken or egg could lead to the infection of the novel corona virus and the another major reason could be the lack of continuous and proper transportation facilities. All this has lead to the burial of living poultry animals under the soil in various parts of the country because the poultry owners are unable to feed those animals due to the financial crisis.





### Migration of Labor

The agricultural labor and the laborers working in the agricultural markets have been migrated to their native place after the lockdown has been announced this has resulted in the hinder of agricultural operations and has also affected the working of the agricultural markets.

## Policies Formed By Government

The government has announced various policies to ease the problems of the farmers during this pandemic which are:

1. The ministry of agriculture has launched a new mobile application named Kisan Rath which will help farmers to sell their produce at home by contacting registered traders and transporters on this mobile application.
2. The state government has announced to form new temporary purchase centers to ease the buying and selling process of the agricultural produce and also maintaining social distancing.
3. The government has announced an e platform named Meri Fasal Mera Byora for the farmers to register their produce online so that they could get details of the market and date of selling of their produce online or via SMS in Haryana.
4. Indian Council of Agricultural Research (ICAR) has also issued an agro-advisory to maintain hygiene and social distancing among farmers working on their fields.
5. Allowance of inter-state passes to the harvesting machines.
6. The Government of India has announced that the first installment of the PM-Kisan Yojana payment to farmers, i.e., Rs. 2,000 will be paid up front to farmers, benefitting over 8.7 crore Indian farmers.
7. The Reserve Bank of India (RBI) has announced a moratorium on agricultural term loans (including crop loans) for a period of three months.
8. The central and state governments have done much to allay the fears in the minds of farmers by quickly announcing exemptions for the agriculture sector – seeds, labourers and farm related activities. States such as Telangana, Punjab and Uttar Pradesh among others have been very proactive in this regard.

# POST-HARVEST HANDLING OF GARLIC

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**Garlic** (*Allium sativum L.*), the spice of human life and one of the most important perennial bulb crop of the lily family (*Liliaceae*) which is grown all over the plains of India. It is used as the spice or condiment throughout the world and is valued for its flavour. Furthermore, it has extensive application in food and pharmaceutical preparations. The flavour of garlic is attributed to the sulfur containing volatiles called allin. Nowadays, people become more aware about health and start consuming garlic in daily life. So, processing and value addition in garlic could generate big market scope

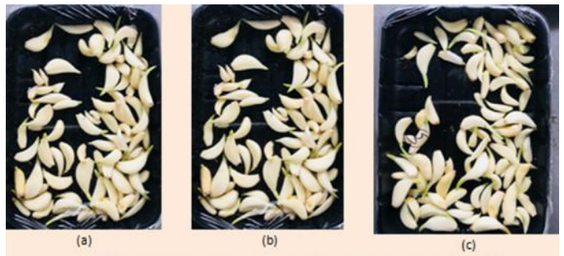
## Medicinal benefits:

Garlic has antioxidants, antibacterial and antibiotic properties. Allicin content in garlic helps to reduce cholesterol levels. It is immensely beneficial to regulate blood pressure and blood sugar levels. It has organo-sulfur compound which has been effective in destroying the cells in glioblastomas (brain tumor). Diallyl sulfide, a compound in garlic, is 100 times more effective than antibiotics. Prophylactic use of garlic may decrease the frequency of colds in adults.



(a) (b) (C)

Samples packed in PP after (a) 7days, (b) 14 days,(c) 21days of storage at ambient conditions without covering with jute bags



(a) (b) (c)

Samples packed in PVC punnets covered with cling film after (a) 4 days, (b) 8days,(c) 14 days of storage at ambient conditions without covering with jute bags

## Harvest and post harvest practices of Garlic

Harvesting → Selection and storage → Peeling → Processing and preservation → Packaging and transportation

## Harvesting

- Look for the bottom leaves on the stalk to turn brown while upper leaves remain green.
- Pull the garlic using garden tools rather than pulling the stems.

## Selection and Storage

- Select the clean, firm and unbroken skin garlic bulbs which are heavy in size. Garlic bulbs should not have any sign of moulding and sprouting without mechanical damage or bruises.
- Store the bulbs at room temperature for a week to cure it and spread in single layer over the storage racks such that bulbs and roots are all uppermost for best air flow.
- Place garlic in nylon netting which is hung vertically to allow good flow of air. Good ventilation is required during its storage generally at the rate of 25 changes/ hour with continuous supply of fresh air.
- Garlic can be kept in good condition for 1-2 months at ambient temperatures of 20 -30º C under low relative humidity (<75%).

| Commodity | Temp | | R.H. | Potential storage duration |
|---|---|---|---|---|
| | 0°C | °F | % | |
| Garlic | 0°C | 32 | 70 | 6-7 months |
| | 28-30 | 82-86 | 70 | 1 month |

### How to Process and preserve Garlic?

There are number of preservation techniques in addition to being healthy increases consumption of its bitter fruit. Further, processing of garlic can become great source of income among farmers and women. Following processing and preservation techniques makes availability of garlic for whole year.

1.**Peeling**: Peeling of garlic can be done by four different methods.

a)**Lye peeling:** Garlic is immersed in hot

caustic soda solution. Vigorously rinsed with water rinse to remove the chemicals adhered to the skin. Neutralized in acid bath and trimmed to give perfect finish.

b)**Water dipping:** Submergence of cloves in warm water for 5-10 minutes.

c)**Oven peeling:** Garlic is placed in oven for 5-10 seconds. The root is then cut and skin slides off easily.

d)**Flame peeling:** Garlic is brought into direct contact with the live flame. High temperature burns the outer skin and can be easily removed.

## Different Preservation techniques for Peeled cloves

| Preservation Technique | Method |
|---|---|
| Freezing | • Peel the cloves and place them in freezer bags in the freezer.<br>• Another method for freezing garlic is to chop it and wrap it tightly in plastic wrap or freezer bag.<br>• Garlic puree oil can be prepared by adding one part peeled garlic cloves in a blender or food processor along with two parts olive oil.<br>• Puree the mixture, then immediately transfer it to a freezer container. Cover the container and place it in the freezer. |
| Roasting | • Wrap the peeled cloves in baking dish and bake at 350°F (180 °C) for 45 minutes to 1 hour.<br>• Sprinkle with olive oil or some greasing agent to be used as side vegetable with pinch of salt and other herbs. |
| Garlic in wine or vinegar | • Prepared by adding peeled garlic cloves to undiluted full strength wine or vinegar and keeping it under refrigerated conditions.<br>• Preserves garlic- liquid mixture for about four months.<br>• Submerged cloves can be further utilised for preparing other dishes. |
| Garlic in oil | • Garlic in oil is prepared by adding citric acid or phosphoric acid to increase its acidity.<br>• Chop the peeled garlic into pieces of 6mm or not longer than ¼th of inch.<br>• Take 2 cups of warm water and add 1 tablespoon equivalent to 15 ml or 15 g of citric acid powder.Add 2/3 cup of chopped garlic to 2 cups of prepared solution and stir it.<br>• Store at room temperature or in refrigerator. |





| | |
|---|---|
| Drying | 1. Open or Shade Drying:<br>• Place the product under the direct sunlight or it can also be carried out undershade.It is widely method.<br>• Preserves nutritional components during shade drying.<br>2. Solar Drying:<br>• Solar drying has faster drying rates.<br>• Air is heated to 10-30 ºC above ambient, which causes air to move faster through drying and reduces its humidity.<br>3. Cabinet Drying:<br>• Superior method than sun drying and other drying techniques.<br>• Optimum levels for cabinet drying - 60 ºC temperature, 30 mm thickness, 9m/s velocity and 0.1% concentration of sodium metabisulphite as pre-treatment. Garlic slices were found to be lighter in color (i.e having higher values of L), high dehydration ratio and moisture content below 5.5%, high organoleptic score<br>4. Tray Drying:<br>• Garlic is dried by spreading on the trays which can be perforated or non-perforated.<br>• Generally recommended temperature of drying is 60 ºC for duration of 1 hour at an air velocity of 2m/s<br>5. Fluidised Bed Drying:<br>• Most suitable method of drying for drying fruits and vegetables which are small in size.<br>• Drying is achieved by fluidisation of food products by the underneath flow of air which is cut into small size or converted into granular form.<br>• Recommended conditions for fluidisation of garlic is 60 ºC for 4 hours with good quality of powder and low in moisture content (<3%),<br>6. Microwave Drying:<br>• Microwave Drying can be performed individually or in combination with conventional drying methods.<br>• Rapid method of drying without causing overheating of product.<br>• The best suitable parameters for microwave air drying are at the temperature of 40, 50, 60 and 70 ºC at air velocities of 1.0 and 2.0 m/s using continuous power of 40 W |

• The best recommended drying parameters are:

*Air temperature : 50-90°C
*Air Relative humidity : 10-40%
*Air Velocity : 1-4 m/s

• Dry garlic can be kept at temperature of 0-1 °C and 65-70 % relative humidity.

• For sun drying, garlic must be protected from sun scald especially during periods of high temperature and bright sunlight.

## Packaging and transportation

Raw garlic is packaged in wooden jointed boxes (17 Kg) and in 25 Kg jute bags, baskets or chip baskets. PP bags and PVC punnets overwrapped with cling film are most suitable for packaging peeled garlic cloves at ambient as well as refrigerated conditions.

# ENVIRONMENTAL IMPACT OF IRRIGATION IN INDIAN AGRICULTURE


## Summary

Irrigation is the largest water user worldwide. In the process of storing, diverting, transporting, irrigating, consuming, and draining water, the natural hydrology of a watershed is changed significantly. These changes impact the natural environment. River flows are altered and reduced and sometimes depleted; groundwater levels may be lowered by pumping or raised by over irrigation; wetlands may be created or dried up. Drainage waters from agricultural lands are usually of poorer quality than the applied water and may carry both agricultural chemicals and naturally occurring substances into groundwater, rivers, and lakes. Although many of the environmental impacts of irrigation are negative, irrigation plays a critical role in providing food and fiber for our growing population Providing the same food without irrigation would likely have even greater environmental impacts. We must educate the public of the benefits of irrigated agriculture and work to minimize the negative environmental impacts.


**Keywords:** Environment; Irrigation; Soil quality; Water logging; Water quantity

## Introduction

Irrigation plays a critical role in providing food and fiber for our growing population. Most of the world's fruits and vegetables are grown with irrigation. Providing the same food without irrigation would likely have even greater environmental impacts. We must educate the public of the benefits of irrigated agriculture and work to minimize the negative environmental impacts. Irrigated agriculture is critical to the global food supply. Although irrigated agriculture has serious environmental impacts, the alternatives would have much greater negative impacts. Although there are undoubtedly irrigated areas that create excessive negative environmental impacts and should be abandoned, elimination or significant reductions in irrigated agriculture is not an option. We, as scientists and teachers, must help farmers minimize negative impacts and help society understand the tradeoffs so we can make rational decisions.

Environmental impacts of irrigation are the changes in quantity and quality of soil and water as a result of irrigation and the ensuing effects on natural and social conditions at the tail-end and downstream of the irrigation scheme. The impacts stem from the changed hydrological conditions owing to the installation and operation of the scheme. An irrigation scheme often draws water from the river and distributes it over the irrigated area. The impacts of irrigated agriculture may be somewhat different than rainfed agriculture. In the process of collecting, storing, diverting, transporting, spreading, consuming, and draining water; and enabling intensive agricultural activities on otherwise marginal or non-productive lands; water, land, plant, animal, and human resources are changed. Some of these changes are positive; others are negative. It is important that we are aware of the changes and their impacts, so that we can minimize the negative impacts and evaluate the benefits and costs of irrigated agriculture.Irrigation plays a critical role in providing food and fiber for our growing population. Most of the world's fruits and vegetables are grown with irrigation. Providing the same food without irrigation would likely have even greater environmental impacts. We must educate the public of the benefits of irrigated agriculture and work to minimize the negative environmental impacts. Irrigated agriculture is critical to the global food supply.





## What Is Irrigation?

Irrigation can also be done extracting groundwater by (tube) wells. As a hydrological result it is found that the level of the water descends. The effects may be water mining, land/soil subsidence, and, along the coast, saltwater intrusion.

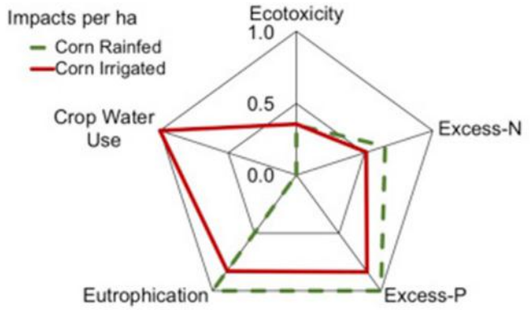
## 1. Environmental Impact Of Irrigation

### 1.1. Direct Impact

An irrigation scheme draws water from groundwater, rivers, lakes or overland flow, and distributes it over an area. Hydrological, or direct, effects of doing this include reduction in downstream river flow, increased evaporation in the irrigated area, increased level in the water table as groundwater recharge in the area is increased and flow increased in the irrigated area. Likewise, irrigation has immediate effects on the provision of moisture to the atmosphere, inducing atmospheric instabilities and increasing downwind rainfall (Hellmich and Simon, 2015), or in other cases modifies the atmospheric circulation, delivering rain to different downwind areas (Pokrovskii and Vladimir 2011). Because irrigation systems deal with redirecting water from rivers, lakes, and underground sources, they have a direct impact on the surrounding environment. Some of these impacts include: increased groundwater level in irrigated areas, decreased water flow downstream of sourced rivers and streams, and increased evaporation in irrigated areas. Increased evaporation in irrigated areas can cause instability in the atmosphere, as well as increase levels of rainfall downwind of the irrigation. These changes to the climate are a direct result of changes to natural moisture levels in the surrounding atmosphere. Increases or decreases in irrigation are a key area of concern in precipitation shed studies that examine how significant modifications to the delivery of evaporation to the atmosphere can alter downwind rainfall.

### 1.2. Indirect Impact

Irrigation systems also have an indirect impact on the surrounding environment. These indirect effects may not be as immediately noticeable as the direct issues. Additionally, these effects take a longer time to develop and produce longer-lasting changes. He indirect effects of waterlogging and soil

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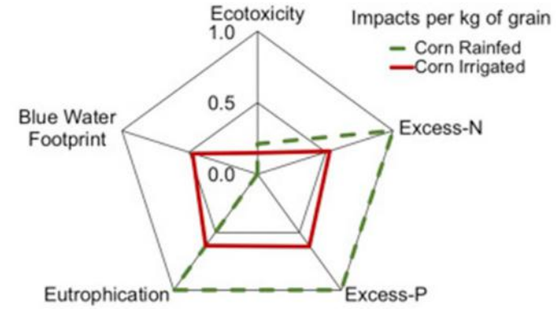


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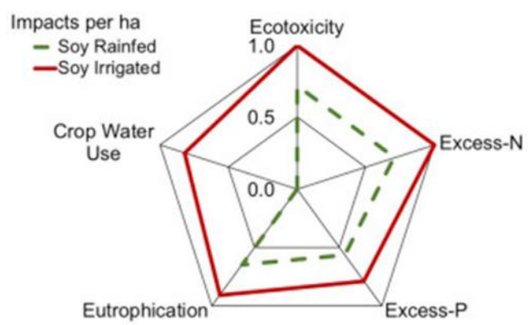


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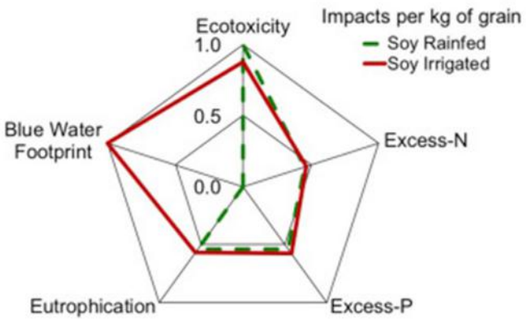


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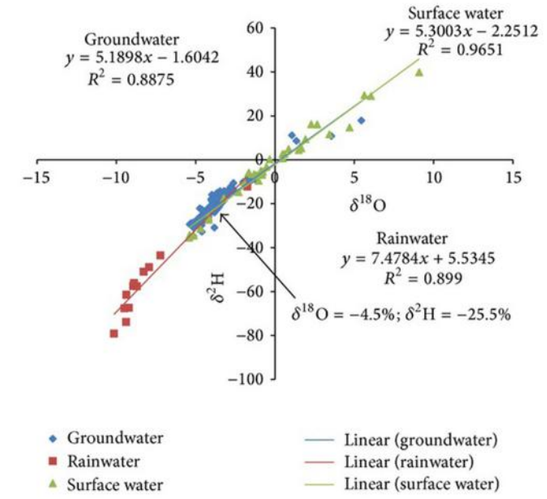
salination occur directly on the land being irrigated. The ecological and socioeconomic consequences take longer to happen but can be more far-reaching. Some irrigation schemes use water wells for irrigation. As a result, the overall water level decreases. This may cause water mining, land/soil subsidence, and, along the coast, saltwater intrusion. Irrigated land area worldwide occupies about 16% of the total agricultural area and the crop yield of irrigated land is roughly 40% of the total .

## 2. Negative and Positive Impacts Of Irrigation

### 2.1 Water Quantity Impacts

Although a portion of the water diverted from rivers for irrigation returns as drainage flows, irrigation diversions always reduce the overall flow in the river system. Reduced flows usually result in reduced aquatic and wildlife habitat. While many of the impacts of irrigation reservoirs and diversions are negative, there are also positive impacts. Reservoirs create habitat for fish and wildlife and recreation opportunities for humans. Hydropower is often generated at irrigation dams. Flood control reduces risks and flood damages for those who live downstream.




### 2.2 Water Quality Impacts

Drainage water from irrigated fields is nearly always lower quality than the water diverted from the river or pumped from the groundwater. As water runs across and percolates through field soils, it picks up sediments, nutrients, pesticides, and naturally occurring substances such as salts. Drainage water from rainfed agriculture also carries sediments, nutrients and agricultural chemicals. However, water quality problems may be greater in arid irrigated areas because there is less water to dilute and transport the pollutants. Also, because irrigation application is controlled, there are greater opportunities to control drainage from irrigation.

### 2.3 Soil Quality Impacts

Soil quality, or the ability of soil to provide sustained high productivity, can be diminished by irrigation. Salt accumulation is usually caused by inadequate drainage, and is often associated with waterlogging. Salt is always imported at some concentration with irrigation water.

Prevention of salinization requires good management of irrigation water, including adequate leaching of salts from the soil, drainage for the removal of salts, and ultimately, transport and disposal of the salts to the ocean or other sinks. When the natural vegetative cover is removed in preparation for cropping, drought and wind can combine to create serious wind erosion damage. Pressurized irrigation systems have allowed cultivation of steep lands that can erode badly during rain storms.

### 2.4 Impacts on the Quality of Human Life

The purpose of irrigation is to provide food and fiber for a growing global human population. Approximately one-third of the global harvest is from irrigated lands. About 70% of the irrigated land is in developing countries and many populous nations are highly dependent on irrigated agricultural production. Most of the world's fruits and vegetables are grown with irrigation. Agricultural production would fluctuate much more with weather from year to year, requiring greater storage of reserves. The quantity, quality, and dependability of our food supply would decline.



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# METABOLOMICS IN ANIMALS

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Metabolomics is the emerging field of Omics Science. It refers to technique in which various low/ small molecular weight molecule or metabolites of biological sample like urine, blood, saliva, milk, breath exhalate etc of cell, tissue ,organ are taken for study and metabolomics profiling is performed involving either mass –spectrometry or nuclear magnetic resonance for comparison. Example antibiotics, pigments (resins, terpenes). Metabolome refers to complete set of metabolites in biological cell, organ, tissue or organism, which are usually cellular processes end products, example fructose, sucrose. This level of metabolites keeps on changing with stimuli (external/internal), stress or diseased condition of animal.

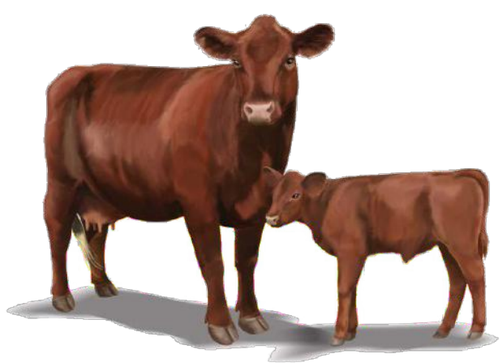
Metabolomics term was first coined in 1990 and used for studying metabolome in field of nutrition, inborn metabolic errors and drug
application effect, like in detection of cancer.

Metabolomics is only one part of different large scale analyses of omics' world like genomics, proteomics, spliceomics, epigenomics, transcriptomics and pharmacogenomics.While genomics deals with DNA,transcriptomics with RNA,proteomics with proteins,metabolomics is related with study of sugars,nucleotide,aminoacids, lipids(lipidome) metabolites which are responsible for phenotypic character and functioning in living being. This is very much related with bioinformatics . Metabolomics study is important because the metabolome is closely knit with genotype of an organism, physiology and the environment that is what type of food organism is consuming or air is being inhaled. This technique helps in having closer look at genotype-phenotype and genotype-envirotype relationships.

It has been reported that all abnormalities/changes which are detected in genome or transcriptome are not causative agent of abnormality/disease that is there may be silent mutations.

Likewise it is not so that all enzymes or protein products detected through proteomics may be functional. It may happen that all environmental influences occurring at different stages are not taken into consideration. But this technique may be used for monitoring changes occurring in genome or for measuring effects of up/down regulation of specific gene transcript.Usually; metabolites are result of cellular pathway which takes into account the variations taking place at genome, transcriptome, proteome including metabolic influences. Proteomics study may involve two dimensional gel electrophoresis.matrix-assisted laser desorption/ionization or time-of-flight mass spectrometry.

Metabolic fingerprinting involves measurement of subset of whole profile with little quantitation or differentiation of metabolites. The target isotope-based analysis mainly focuses on metabolome particular segment by analyzing few selected metabolites which comprise specific biochemical pathway.







## PROCEDURE:

In first step sample collection is done followed by treatment and processing.Metabolomic assessment can be pursed either in vitro or in vivo using tissue, fluids or cells. Mostly biofluids are preferred as it is easy to collect like serum, urine, plasma, saliva, bronchial washes, pleural fluids or prostatic secretions. But mostly use of serum and urine are in practice. Try to maintain low temperature and consistent samples extraction as it is essential. For biofluids 0.1-0.5 mL is the standard sample volume. Nowadays some scientists have also shown interest in using tissues directly. For NMR there is requirement of minimal sample preparation.

Seperation techniques used mainly include methods like gas chromatography, high performance liquid chromatography (HPLC), Ultra performance Liquid chromatography and capillary electrophoresis. The detection technique for qualitative and quantitative assessment involves use of nuclear magnetic resonance spectroscopy (NMR) or mass spectrometry.NMR uses isotope possessing property of magnetic spin. Isotopes mainly used are 1H and 13 C .NMR spectroscopy are used to measure phosphorylated lipid metabolites and high energy phosphate metabolites. The acquisition time is about 10 minutes. As it preserves tissue architecture pathological evaluation is not compromised. The metabolites detected in cancer includes aminoacids (leucine, Isoleucine, valine, alanine, glutamine, tyrosine, asparagine, lysine, free choline, phenylalanine, glycine, taurine, glycine),beta hydroxybutyrate, alpha ketoisovalerate, beta glucose, alpha glucose, formate, UTP and UDP, phosphatidylcholine, plasmalogen, acetate, glutathione,succinate,fumarate.Dimethylalanine, OInorganic phosphate, triacylglycerol, creatine, phosphocreatine, betaine,ADP and ATP,sugar phosphates, phosphatidyl-glycerol, myo-inositol, cholesterol and esters. Both NMR and MS involve intial chromatography stage followed by separation according to their mass to charge ratio. All metabolites cannot be ionized to an equal extent.MS is more sensitive for metabolite detection and requires more tissue destruction and there is difficulty in quantification while NMR spectroscopy is less sensitive for metabolite detection, having easy quantification, is non-destructive and requires little sample handling and preparation. Although other techniques are also available like ion –mobility spectrometry, electrochemical detection (coupled to HPLC), radiolabelling techniques (when combined with thin layer chromatography), MRSI (Magnetic resonance spectroscopic imaging) and PET scan.

Data Analysis is done using multivariate analysis, like Partial least square method (PLS), Principle component Analysis or orthogonal PLS (OPLS). In final step validation is done followed by clinical application.

## APPLICATIONS:

Metabolomics is used in variety of health applications including pharmacology and pre-clinical drug trials, transplant monitoring, oncology, toxicology, new-born screening, clinical biochemistry and as a tool for functional genomics. In poultry there is effect of breed and feed on egg composition which can be well judged using albumin metabolites ( erythritol, threitol, ribitol, linoleic acid, isoleucine, dihydrouracil, 4-hydroxyphenyllactic acid, alanine, glycine, N-butyrylglycine, pyruvic acid, valine, sugar alcohols and yolk metabolites(erythritol, threitol,urea,sugar alcohol). Acyglycine is diagnostic marker of inborn errors of metabolism. In ruminants Non-esterified fatty acids, creatinine, albumin, BHBA, growth hormones, enzymes, cholesterol, urea, Inulin, triiodothyronine, lactose can be used as indicators.

## PROBLEMS AND CHALLENGES:

1. Metabolites have variations in molecular weight and concentration
2.Metabolites are more dynamic and so make metabolome more time sensitive.
3. Loss of metabolites like glutathione may take place during tissue extraction.
4. All metabolites cannot be detected.

It is concluded that Metabolomics will be solution for animal problems in future.

# PANCHAGAVYA

## An organic weapon against plant pathogens

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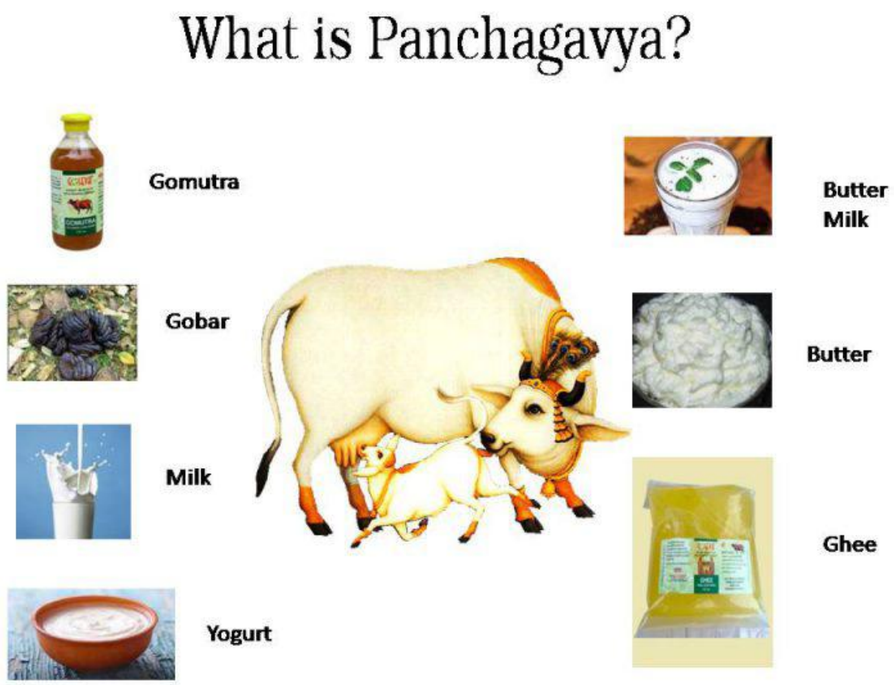
## INTRODUCTION

Panchagavya is an organic product produced by using five products obtained from cow, viz, cow dung, cow urine, cow milk, ghee and curd. In Sanskrit, 'panchagavya' means 'five products from the cow'. Panchagavya has the potential to play the role of promoting growth and providing immunity in plant system. Panchagavya was found to have the properties of both, fertilizer and bio-pesticide. It posse's antifungal properties through which it is responsible for inhibition of spore germination and mycellial growth of fungal pathogen. Panchagavya is prepared from organic substance only so, it has no residual effect. With the control of disease, it also supply macro and micro nutrients and growth hormones to plant.




## HOW TO PREPARE PANCHAGAVYA?

Panchagavya actually consists of nine organic products. In which, five products are from cow, viz, cow dung, cow urine, cow milk, ghee and curd. Other four products are jaggery, banana, tender coconut and water.

All the items are added to a wide mouthed mud pot, concrete tank or plastic can. Container should be kept open under shade. The content is to be stirred twice a day both in morning and evening. After 30 days, stock solution of panchagavya will be ready. It should be kept in the shade and covered with a wire mesh or plastic mosquito net to prevent houseflies from laying eggs and the formation of maggots in the solution.





## PROCEDURE

* Mix 1 kg cow dung and 1 kg cow ghee thoroughly both in morning and evening hours and keep it for 3 days.

* After 3 days, mix 10 litres cow urine and 10 litres water and keep it for 15 days with regular mixing both in morning and evening hours.

* After 15 days, mix 3 litres cow milk, 2 litres cow curd, 3 litres tender coconut water, 3 kg jaggery and 12 nos. of well ripened bananas in solution.

* This mixture is stirred regularly twice a day and allowed to ferment for 30 days.

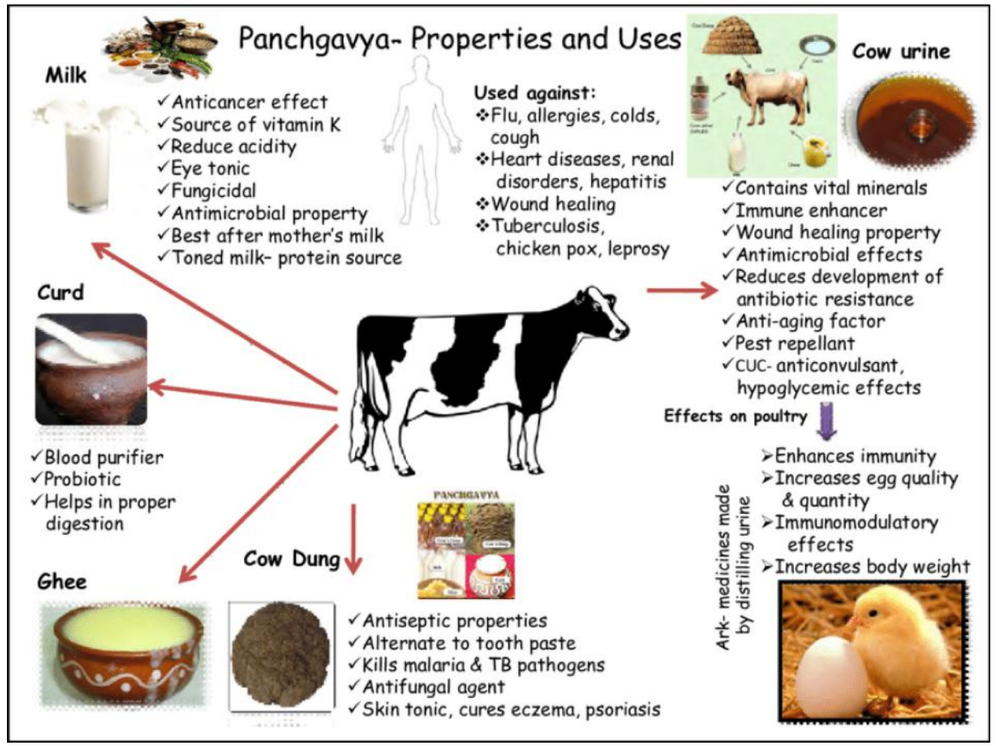
*After 30 days, Panchagavya will be ready for use.

## How to use Panchagavya?

Prepared Panchagavya should be diluted before using on plants. In morning or evening hours, diluted solution can be sprayed directly on small plants. Mechanical sprays can also be used after filtration of diluted solution. For big trees, diluted solution is applied at the root zone with irrigation water. For pest or disease infested plants, entire affected area is sprayed. For controlling seed borne pathogens, seed treatment is given with Panchagavya.

## BENEFITS OF USING PANCHAGAVYA

Prepared Panchagavya should be diluted before using on plants. In morning or evening hours, diluted solution can be sprayed directly on small plants. Mechanical sprays can also be used after filtration of diluted solution. For big trees, diluted solution is applied at the root zone with irrigation water. For pest or disease infested plants, entire affected area is sprayed. For controlling seed borne pathogens, seed treatment is given with Panchagavya.



# Effective Treatment of Bovine Mastitis with Herbal Medicines: An Alternative to Antibiotics

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## Abstract

Mastitis in indigenous and exotic cattle reared for dairy purposes is a highly prevalent infectious disease, leading to considerable financial loss to farmers. Mastitis causes huge economic losses to dairy industries by reduced milk quality and production, mortality, and culling of cows and also due to the cost required for treatment. Common treatment available against disease is the intra-mammary, intramuscular, and intravenous infusion of antibiotics. However, antibiotic use is associated with the problem of antibacterial resistance, residues in milk, and residual effect in the food chain. This led to a search for alternative treatment methods necessary. Medicinal herbs or plants are an excellent resource that can be used as an alternative treatment method. The plants form an essential component of ethno-veterinary medicine used in the treatment of diseases like bovine mastitis. This article helps to provide brief information on the medicinal plants used in the treatment of bovine mastitis. Antimicrobial studies of these plant species, some of their extracts and indications for how to use have been included in detail so that the farmers on their level can check mastitis.

**Keywords:** Antibacterial, Bovine mastitis, Ethno-veterinary, Medicinal plants, Residual effect.

## INTRODUCTION

Mastitis in indigenous and exotic cattle reared for dairy purposes is a highly prevalent infectious disease, leading to considerable financial loss to farmers. Cows suffering from mastitis cannot be milked regularly after the mammary gland cells are affected along with the formation of a clot in milk. Collectively, these factors cause huge economic losses to dairy industries by reduced milk quality and production, mortality, and culling of cows and also due to the cost required for treatment. The main mastitis-causing pathogens include contagious bacteria and fungi that survive and replicate on the skin surface and teat wounds, e.g., Staphylococcus aureus, Streptococcus agalactiae, and Streptococcus dysgalactiae, as well as environmental contaminants that are not retained on the teat, e.g., Streptococcus uberis, Escherichia coli, and other coliforms. These bacteria gain entry into mammary glands of cows through their teat canal, where they colonize, replicate, synthesize toxins and release toxins, affecting the mammary gland cells.

### Reasons for alternative to antibiotics:

Continuous and inappropriate use of antibiotics is developing resistance in microbial population leading to its ineffective treatment. Antibiotic use is associated with the problem of residues in milk and residual effect in the food chain. The indiscriminate use of these products may contribute to the establishment of persistent infections in the udder. Demand for organic products has become a priority in livestock health research. Side effects like digestive disturbances, fungal infection, drug interaction, etc can be avoided by the use of herbals. Expensive treatment expenses can be avoided. Medicinal plants like *Azadirahcta indica* (Neem), *Garcinia indica* (Kokam), Aloe vera, *Allium sativum* (Garlic) and *Tinospora cordifolia* (Giloy) are studied against mastitis.





## Medicinal Plants

Medicinal plants beneficial against mastitis are well studied and evaluated one by one.

### Azadirahcta indica (Neem)

Neem tree is native to the Indian subcontinent and is typically grown in tropical and sub-tropical regions. Indian Ancient Ayurveda was the first to bring the antifungal, antihelmintic, antibacterial, antiviral, antioxidant, immunomodulatory, and antitumourogenic constituents of the neem tree to the attention of Indian people. Neem is traditionally used as medicine and neem leaves are consumed as prevention from various diseases. Similarly, neem leaves and seed kernels are traditionally used in animal populations from ancient times as herbal antiseptic, herbal antibacterial, and herbal antifungal.

Triterpenes and carbohydrates are active principles. Cause reduction of somatic cell count, milk neutrophils, nitric oxide content, and total bacterial count which reflects the anti-inflammatory and antimicrobial activities of the herb. Nimbidin is the main active antibacterial ingredient and the highest yielding bitter component in the neem oil which is e xtracted from neem leaves and seed kernels. Nimbidin has antimicrobial property against Staphylococcus aureus, Streptococcus agalactiae, Streptococcus uberis, Streptococcus dysgalactiae and some candida spp.

To extract neem oil, the tree seeds weighing 100mg are crushed, then filtered or warm 100ml water is added into crushed seeds and mixed uniformly, the further mixture is kept for overnight and the next morning mixture is sieved properly. Such freshly extracted 15ml neem oil is injected intramammary in the affected quarter of the mammary gland once in a day for a couple of weeks.

Kokum Kernels

### Allium sativum (Garlic)

A common herb, annual in life form. Its bulb is known for its medicinal properties. Allicin (diallylthiosulfinate) is a defense molecule from garlic with a broad range of biological activities. A study conducted by has shown the efficacy of 150 g of garlic bulbs ground and mixed with butter in 7-day recovery or an alternative dose of 1–2 glasses of garlic, resulting in a 10-day recovery. The sensitivity of antibiotic-resistant strains to certain antibiotics may increase by a fresh garlic extract. A significant decrease in the number of somatic cells was observed in all sample from the demonstrated level of over 100 thousands/ml to the value of several tens of thousands in 2-3 weeks post-treatment. It acts by inhibiting the proliferation of bacterial cells and has immune potentiating activity.

More than 50% recovery was observed in animals affected with mastitis when treated with Garlic, Vitamin E & Se, and Lemon separately.

### Garcinia indica (Kokum)

Kokum is a fruit-bearing tree and is native to the Western Ghats region of India located along the western coast of the country. Kokum is found in forest lands, riversides, and wastelands. These trees prefer evergreen forests but can be seen in areas with relatively low rainfall. Guttiferone-A and 7-epiclusianon from the fruits and seed kernels of a tree are the active principles. It has antimicrobial property against Staphylococcus aureus, Streptococcus agalactiae, Streptococcus uberis, and Bacillus cereus along with the trypanocidal, antispasmodic, antioxidant, antitumourogenic activity.

Clean kokum kernels are boiled using a steam boiler and these kernels are then sent to the oil press to obtain kokum oil. Kokum oil can be extracted traditionally from kokum kernels by roasting the seeds on a wooden fire and such roasted seeds are finely grounded on a grinding stone; such powdered seeds generate moisture which gives it pasty appearance; water is added to paste and such paste is boiled on low flame. Boiling causes the release of oil and helps it to float on water. Such oil is collected and filtered. Kokum oil is applied to an affected quarter of mammary gland thrice in a day for at least two weeks.

## Aloe Vera

A Succulent plant species are widely being used as a medicinal plant for various conditions like an antioxidant, antibacterial, antifungal, antiviral, wound healer, diabetes, etc. Because of its antibacterial activity against Staphylococcus aureus (S. aureus), Escherichia coli, MRSA (Methicillin Resistant S. aureus), Streptococcus spp., it can be used in mastitis treatment. Bacterial Cell Membrane Disruption was observed in the above-stated species after incubation for 24 hours with methanolic extract of Aloe vera.

Aloes helps to drain the infection, has anti-inflammatory properties, and is a coagulant. It has a diuretic property also, which serves to soften the hardened udder. Coats and Holland recommend injecting 20 to 60 cc of aloes (in gel or juice form) into the infected quarter at least once a day or can be applied over udder in paste form.

Aloesin, Aloin, Aloe-emodin, Aloe-mannan are the active compounds. The ingredients required for the preparation of herbal paste were Aloe vera (3 leaves gel), turmeric powder (handful quantity), and lime. Dilute it with water and apply over infected and normal udder after the complete draining of quarters. In the study pH, conductivity, and somatic cell count of mastitis found lesser than the positive control in the herbal treatment after 5days of post-treatment.

## Tinospora cordifolia (Giloy)

Genetically diverse, large, deciduous climbing shrub with greenish-yellow typical flowers, found at higher altitude. It is famous for its medicinal properties like antimicrobial, anti-diabetic, anti-spasmodic, anti-inflammatory, anti-oxidant, anti-stress, anti-malarial, immunomodulatory and anti-neoplastic activities. Gloitin, Tinosporic acid (active compounds) aids in increasing the phagocytic activity of PMNL cells in milk in Subclinical mastitis and also play a role in a specific and nonspecific immune response. Upadhya and coworkers demonstrated the antibacterial activity of Tinospora cordifolia extract against Escherichia coli, Staphylococcus aureus, Klebsiella pneumoniae, Proteus vulgaris, and Salmonella typhi. Intramammary infusion of a polysaccharide fraction of T cordifolia (PFTC) treatment significantly reduced the somatic cell count (SCC) and neutrophil count. The stems were cut into small pieces washed, shade dried and pulverized by a mechanical grinder, passed through a mesh sieve. Further, dilute the obtained paste in PBS and infuse intramammary for 1-2 weeks.

It is concluded that Dairy farming is one of the largest sources of economy in India. Mastitis and its consequences led to serious losses to the farmers and entrepreneurs engaged in the Dairy farming sector. The commonest treatment available against mastitis is the intra-mammary, intramuscular, and intravenous infusion of antibiotics. However, antibiotic use is associated with the problem of antibacterial resistance, residues in milk and residual effect in food chain therefore use of herbal medicines against mastitis is the best alternative. Proper management, preventive measures, and alternatives to allopathic medicines need to gear up in the animal sector to reduce the financial viability of farmers and save them from an economic crisis.





# DIGITIZING INDIAN AGRICULTURE

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By 2050, the world's population will be nearly 10 billion. Much of the addition will be in developing countries like India, where increasing quality of life often causes an increase in food intake per capita. As a result, to feed the planet we will need to produce 50% more food than we do today, despite restricted and insufficient arable land and water supplies. At the same time, existing agricultural activities, absorbing 70 % of global water withdrawal (and 91% in India), are largely ineffective. An example is the still commonly used flood irrigation system, which wastes water and yields unoptimized. The planet will need to embrace smart technology and learn how to best use its capital to produce more with less. India is one of the world's most water-challenged countries, with 16 % of the world 's population and just 4% of world's water supplies. With more than 90% of freshwater withdrawals going to agriculture and following the unpredictable monsoon and conventional farmers' use of inadequate flood irrigation - including for rising water-hungry crops such as paddy, cotton and sugarcane - groundwater levels have dropped over the years. Water shortage, declining cultivable land and lower productivity add to the farming community's woes in India and highlight the need for sector reform Drip irrigation is a technology that gives each plant the amount of water and fertilizers it needs, when and where it needs them. This helps farmers to double their yields by using just 50 percent of the water provided by conventional irrigation methods, by increasing the productivity of other farm inputs such as fertilizers, pesticides, labor, etc. India has over 140 million hectares of net cultivated land and about 45% of the land is irrigated. Roughly 9 million ha are currently under micro irrigation, around four million ha of which is irrigated by drip. It means a long way to go in agriculture for a smarter India

Farmers in India once had no landline phones and went straight to cell phones. This technology is the same. There's great technology transforming agriculture and helping farmers dramatically increase yields. For example, an ongoing project at Ramthal in Karnataka is spread over 11,000 ha and involves over 6,000 farmers. The community-based drip irrigation system is regulated from where we can determine how much water will go to each field and, when. everything is digital, wireless the hardware, data and other digital resources are continually dropping and their functionality improves, you don't need to own a large farm to reap the advantages and high returns of these systems.

I assume we will see a much wider adoption of advanced drip irrigation technology in India in five to 10 years from now, and every farmer will have an integrated, intelligent system that he can run from his mobile device. These mass adoptions would boost farm sector profitability, and India's overall economy would increase farmers ' income. It is the vision of "smarter India," a vision already happening

# Medicinal and Nutritional properties of
# DRAGON FRUIT
## (Hylocereus spp.)

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## Introduction

Dragon fruit is often considered a tropical "Supper food" because of its nutritive and medicinal value. It is also known as "pitahaya" if it comes from the very closely related genus Stenographers. The actual Dragon fruit is the cactus genus Hylocereus are originally native to Mexico. They were transplanted to Central America, probably by Europeans (Morton, 1987). These cacti are cultivated in Southeast Asia mainly Thailand and Vietnam, The United States, Israel, Australia, Cyprus and the Canary Islands. Pitahaya producing Hylocereus species include Hylocereus undatus, Hylocereus costaricensis, Hylocereus megalanthus, etc. Fruits of the Dragon fruit are sweet with leathery skin. Hylocereus are the tall cacti species with flowering fruit. It is a veining, terrestrial or epiphytic cactus with fleshy stem. The plant grows climbing the support pole or other tree using aerial roots. Dragon fruit stems are scan dent (climbing habit), creeping, sprawling or clambering and branch profusely with generally three ribs and undulating horn-like margins with areoles, bearing spines. Scented, nocturnal, greenish-yellow or whitish and rarely rose-tinged flowers are produced on the succulent stem. The dragon fruit is oblong to oval, to 6–12 cm long, 4–9 cm thick, mostly red with large bracteoles. It has thin, leathery rind with sweet flavoured white or red pulp inside. Very small, black coloured edible seeds are embedded in the pulp. The fruit normally weighs from 150 to 600 g. Dragon fruit grows best in dry, tropical and subtropical climates enduring temperatures up to 40 °C. In wet tropical zones plants grow well but sometimes have problem setting fruits reliably. The dragon fruit sets on the cactus-like trees 30–50 days after flowering and can sometimes have 5-6 cycles of harvests per year. Dragon fruit tree is used as ornamental vine in gardens and landscapes. It is also used as flavoring agent in drinks, juices and Alcoholic beverages sorbet, smoothie and pastries.

### Objectives:

Now-a-days, Dragon fruit is gaining popularity in India as a medicinal and nutritious fruit. It is being eaten with a say of high nutritional properties and remedial over various health problems. The major aim of this study is to explore the research evidences for the assumptions that dragon fruit has high nutritive and medicinal properties.

### Medicinal and Nutritional properties of fruit:

Dragon fruit is considered as a heavenly fruit on the earth with high nutritional and medicinal values. It is considered to lower blood sugars. Eating fruit is considered beneficial for carbohydrate metabolism, strengthening bones and teethes, heart tissues, healthy blood and tissue formation, strengthening immune system, faster healing of bruises and wounds, respiratory tract infections and even as a mild laxative due to substantial fiber content. Dragon fruit is believed to able to lower cholesterol concentration, to balance blood sugar concentration, to prevent colon cancer, to strengthen kidney function and bone, to strengthen the brain workings, increasing the sharpness of the eyes.

### Fruit pulp:

Dragon fruit has many valuable properties. The fruit pulp contain 87.08 g moisture, 1.1g protein,0.4 g fat, 11.0 g carbohydrate, 3.0 g fiber, 20.5mg vitamin C, vitamins 0.04mg B1 and 0.05mg B2 , It's also rich in antioxidants and minerals like calcium(Ca) 8.5mg, iron(Fe) 1.9mg , potassium, sodium, etc. (Rahmawati and Mahajoeno, 2009) have reported vitamin C content as high as 6000mg/100 g of fruit pulp.

### Fruit Seeds:

The seeds of dragon fruits are high in polyunsaturated fats (omega-3 and omega-6 f atty acids) that reduce triglycerides and lower the risk of cardiovascular disorders. Eating dragon fruit can help the body to maintain such normal function as ridding the body of toxic heavy metals and improved eyesight. Lycopene, responsible for the red color in dragon fruit, has been shown to be linked with a lower prostate cancer risk.

### Pigment betalains:

Dragon fruit is also considered good source of food dye or food colouring agent. Food colouring agents are required to compensate the colour losses during processing. The health-concious consumers are prefering natural food dyes over the synthetic one. Dragon fruit is rich in pigment betalains comprising betacyanins and betaxanthins. Rebecca et al. (2008) not only extracted these pigments but reported great tolerance of these pigments towards the factors causing colour loss during processing. recommended refrigeration at 4oC without light for preserving the dragon fruit peel dye colour upto 3 weeks. Rodriguez et al. (2016) revealed that the antioxidant, anti-inflammatory, antiangiogenic and GST-inducing activities of betalains from red dragon fruit peels were enhanced through carbohydrate encapsulation.

Dragon fruit is gaining popularity in India as a nutritious and medicinal fruit. It is being eaten with a say of high nutritional value and remedial over various health problems. After exploring the available research evidences related to high nutritive and medicinal values of dragon fruit, it can be concluded that dragon fruit is rich in nutrients like vitamin C, B1, B2, B3, high fibre content, minerals like Ca, Fe, P, less carbohydrates and no fats, seeds rich with 50 per cent of essential fatty acids namely, linoleic acid and linolenic acid a necessity in human metabolism and cannot be synthesized from other food components by human body. All these factors are rendering it beneficial for various diseases. Even the stem of dragon fruit tree is found possessing medicinal values. As premature stem of dragon fruit contains higher ascorbic acid, it may have been helpful in preventing the risk factors of certain diseases. Fresh and dried dragon fruit skin both are rich in pectins and betalains making it natural food thickener and natural colouring agent. Of course, a very scanty research references available on the nutritional composition of dragon fruit have hampered the concrete conclusions over some aspects.

# SOILLESS MEDIA CULTURES

## A Propitious Auxiliary for Crop Production in Horticulture

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Nurserymen found that productive field soils confined to contain often gave inferior results because of compaction and inadequate drainage but that improvements could be made by incorporating materials such as peat, sand leaf mould and rotted manures. Soil less media are being tailored to meet the needs of plant and with suitable nutrients mixture, we can provide all the required nutrient for the growing plants dissolved fertilizer from becoming too concentrated and damaging the plants,

Now at these days sawdust, ground bark, and peat sawdust mixture are the mainstay of the nursery and green house industries because of their low cost, light weight and case of drainage and uniformity of plant ratio produced.

Besides sawdust, ground bark and peat-sawdust mixture, some other materials such as sand gravel pumice perlite, vermiculite and dolomite have also been successfully used as a soil less media for crop yield. Peat and peat sawdust mixture has been widely adopted because of its uniformity and high moisture holding capacity but sawdust from deciduous





tree plants are less suitable for media because of more rapidly decomposition then coniferous saw dusts.

In soil less media nutrients are supplied to the plants by incorporation of slow release fertilizers or by nutrient solution feeding on a day to day basis. Care must be taken to ensure that the water content of a soil less medium is frequently replenished to prevent dissolved fertilizers from becoming too concentrated and damaging the plants.

## PROPERTIES OF SOIL LESS MEDIA

### A. Physical Properties

* High absorption of water than soil.
* High air content.
* Particle size diversity.
* Cow bulk density determines the balance between height weight and good water/air ratio.
* High porosity resulted good air/water ratio.
* High hydraulic conductivity.
* Constant volume.

### B. Chemical Properties

* High CEC content.
* Sufficient nutrient contents.
* Efficient buffer capacity
* Low electric conductivity.

### C. Additional Properties:

* Weed free
* Free of disease and pests.
* Stable formula.
* Easy to prepare.
* High resistance to changes.

### DISADVANTAGES OF SOIL

* High bulk density.
* Low hydraulic conductivity.
* High weight.
* Inconsistency of properties.
* Compaction
*Chance of weed and diseases infestation.

## General standard of soil less media used for horticultural purposes

| | | |
|---|---|---|
| Bulk density | - | 0.3-0.78 g/cm3 |
| Water content | - | 20-60% |
| Air content | - | 30-50% |
| pH | - | 5.5-6.5 |
| CEC | - | 10-100 meg/100g |

# TRANSPLANTING MEDIA

### Media for bedding plants:

The cornell peat-lite mixtures are commercially available and are suitable for seedlings, bedding plants and pot plants. These mixtures are prepared by mixing 1:1 peat-vermiculite, 1:1 peat- perlite, 2:1:1 peat-vermiculite-perlite by volume measurement. For bedding and pot plants when slow release fertilizers are used in these medium, an occasional overwatering is required to remove any accumulation of excess soluble salts.

### Media for vegetable seedling blocks:

For the production of vegetable seedling peat, peat vermiculite or peat-perlite mixtures are suitable. A cheaper mixture using half sphagnum peat and half black peat (peat humus from marshes) is widely used for seedling blocks.In case of non-availability of black peat, the sawdust can be mixed with sphagnum peat in place of black peat.

### Media for flower cuttings:

Soil less media are well suited to the rooting and growing of flower cuttings because of rapid rooting and reduction in black stem rot incidence due to their good soil aeration.

A 1:3 peat-sawdust mixture is suitable for rooting of geranium cuttings and a 1:2 peat-sawdust mixture for poinsettias and chrysanthemums. A mixture containing equal parts of peat, sand perlite and sawdust is also a good rooting medium for the flowering plants.

# GROWING MEDIA

For growing soil less media sphagnum peat, pumice ground bark hemlock-sawdust and sand are used widely. In these supplied as a dilute nutrient solution throughout the growing season to meet the remaining needs of the crop.

WWW.JUSTAGRICULTURE.IN

### Media for green house vegetables:

Peat based mixture, sand-sawdust mixture and hemlock-sawdust are used as growing media for greenhouse vegetables. These media have placed in plastic beds, plastic tubes, pots or wooden sided beds isolated from the soil by plastic sheeting.

Slow release fertilizers may be used as a mixture for growing greenhouse vegetable in peat-lite mixtures but due to high cost this method has not been adopted commercially. In European countries and Manitoba, fertilizers and ground limestone are thoroughly mixed with coarse peat and placed in beds for green house vegetable production

### Media for potted nursery plants:

Container green plants are based on fine sand and sphagnum peat ranging from 100% sand to 100% peat with 3:1, 1:1, and 1:3 mixture being the most useful. Sand Dust, wood shaving or rice hull may also be used for potted plants, Fertilizers are incorporated into the growing mixtures, depending upon crop and growing method.

Peat-sawdust mixture and ground bark alone are well suited to container growing of nursery stock because they are inexpensive well drained and light in weight and have a fairly good moisture holding capacity. Moisture holding capacity can also be increased by addition of more in the mixture.

# USE OF DRONES IN AGRICULTURE

## AN EYE IN THE SKY

## Introduction:

Till 2050 world population will rise to 9 billion (approx) and we have to increase our production to 50% to feed the population. Right now more than 815 million peoples are hungry in world and more than half of them are in the Asia continent. Consequently in coming years food production requires boost up nearly of 70 to 80%. Use of drones is the latest technology which has been introduced and can help in achieving the aim. Drones also known as unmanned aerial vehicles (UAV) are generally remote controlled aircraft with no pilots on board. They fly over the fields at low altitude and capture whole data. They are the rapidly evolving & replacing satellites and aircrafts. They can capture high quality images at cheap prices which satellites cannot do. They generally run on battery or fuel. They are being used in various fields including military, agriculture, film industry, humanitarian relief etc. Drones have initiated a technological revolution in agriculture sector. They can gather large amount of spatial data. The use of drones in agriculture is rising in crop production, early warning, forestry, fisheries etc. They are so efficient that they can gather whole soil data without even touching the soil. Drones these days are equipped with modern technologies like navigation, controls, imaging, sensing etc. They are also being used for spraying of fertilizers and pesticides. However, with the advancement of technology they are also being used in whole production process from land preparation to harvesting. The market for agricultural drones is rising vastly and many companies have entered in this business. By 2050 market of UAV will rise upto $32.4billion. Parrot, Precision hawk, AGEagle, and Trimble are some of the major industries in this sector

## Types of drones on basis of platform:

Generally two types of drones are available on platform basis:

1. Fixed wing
2. Rotatory wing

- Fixed wings are generally similar to airplanes and are used in spraying and photography purpose. They are greater in size than rotator winged.
- Rotary winged are classified further into helicopter and multi rotors. Helicopters UAV are used mostly in agriculture wheras multi rotors are used in extremely precisetasks, suchas pollen–moisturedistribution and precision control.

## Utility of drones in agriculture:

### 1. Irrigation equipment monitoring:

Maintaining and survillencing irrigation pivots in large fields is a tedious task and requires large amount of labour. Mid season inspection of nozzles and sprinklers of equipments can be done by easily.

### 2. Forestry:

Drones are used to capture large numbers of images which are used to prepare orthomaps these maps are further used for analysis planning and management. These are also used in monitoring of illegalactivitiesandencroachment,treecanopyanalysis, conservation features, tracking native species, conducting an inventory of small forest areas.

### 3. Weed Eradication:

Drones using NDVI and multispectral imaging technology are used to gather data on the spread of weeds and their intensity in fields. Using spectral signatures of weeds common to that area are made available and are used to read drone images. These data are further sent to variable rate herbicide applicators.

### 4. Crop spraying and spot spraying:

We are well aware that crop require fertilization to maintain high yields. This process earlier was done by aeroplanes or manually which is very costly and labour intensive task. These days drones are equipped with reservoirs in which fertilizers, herbicides, pesticide are filled using drones for spraying is cost effective and is safer. Earlier if there is problem in certain piece of land entire acreage had to be sprayed which is costly and waste of time & resources also. Drones can be used effectively for the routes and areas which need to be sprayed.

### 5. Crop Mapping and Surveying:

One of the biggest advantages of using drone technology is the ease and effectiveness of large scale crop and acreage monitoring. With near infrared (NIR) drone sensors you can actually determine plant health based upon light absorption, giving you a birds-eye view of the overall farm health. You'll be able to collect information like:

* The overall crop and plant health
* Land distribution based on crop type
* Current crop life cycle
* Detailed GPS maps of current crop area

### 6. Real-Time Livestock Monitoring:

Drones equipped with thermal imaging sensors pilot can be use in management and monitoring of livestock. Pilots can easily see their herds if they are injured or missing and which are giving birth to new ones. Plus, thermal imaging will also help to keep an eye out for any livestock predators, which can be a huge advantage for the farm owners.

### 7. Seed planting:

Planting seed with the help of drone is the newer technology. In this context a company named as Droneseed is using UAV to deliver 57 pounds of pay load involving herbicide, seeds etc. Once this technology will get launched in market it will change whole scenario of agriculture.

## Advantages of Agriculture Drones:

a. Drones equipped with thermal cameras which help in identifying wet and dry land patches which further helps in avoiding of wastage of food.

b. Drones come back to nhome just by presin g button.

c. Drones are equipped with geographic information system. It helps further in analyzing all types of spatial data which helps in mapping and increase yields.

d. Latest agriculture drones help in collecting data which helps in improving crop health.

# Disadvantages of Agriculture Drones:

*Basic knowledge and technical skills are required to drive them.
*Drones are much costly to afford for small and marginal farmers.
*Most of drones available are having less fly time and other ones with high fly time are very costly and technical to drive.
*Other aircrafts may disturb them.
*Clearance certificate from government is required in driving of drones.
*In harsh environment condition it becomes difficult to fly them.

# Career as an Agriculture Drone Pilot:

After becoming agriculture drone pilot one will be in front line for capturing farm, livestock & other valuable data and transferring this data into actionable form for farm production. One needs to get certified after learning how to fly drones and how to handle data from government recognized institute.
Once you get drone license one can earn money through following ways:

- One can work as consultant, can offer data on basis of land evaluation and can also guide about actions that farmer can take on basis of maps based on thermal and advanced imaging techniques.
- Providing drone system to farms for planting, spraying and regular crop management activities.
- One can also take contracts from farm ownerss for spraying or monitoring their farms to.
- One can also work as drone pilot for farms requiring drone pilot.
- One can create turf and outdoor maps for companies.

It is concluded that In future drones will be very helpful in nearly every agriculture work or process starting from seed planting, irrigation management to spraying of herbicides & pesticides to providing the data till harvesting of the crop. Scope of drones is very vast in agriculture sector. They are costly today but in long run they are very useful and with their increased use there are chances that Government may also provide some subsidy to farmers for buying them. After getting license to drive agriculture drones they may also help farmers in future in getting an additional source of income.


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# NUTRITIONAL AND MEDICINAL VALUES OF TAMARIND

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## ABSTRACT:

Tamarind (*Tamarindus indica L.*) It is a multipurpose long-lived tree best known for its fruit. It is a large evergreen tree with an exceptionally beautiful spreading crown, and is cultivated throughout the whole of India, except in the Himalayas and western dry regions. Tamarind plants are hard and drought tolerant. Tamarind is a nutritious versatile fruit. The whole seeds also contain protein, fat, sugars and carbohydrates. Both pulp and seeds are good sources of potassium, calcium and phosphorous and contain other minerals like sodium, zinc and iron. Tamarind seeds have been used in Cambodia and India, in powdered form, to treat boils and dysentery. Boiled, pounded seeds are reported to treat ulcers and bladder stones and powdered seed husks are used to treat diabetes. Apart from fruits, tamarind leaves are used to treat conjunctivitis, throat infections, coughs, fever, intestinal worms, urinary troubles and liver ailments, cardiac and blood sugar reducing medicines and ulcers.





Keywords:- Tamarind, pulp, seeds, tartaric acid, Triterpenoids etc.

## INTODUCTION:

Tamarind (Tamarindus indica L.) or Imli is also called Indian Date. It belongs to the family Leguminaceae. It is native to Tropical Africa, particularly in Sudan and also grown well in the tropical and semi-arid parts of India. It is a multipurpose long-lived tree best known for its fruit. It is a large evergreen tree with an exceptionally beautiful spreading crown, and is cultivated throughout the whole of India, except in the Himalayas and western dry regions. Tamarind plants are hard and drought tolerant. It has special importance in social, urban and agro forestry due to its multipurpose uses as industrial, pharmaceutical and commercial level. Almost all parts of the tree find a use in the food, chemical, pharmaceutical or textile industries, or as fodder, timber and fuel.

## MEDICINAL VALUES:

Tamarind has been used in the treatment of a number of ailments, including alleviation of sunstroke, Datura poisoning and the intoxicating effects of alcohol and 'ganja'.The consumption of adequate amounts of 'poha beer' a popular tamarind fruit drink of Northern Ghana in Africa, could help reduce the prevalence of iron deficiency anaemia. This was based on the vitamin C content in it which enhances bioavailability of non-haem iron. Tamarind seeds have been used in Cambodia and India, in powdered form, to treat boils and dysentery. Boiled, pounded seeds are reported to treat ulcers and bladder stones and powdered seed husks are used to treat diabetes. Triterpenoids, phenols and alkaloids in tamarind extracts are being looked at for their use in controlling pests and diseases, e.g. control of citrus canker, root knot nematode and of a range of fungi. Tamarind plant extracts have been used to purify drinking water.

## NUTRITIONAL VALUES:

Tamarind is a nutritious versatile fruit. The fruit consists mainly of pulp and seeds. Tamarind is valued highly for its pulp used in the preparation of food and beverages for domestic and industrial purposes. The pulp constitutes 30-50% of the ripe fruit, the shell and fibre account for 11-30% and the seed about 25-40%. The most outstanding characteristics of tamarind fruit is its acidic and sweet taste due to tartaric acid (10%) and reducing sugars (30-40%). The fruit, both ripe and dry, contains mainly tartaric acid, reducing sugars, pectin, tannin, fibre and cellulose. The whole seeds also contain protein, fat, sugars and carbohydrates. Both pulp and seeds are good sources of potassium, calcium and phosphorous and contain other minerals like sodium, zinc and iron. The acidic pulp is used in culinary preparations such as a curries, chutneys, sauces, soups etc. Fruits are having the higher content of protein, vitamin B and tartaric acid. Tamarind fruit supplies vitamin A in the form of pro-vitamin A containing carotenoids and is bioavailable to supply the required amount of recommended retinol equivalents (500-600) per day. Tamarind consumption prevents malnutrition and chronic human diseases, and supplies necessary macronutrients (carbohydrates, proteins and fats), micronutrients (calcium, iron, iodine, manganese, magnesium, zinc), fiber, vitamins A, C, D, folic acid, and other vital compounds.

# PLASMA THERAPY
## A POTENT TOOL AGAINST CORONAVIRUS

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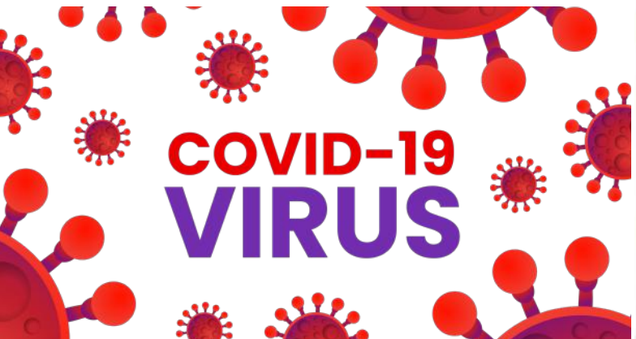
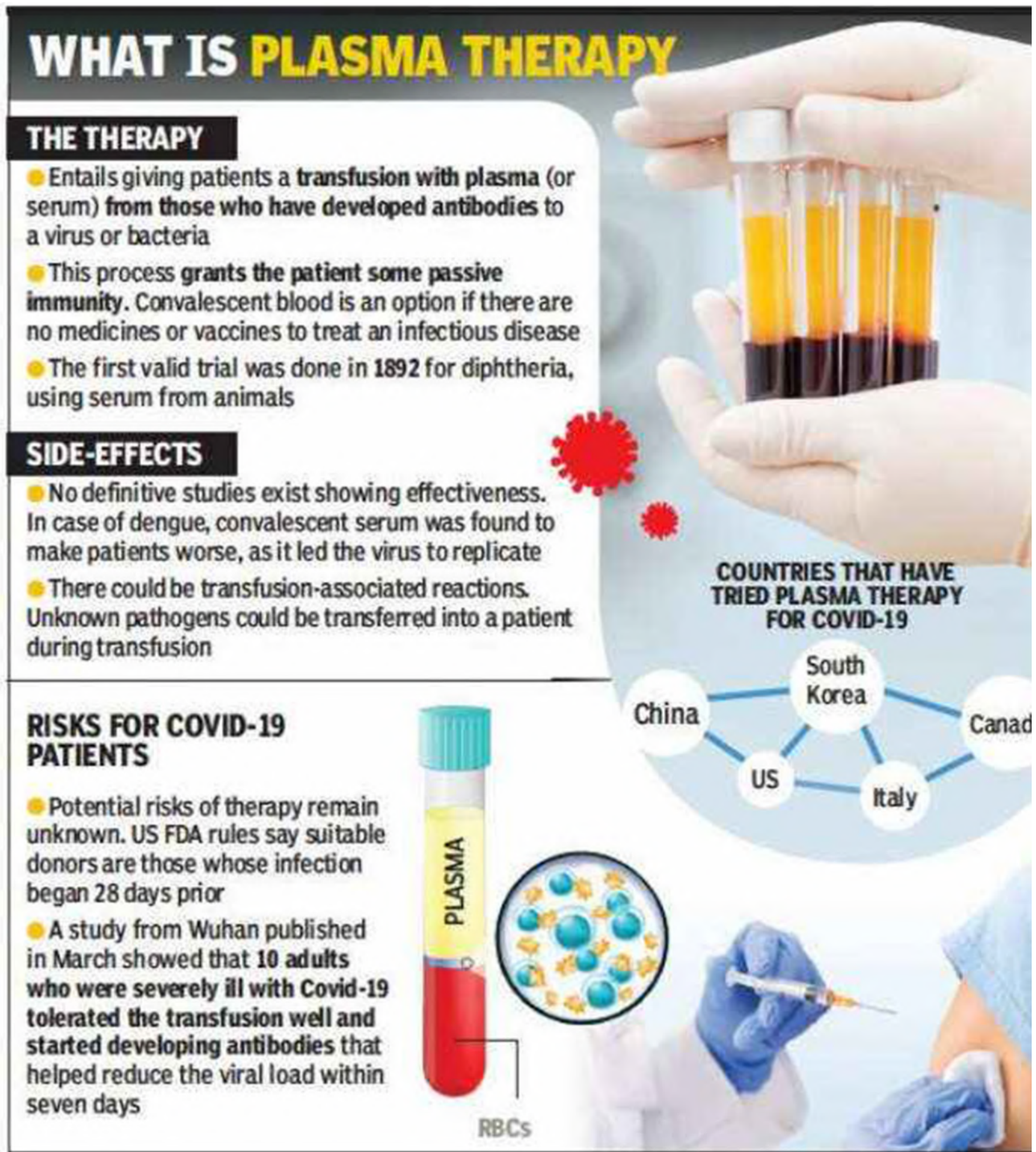
## Introduction:

Plasma represents a "cosmic soup" of fixed/freely moving ions, enzymes, active species, antibodies and energetic UV photons. Plasma therapy involves administration of immunoglobins containing plasma of recently recovered person of a particular disease to the individual who is susceptible/ infected with the same disease. This is helpful in terms of diseases where vaccine production is a big task i.e. Covid-19. In this case, Convalescent Plasma (CP) Therapy is acting as a boon. Convalescent/ Immune plasma refers to plasma that is assembled from individuals, following resolution of infection and development of antibodies.

Passive antibody therapy has been in trend for over a century. The therapy deals with the administration of the reactive agents (antibodies) against the target pathogen of interest. Nowadays, passive antibody therapy relies primarily on pooled immunoglobulin preparations that contain high concentrations of antibodies. In contrast, plasma has been used emergently in epidemics where there is insufficient time or resources to generate immunoglobulin preparations.Passive antibody therapy, through transfusion of convalescent plasma, may prevent clinical infection or blunt clinical severity in individuals with recent pathogen exposure.




## Mechanism of action of plasma therapy:

The antibodies present in (i.e."immune") plasma possesses salutary effect and mediate therapeutic action via various mechanisms. Antibody has a special ability to bind to specific pathogen and hence, antibody is able to directly neutralize the infective nature of any pathogen. On the other hand, other antibody- mediated pathways such as -dependent cellular cytotoxicity, complement activation, or phagocytosis may also contribute to its therapeutic effect.

Convalescent plasma can be assembled swiftly using the established blood collection and transfusion infrastructure. Specifically, convalescent plasma is obtained and administered using standard collection and transfusion practices that are available around the world.

## Convalescent Plasma in treatment of CORONAVIRUS:

Convalescent plasma has been used in 21st century in two other Corona virus epidemics i.e. SARS1 in 2003 and MERS in 2012 to the present. Knowledge from those outbreaks illustrates that convalescent plasma includes neutralizing antibodies. Hence, this can be used as potent treatment against viral infection. The current pandemic also deals with the convalescent plasma study to treat patients in China suffering from COVID- 19. The pilot study of 10 patients with severe COVID-19 was done and the investigators collected convalescent plasma with neutralizing antibody titers at or exceeding a 1:640 dilution. No serious adverse effect in the recipients was found in Transfusion of convalescent plasma. All the patients had improved in symptoms i.e. cough, cold, chest pain and shortness of breath within 1-3 days of transfusion; they also demonstrated radiological improvement in pulmonary lesions.

The risks of COVID-19 infection are thoughtful. The increasing cases of positive people are considerable. In this scenario, human plasma from improved COVID-19 patients is anticipated to be potentially effective and a safe therapy for treatment and post-exposure prophylaxis alike. Plasma transfusions also improve clinical condition and decrease mortality rates. Substantial evidence of benefit with prior use for viral infections offers strong precedent for such an approach. However, a controlled clinical trials are always mandated to determine its efficiency and exact role in treatment of Novel corona virus.

# IMPACT OF COVID-19 ON HORTICULTURE

**Anis Kumar**
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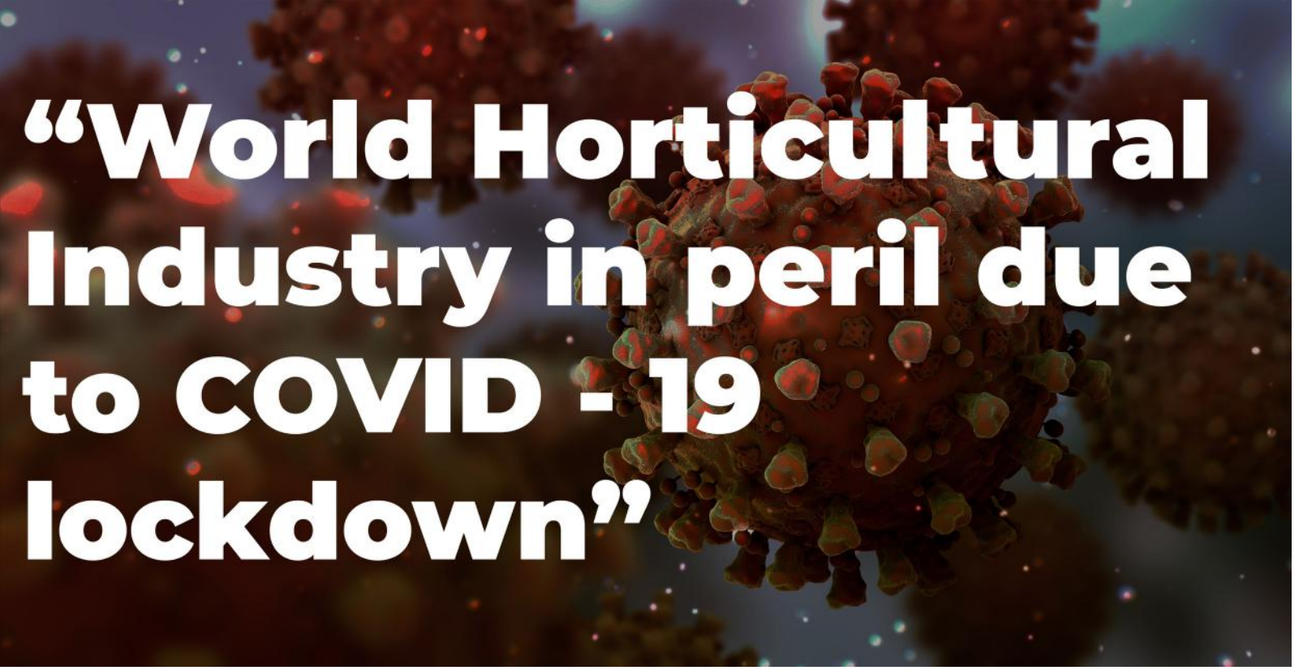
Horticulture is the study or practice of growing flowers, fruits and vegetables. Horticultural crops are very nutritious. Particularly, fruits and vegetables provide higher amount of vitamins and minerals to us. In our daily life, we eat different fruits and vegetables. Growing horticultural crops is very suitable for small and marginal farmers

## History of horticulture in India

Horticulture has improved the economic status of farmers in India. Seasonal availability of fruits and vegetables throughout the year has increased the per capita consumption from 40 to 85 grams and 95 to 175 grams of fruits and vegetables, respectively. It has also played a significant role in women endowment, providing employment opportunities to them in mushroom cultivation, floriculture and vegetable seed production etc. The annual growth rate during the period was more than 6.5 percent. Thus, horticulture sector constitutes more than 24.5 percent from mere 8.5 percent of area to the gross domestic product (GDP) of agriculture.

India is blessed with various types of soils and varied agro – climatic conditions as a result of which the country has the advantages of growing a variety of horticultural crops. Horticulture includes a wide range of crops viz., fruits, vegetables, tuber crops, flowers, plantation crops, medicinal and aromatic plants. These crops are being grown in varied agro – climatic conditions i.e temperate, tropical, subtropical and arid zones.India has made a fairly good progress on the horticultural map of the world with a total production touching over 152.2MT during 2000 – 2001. Presently, India is the largest producer of fruits and second largest of vegetables in the world after China. India ranks third after China and U.S.A, in the production of horticultural crops. India is world's largest producer of mangoes and second largest producer of banana and onion. The recent breakthrough in technology coupled with concerted and sustained efforts to augment the food production has transformed India in achieving self-sufficiency in food grains production. However, the problem of malnutrition needs to be overcome



# "World Horticultural Industry in peril due to COVID - 19 lockdown"

COVID – 19/ Corona virus is a respiratory illness which has infected more than 200 countries and has killed more than 6 lakh people globally. As countries across the world increased their actions to contain the spread of COVID - 19, the implications are beginning to be felt across the horticultural and agricultural products supply chains. Horticulture industries across the world are severally affected. Ornamental growers across Europe are suffering from reduced demand. In Britain, the closure of more than 3,000 garden centers and nurseries mean makers of what's fresh food supply is being threatened by COVID - 19. Fresh fruits and vegetables became increasingly scarce in Europe and United states. African countries like Kenya, which is a major supplier of green beans and peas to Europe, half of the workers in the sectors have been sent home on mandatory leave because of the industry's inability to ship orders, even as demands from European retailers surge.

## Effects of COVID - 19 on Indian Horticulture sector

Due to COVID – 19 pandemic a nationwide lockdown has been imposed across the country to contain the spread of this deadly virus. This lockdown has severely affected the various economic sectors of India and so horticulture sector too. Farmers/growers across the country have faced many problems due to the nationwide lockdown. For examples in Southern states of India like Andhra Pradesh and Telangana this lockdown has dealt a blow to the horticultural sector at the time when crops like banana, watermelon, musk melon, sweet lime, grapes, pomegranate and papaya were ready for harvesting. With the shutdown of agriculture markets, state governments have instructed the farmers not to bring their produce to the markets. State governments ensured the farmers that all their produce would be procured by the government itself.

There is a great demand for labour in agriculture sector but "no one is coming out due to lockdown." There is no transportation facility to procure labour from nearby villages. Banana planted in 4,000 hectare and sweet lemons harvested from 600 hectare area got damaged. The horticultural crops have got a huge hit by the nationwide lockdown due to COVID-19 pandemic. With the transport coming to complete halt, farmers are unable to take vegetables and fruits to the markets in the towns. Banana, sweet lemon, watermelon, tomato and chili farmers in Andhra Pradesh are affected too are badly by this situation. There are no cold storage units to store bananas. The entire crops are wasted due to many reasons like there are no buyers. We may see a situation where farmers will dump the bananas like what we have seen earlier with onions and tomatoes in the past.

The lockdown has affected much more to the horticulture industry. Few days ago, ETCFO spoke with INI Farms Finance Head, Sushil Parikh. INI farms are an integrated horticulture start – up, which was set up in 2009. It is working with more than 2,500 farmers across Maharashtra, Gujarat,





Rajasthan, Andhra Pradesh and Tamil Nadu. It exports pomegranates and bananas to over 35 countries. The peak season for exports is from January to May and the lockdown was imposed during this export season & it severely affected the activities of INI Farms and many more other businesses too. The Indian horticulture sector has suffered the losses of up to 70% during the lockdown period.

## Problems

Meanwhile, the main problem is the shortage of labour. At every step i.e from sowing, weeding, harvesting, sorting, packing, loading, transportation and upto processing labour is required. Due to scarcity of labour supply chains are also disrupted. There are so many farmer who did not got the genuine price for their produce, they sold their produce at very low price. Due to the increased cost of harvesting & transportation, fall in rate & demand and closure of majority of markets, the horticulture industry has suffered severe monetary losses worth thousands of crores.

## Studies says

Bhogal 1994 conducted a study in Nainital district of Uttarakhand and his study revealed that 66.66 percent of the apple growers were facing problems due to the non – availability of cold storage facilities, 64.00 percent of the apple growers were facing problems due high marketing cost and 51.39 percent of growers were facing problems due to the lack of transport facilities.

Kumar S 1996 in his study on management of mango gardens by farmers in Krishnagiri taluk of Dharmapuri district revealed that majority of the respondents i.e 80.93 percent leased out their mango gardens, nearly fifty percent of respondents sold their produce at different market places and only 9.17 percent of the respondents auctioned their produce.

Venkatarman and Gowda S, 1996 studied the economics of tomato production in Kolar district of Karnataka. They worked out the per acre total cost of production and the marketing costs which was Rs. 15,648.26 and. 18,406.77, respectively. Out of total cost of production 37.55 percent was incurred on labour, 21.55 percent was on manures and fertilizers and 13.64 percent on plant protection chemicals.

The government needs to immediately step in to improve the farming system so that farmers can sell their produce on time at reasonable price.

# WAYS OUT

## Solutions for packing:

It's very difficult to protect the produce from mechanical injuries during transportation. Some horticultural crops when packed in wooden cartons then there is an increased risk of the mechanical injuries to the commodities. So, there should be some innovative packing technologies so that these losses can be reduced.

## Solution for cold storage:

As we know horticultural commodities are very perishable in nature. Thus, government should avail the cold storage facilities for the horticultural crops at fare price so that farmers can afford and adopt these practices very easily.

## Solution for transportation:

The horticultural crops are mostly transported by road. So, to ensure the proper transportation of the horticultural commodities better road facilities should be there in the country.

## Solution for proper weighting:

There should be a proper system for weighting of the horticultural commodities so that seller can know & get the exact quantity and exact price.

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# ELEMENTAL ANALYZER (CHNS)

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## Introduction

Carbon, hydrogen, nitrogen, and sulfur (CHNS) are fundamental elemental components that are analyzed on the ship during IODP expeditions. Fluctuations in the concentration and/or content ratio of carbon, nitrogen, and sulfur define the origin, depositional environment, and diagenetic alteration of source materials. A few options for sample preparation method, instrument settings, and measurement methodology exist. In addition to the pregenerated methods, specific analytical methodology may be required based on the nature of certain sample materials. In this case, new methods will be created by the laboratory technicians working in conjunction with the scientists. Each instrument method is recorded by the USIO and will be associated with the measurements performed under that method.

**Keywords: Carbon, Nitrogen, Hydrogen, Sulfur**

## Carbon Analysis

Most marine sediments and sedimentary rocks contain both carbonate ("inorganic") carbon and organic carbon. The CHNS procedure measures total carbon (inorganic plus organic) when following the standard method. Organic carbon content is then determined by using the inorganic carbon value from coulometric analysis and calculating the difference between total carbon from CHNS analysis and inorganic carbon analyzed by coulometer. Alternative methodologies can be employed to measure organic and inorganic carbon.

## Nitrogen Analysis

Nitrogen is one of the important limiting nutrients in the ocean. The global carbon cycle and, consequently, atmospheric CO2 might be tightly coupled to the nitrogen cycle, and therefore changes in the magnitude of the sinks and sources of fixed nitrogen in the oceans can significantly influence global climate. Biological nitrogen fixation, denitrification and consumption of nitrate by phytoplankton are the major biological processes of the global nitrogen cycle. Changes in ocean circulation and nutrient supply, which occur in response to changes in environmental conditions, affect the relative importance and spatial extent of the major pathways of the nitrogen cycle.





## Carbon-Nitrogen Relationship

C-N signatures indicate diagenesis and changes in productivity in seafloor sediments. Diagenesis may cause a decrease in C/N with decoupled C-N concentration variations, whereas productivity changes tend to produce C-N covariance in concentrations at relatively constant C/N ratios. Without significant superimposed diagenetic effects, linear relationships between C and N compositions can in some cases be interpreted as reflecting sources of organ-ic matter:

- C/N = 6–8: fresh marine organic matter
- C/N = 8–20: degraded marine organic matter
- C/N > 20: continental organic matter

Low C/N values occur in sediment that is poor in organic carbon; these values may be biased by the tendency of clay minerals to absorb ammonium ions generated during the degradation of organic matter. Sediments rich in TOC have higher C/N values than sediments lean in TOC. C/N values that are elevated above algal values are com-mon in organic carbon-rich marine sediments. These values evidently result from the selective loss of nitrogen as organic matter settles from the photic zone because nitrogen-bearing proteins are more labile than other organic matter components such as carbohydrates and lipids. This type of preferential nitrogen depletion and consequent carbon enrichment is recognized in organic carbon-rich sediments. C/N elevations are most pronounced when TOC concentrations are highest, suggesting that a higher rate of organic matter delivery leads to diminished organic matter degradation.

## Sulfur Analysis

Cycling of sulfur compounds is a ubiquitous process in marine sediments that supports a range of microbial meta-bolic strategies. The occurrence of sulfur over a wide range of oxidation states (–2 to +6) allows sulfur species to serve as both electron acceptors and electron donors. In reduced form as sulfide (H2S = H2S(aq) + HS–), sulfur is also an important sink for reactive iron. The reduction of sulfate to sulfide is by far the most important pathway for sedimentary organic matter oxidation in anoxic marine sediments, and there is evidence that anaerobic oxidation of methane controls microbial sulfate reduction (MSR) in many marine systems.

Much of the sulfide produced during dissimilatory MSR in marine sediments is oxidized back tosulfate by a variety of biological and abiotic pathways, and sulfate produced by oxidation of sulfide may have variable isotope values reflecting the nature and complexity of the abiotic and biological oxidation pathways and relative contributions from different oxidants. These pathways often include the production of intermediate sulfur species such as elemental sulfur and thiosulfate, which can undergo further bacterial disproportionation reactions that may lead to further fractionations of both sulfur and oxygen isotopes in secondary sulfate.

Elemental sulfur is a possible intermediate in pyrite formation and may serve as an indicator for active SO4 reduction. Elemental sulfur enrichments may form at places where the sulfide concentrations were high, resulting from in situ SO42– reduction. Elemental sulfur forms from partial oxidation of sulfide. In addition, low-molecular-weight organic sulfur compounds are included in elemental sulfur.




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# Sulfur-Carbon Relationship

In normal marine sediments the relation between sulfur and carbon contents has a slope of 1/2.8 (Stot/Corg ratio, wt%/wt%) and passes through the origin (assuming that sulfur fractions other than reduced sulfur are relatively negligible). In euxinic marine environments, however, sulfide is omnipresent (independent of local Corg contents) and iron sulfide formation can take place in the water column or at the sediment/water interface. In addition, even slowly reacting iron compounds may react with sulfide in euxinic environments. Consequently, positive intercepts on the sulfur axis are obtained in sulfur vs. carbon plots for euxinic sediments, and only weak correlations may be observed. Additionally, postdepositional sulfidization of Corg-poor sediments may result in extremely high sulfur/carbon ratios.

# Theory of Operation

Dried and powdered samples are combusted in a tin sample crucible with vanadium pentoxide catalyst, purified by a reactor packed with electrolytic copper and copper oxide, separated on a gas chromatographic column, and analyzed using a thermal conductivity detector (TCD).

Addition of the V2O5 ensures complete conversion of inorganic sulfur in the sample to sulfur dioxide. When the tin crucible with sample is dropped into the reactor, the oxygen environment triggers a strong exothermic reaction. Temperature rises to ~1800°C, causing the sample to combust. The combustion products are conveyed across the reactor, where oxidation is completed. Nitrogen oxides and sulfur trioxide are reduced to elemental nitrogen and sulfur dioxide and oxygen excess is retained. The gas mixture containing N2, CO2, H2O, and SO2 flows into the chromatographic column, where separation takes place. Eluted gases are sent to the TCD where electrical signals processed by the Eager 300 software provide percentages of nitrogen, carbon, hydrogen, and sulfur contained in the sample..

# ZERO BUDGET NATURAL FARMING : A NEW APPRAISAL


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Before 1940's, when the population was smaller than it is today, it was common for farmers throughout the world to grow organic food and yields were similar to that of prehistoric times. However, as the world's population increased, growing organic food was no longer a feasible way to feed the society. This had led to the introduction of intensive technologies including more efficient ways to feed the population that had almost double in size. Fertilizers, mechanized cultivation, pesticides and herbicides helped in producing greater yields for the larger population

Green Revolution transformed the country from a food-deficit state to self sufficiency during early 1970s. The green revolution promoted use of new and high yielding varieties of crops that depend on agrochemicals to produce higher yield. Indian farmers increasingly find themselves in a vicious cycle of debt, because of the high production costs, high interest rates for credit, the volatile market prices of crops, the rising costs of fossil fuel based inputs and private seeds. The consequences of green revolution were reviewed and found that it has led to reduced genetic diversity, increased





vulnerability to pests, enhanced soil erosion, reduced soil fertility, water shortage, micronutrient deficiencies, increased soil contamination, reduced availability of nutritious food crops for the local population.

Therefore, an alternative agriculture and agro economical methods could apply which can function in an ecosystem friendly while sustaining and increasing the crop productivity and also concerning about health promotion in the community. Re-orienting conventional agriculture to more productive alternative farming systems has now been of the hour, as has been enunciated by Dr. M. S. Swaminathan, "If agriculture goes wrong nothing else goes right" and "younger people will only join agriculture if it is technologically driven". This will require new approaches and innovations as well as increasing collaboration between various stakeholders in the food system.

On the search for eco-friendly and farmer-friendly alternative systems of farming, Government of India has committed to double farmers' income by 2022 and all efforts are being made to execute the pledge. While the country has been planning to revamp its agricultural production system including R&D to meet this formidable challenge, the economic survey of 2018-19 made fervent appeal for adoption of Zero Budget Natural Farming (ZBNF) in a big way to double farmers' income and it was subsequently endorsed by the Hon'ble Finance Minister during her budget speech in the parliament.

The ZBNF has attained wide success in southern India, especially Karnataka where it was firstly evolved. Later, it was promoted by the Government of Andhra Pradesh during the last two decades as Community Managed Sustainable Agriculture (CMSA) or Climate Resilient Zero Budget Natural Farming (CRZBNF). Now, it is spreading all over India, so rapidly and dynamically.

ZBNF is basically a natural farming technique that uses biological pesticides instead of chemical-based fertilizers. Farmers use earthworms, cow dung, urine, plants, human excreta and such biological fertilizers for crop protection. Four aspects that are integral to ZBNF are:

* Beejamrut, or microbial coating of seeds using cow dung and urine based formulations,
* Jeevamrut, or the application of a concoction made with cow dung, cow urine, jaggery, pulse flour, water and soil to multiply soil microbes,
* Acchadana-Mulching, or applying a layer of organic material to the soil surface in order to prevent water evaporation, and to contribute to soil humus formation and
* Whapasa, or soil aeration through a favourable microclimate in the soil.

These practices have been shown to have a positive effect on the quality of the soil, improving its fertility and water retention capacity. This is likely to reduce reliance on resources such as water and electricity for irrigation. Substituting chemical fertilizers and pesticides with natural inputs might reduce input costs and farmers' exposure to credit risks; the increase in net income will improve the cash flow of poor and vulnerable farmers, and may enhance their ability to deal with economic shocks and the reduced resource-dependence and improved soil quality might then help farmers to adapt better to extreme climate events.

ZBNF falls under a larger tradition of farming in India, called natural farming. There areteachers from other parts of India who promote similar principles but not at the same scale. Organic farming, Biodynamic farming, Homa Jaivik Krishi, Rishi Krishi, Panchagavya Krishi, Natural farming, Permaculture, LEISA farming, Natueco farming, Homa Farming,Yogic farming etc. are based on nature and implemented to protect soil and environment degradation, protection from the hazardous side effects of chemical methods, such as magnification, pollution, carcinogenic elements, and food poisoning.

# FARM MECHANIZATION
## THE SWADESHI SILENT REVOLUTION

**P. Oral Roberts**
**SHUATS University, Allahabad,U.P**

## FARM MECHANIZATION

Farm Mechanization is the application of engineering and technology in agriculture to practice agricultural operations in a better way. Mechanization helps in efficient utilization of the inputs, safety & comfort of agricultural workers, improvement in the quality and value addition of the produce. Mechanical aids include hand tools, animal drawn equipment, tractors, power tillers, electric motors, engines, processing and hauling equipments etc.

## ESSENCE OF FARM MECHANIZATION IN THE CONTEXT OF INDIAN AGRICULTURE

Agriculture provides approximately 52% of the total jobs available in India and contributes around 18.1% to the GDP. The agriculture sector of India has occupied almost 43% of India's geographical area. The population of India is projected close to 1.380 billion in 2020. In order to ensure food security to the nation, productivity per unit land holding has to be increased inevitably. This can't be achieved by solely sticking to the traditional farming methods and farm tools. Therefore it becomes essential in switching to farm mechanization to a large extent. Availability of farm power and production of food grains has increased from 0.25kW/ha and 0.5t/ha in 1951 to 1.68kW/ha and 1.921t/ha, respectively in 2011.

## BENEFITS OF FARM MECHANIZATION

1. Leads to improvement in Agricultural Techniques
2. Modifies the social structure in rural areas
3. Introducing Commercial Agriculture
4. Mitigate Farm Labour Shortage
5. Results in proper land usage
6. Reduces Fodder Area and Enlarges Food Area
7. Best return of Farm Income

## OBJECTIVES OF STRENGTHENING OF AGRICULTURALMECHANIZATION (SMAM)

1. Promotion and Strengthening of Agricultural Mechanization through Training, Testing and Demonstration
2. Demonstration, Training and Distribution of Post Harvest Technology and Management (PHTM)
3. Financial Assistance for Procurement of Agriculture Machinery and Equipment
4. Establish Farm Machinery Banks for Custom Hiring
5. Establish Hi-Tech, High Productive Equipment Hub for Custom Hiring
6. Promotion of Farm Mechanization in Selected Villages
7. Financial Assistance for Promotion of Mechanized Operations/hectare Carried out Through Custom Hiring Centres
8. Promotion of Farm Machinery and Equipment in North-Eastern Region.

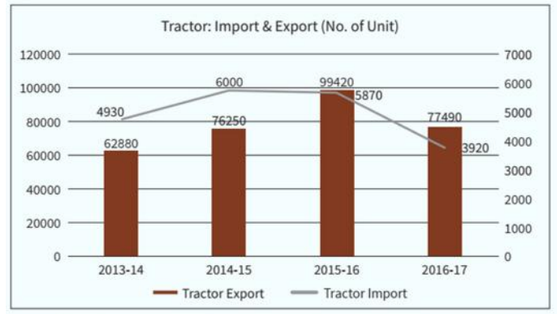
From the above mentioned objectives, 1st & 2nd comes under Central Sector (Central share 100%) and other 3rd to 8th under Central Sponsored Scheme (central share 50%: State Share 50%). Government is promoting Farm Mechanization by making agricultural equipment available among farmers at cheaper rates. 25-50% subsidy on procurement cost is available under RKVY, NFSM, NHM & TMOOP scheme for various equipments. Subsidy on tractors and power tillers is available on the models approved by the department of Agriculture. In addition to tractors and power tillers, combine harvesters are also available to the farmers on subsidy. As an individual farmer may not be able to purchase high cost equipment on his/her own, Self Help Group of farmers (SHGs), user groups, cooperative societies of farmers etc are also made eligible for assistance under the programme.

## THE SWADESHI SILENT REVOLUTION

Farm Mechanization is an expanding SWADESHI SILENT REVOLUTION. Export and import of farm machineries have been increasing over the years in Indian Agriculture. According to the Department of Agriculture, use of workers and draught animals has decreased from 63.5% in 1971-72 to 13.67 while share of tractors, power tillers and motors has gone up from 36.5% to 86.33% during the same period.

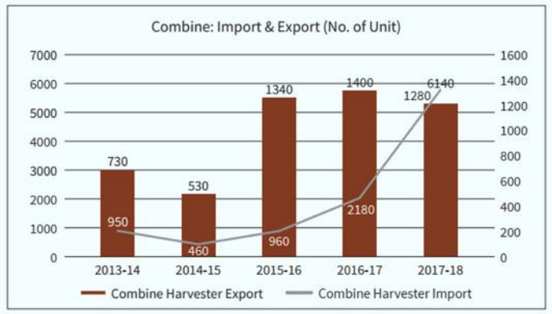
## TRACTOR TRADE

- India is the largest tractor market in the world. India exports an average of 79,000 tractors annually. India's tractor export markets include African countries and ASEAN countries where soil and agro-climatic conditions are similar to India.
- In 2013-14, India exported 62,880 units of tractors which increased to 77490 in 2016-17 growing at a CAGR of 5.36%. In 2016-17, India imported 3920 units of tractors while during 2013-14 it imported 4930 units of tractors, thus registering a negative growth at a CAGR of 5.57% over the period of four years



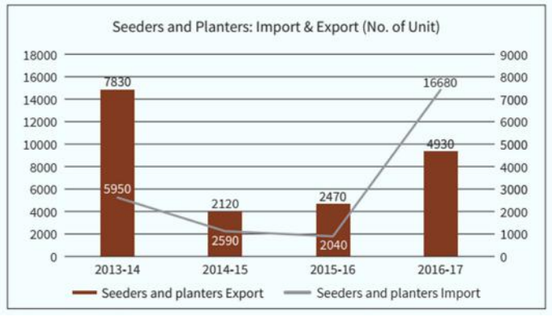

# COMBINE HARVESTERS TRADE

Domestic companies are covering major part of this market whereas foreign companies are also picking up. Import has increased with a CAGR of 91.14% between 2013-14 and 2017-18 while export has increased at a CAGR of 24.66% annually. Import has increased from 68.31 Crore during 2016-17 to 95.13 Crore during 2017-18 while export has also increased from 41.65 Crore to 54.59 Crore, thereby, India is net importer of Combine Harvesters. Iran, Sri Lanka and Nepal are among the countries that generally import combine harvesters from India




# SEEDERS, PLANTERS AND TRANSPLANTERS TRADE

India majorly relies on imported machinery in this segment. Imports of the machinery grew at impressive CAGR 29.40% whereas the exports saw a negative growth of CAGR 10.92% over the period from 2013-14 to 2016-17. Imports of these machinery grew from 29.95 Crore in 2015-16 to 34.84 Crore in 2016-17 whereas, the export increased from 5.25 Crore to 7.08 Crore during the same period




It is concluded that Sustainable Farm Mechanization is capable to increase land productivity besides support opportunities that relieve the burden of labour shortages. It reduces poverty and achieves food security while improving people's livelihoods. During last 53 years average farm power availability in India has increased from about 0.30 KW/ha in 1960-61 to about 2.02KW/ha in 2013-14. Over the years the shift has been towards the use of advanced mechanical and electrical sources of power thereby bringing forth an appreciable increase in Agricultural and allied production. It is thereforeundoubtedly concluded that Farm Mechanization is the SWADESHI SILENT REVOLUTION, strengthening the Nation.






# COMMONLY USED FARM MACHINERIES AND IMPLEMENTS

| Tractor | | | Power Tillers | | |
|---|---|---|---|---|---|
| **Manufacturers** | **Specifications (PTO HP)** | **Price Range** | **Manufacturers** | **Specifications (PTO HP)** | **Price Range** |
| EICHER | 20.5 – 38 | ₹ 575000 to ₹ 620000 (39 -42 PTO HP) | GREAVES | 14.6 W.C. Engine | ₹161000 (with Rotary) approx. |
| HMT | 21.9 – 64 | | KAVI | 11 KW 14.75 HP | |
| John Deere | 32.5 – 63.35 | | KRANTI | 11-2 KW 15 HP | |
| Mahindra | 13 – 51 | | Manam | 7.00 KW | |
| TAFE | 27.5 – 75 | | RHINO | 10.7 (KW) 14.5 HP | |
| Sonalika | 24.67 – 40.63 | | SHRACHI | 8.5 KW 11.4 HP -9.00 KW 12 HP | |
| Shaktiman | 26.2 – 52 | | VIJAY | VR-15 L 14.3 HP | |
| Mitsubishi Shakti | | | VST | 9 – 14.3 HP | |

# MANUFACTURERS, SPECIFICATIONS AND PRICE RANGE OF ROTAVATOR AND PADDY TRANSPLANTER

| Rotavator | | | Paddy Transplanter | | |
|---|---|---|---|---|---|
| **Manufacturers** | **Specifications (PTO HP)** | **Price Range** | **Manufacturers** | **Specifications (PTO HP)** | **Price Range** |
| Shaktiman | Should match with Tractor/ Power Tiller to be purchased | Approx. 105000 | Mahindra & Mahindra | 2.3 HP/ 170 Kg | ₹182000 approx. |
| MALWA | | | | | |
| Sonalika | | | VST Tractors 7 Tillers | 2.3 HP/ 130 Kg Self propelled | |
| Fieldkin | | | | | |

# MANUFACTURERS, SPECIFICATIONS AND PRICE RANGE OF MB PLOUGH, CAGE WHEEL, DISC HARROW, CULTIVATOR AND SEED CUM FERTILIZER DRILL

| **Items/ Features** | **MB Plough** | **Cage Wheel** | **Cultivator** | **Cultivator** | **Seed cum Fertilizer Drill** |
|---|---|---|---|---|---|
| Manufacturers | Not Specific | Not Specific | Not Specific | Not Specific | Not Specific |
| Specifications | Should match with Tractor/ Power Tiller to be purchased | Should match with Tractor/ Power Tiller to be purchased | Should match with Tractor/ Power Tiller to be purchased | Should match with Tractor/ Power Tiller to be purchased | 7,9 & 11 tynes, should be matching with Tractor |
| Price Range | Approx. 27000 and above | _ | ₹ 46000 approx. And above (depending upon no. Of discs) | ₹ 20000 approx. | ₹40000 approx. And above |

# HOMA FARMING
## A HEALING FIRE FOR AGRICULTURE

**Jagriti Thakur**
**University Institute of Agricultural Sciences, Chandigarh University**

## HOMA FARMING:

It is a healing fire from the ancient science of 'Atharvaveda'. It is a process of purifying the atmosphere through a specially prepared fire performed at sunrise and sunset daily. It envolves burning of specific organic substances like cows ghee, rice grains, twigs of plant like peepal, bael etc. It is also known as the "Maharishi" vedic organic agriculture, since it was earlier mentioned in 'Atharvaveda' and it had been practiced successfully by 'Rishis and Maharishis'.

## THE SCIENCE AND THE BELIEF BEHIND IT:

Utilizing the healing fire, holy ash & vedic sounds, the sounds of natural law to awaken the inner intelligence of the plant and promote a peaceful healthy life for all who eat them. The chanting of mantras removes negative energies from the environment.

The basis process performed in Homa farming is Agnihotra. Agnihotra is a healing fire from the ancient science of Ayurveda. It is a process of purifying the atmosphere through a specially prepared fire which is performed daily at sunrise and sunset. The beneficial effects of Agnihotra help to reduce stress, improve overall health and provide positive energy. This simple yet powerful tool is used across the planet by people from all the walks of life with amazing results that help to transform their lives and heal the planet.

## MATERIALS REQUIRED:

**Pyramid:** Copper pyramid which has capacity of all the electricity energies and others.

**Rice:** Only unbroken rice should be used.

**Cow Ghee:** It is a very special medicinal substance, when used in Agnihotra fire. When cow ghee is burned with rice it purifies atmosphere and also induces rain.

**Cow dung Cake:** Patties of fresh cow dung is prepared and dried in sun.

Dried Cow dung has been found to be rich in Actinomycetes and treated as medicine in all ancient culture from India to North or South America, Scandinavins, East or West Europeans or Asians.


## METHOD OF PREPARATION OF AGNIHOTRA FIRE

*Arrange pieces of cow dung in such a manner to allow free passage of air.
*Apply a little ghee to small piece of patty, light it and insert in the pyramid.
*Don't use any mineral oil or blow through mouth to make fire.
*At sunset & sunrise utter the Agnihotra Mantras and after the word Swaha add a few grains of rice coated with ghee to the fire.
*The practice should be initiated with sunset followed in morning and repeated at sunset & rise at the farm or at home.

## PROCEDURE:

| Morning Agnihotra | Evening Agnihotra |
|---|---|
| Agnaye swaáhá,<br>Agnaye idam na mama<br>(add first pinch of rice)<br>Prajápataye swaáhá,<br>Prajápataye idam na<br>Mama(add second pinch of rice) | Agnaye swaáhá,<br>Agnaye idam na mama<br>(add first pinch of rice)<br>Prajápataye swaáhá,<br>Prajápataye idam na<br>mama(add second pinch of rice) |

## ADVANTAGES:

* It is a total and complete organic farming with assured yield.
* Produces healthy soils, healthy plant life and healthy yield
* Restores natural taste, color and flavour of the yields.
* Improve the cooking quality of rice and other cereals.
* Reduces incidence of pests and disease and there by the need of pest control measure
* Ecofriendly.
* Safe to handle.
* Cost effective.
* Leads to sustainable agriculture.

## EFFECT OF HOMA FARMING ON SOIL & CROP

*By applying the energetic ash the soil quality is improved successively from year to year. Soil structure will become very friable < has good water retention and contain ample essential nutrient.
*It also controls the pests and diseases.
*Fertility of the soil is also increased and it also purifies the water.
*Some scientists discovered that agnihotra ash contain 94 elements.
*This ash acts like a catalyst on plant growth in homa atmosphere plants develop leaf vein that are cylindrical and larger than normal due to this water and nutrient be more easily assimilated by the plant.
*Agnihotra ash increases the amount of water soluble phosphorus available to the plant in the soil this have great effect on growth and reproductive cycle.
*Homa atmosphere is also conducive for the production of chlorophyll. Hence, increase photosynthesis and respiration this in turn promotes the proper oxygen cycle in nature.
*Plants that grow in homa atmosphere display a greater array of cell structure.



# PLANT NUTRIENT SOLUTION:

To make an Agnihotra plant nutrient solution, up to 4 tablespoons of Agnihotra ash and up to 4 tablespoons of pulverized, dried cow dung are stirred in approximately 5 liters of water and then applied to plants. This may be repeated every 14 days, depending on how much it is needed.

# TREATMENT OF SEEDS ANDBULBS BEFORE PLANTING AND SOWING:

Seeds and bulbs are treated i.e., impregnated with a mixture of Agnihotra ash and cow urine. It is recommended to prepare a mixture of cow urine and water in a ratio of 50:50, to which up to 4 tablespoons of Agnihotra ash per 5 liters of solution are added and stirred. Seeds and bulbs should be soaked in this solution for 30-40 minutes. This strengthens the germinating plant and makes it more resistant to pests. Like cow dung, cow urine has antibacterial effects and provides a protective coating around the seeds and bulbs. After this time of treatment, seeds are spread on filter paper or other absorbent paper to dry. They should be dry enough to spread but moist enough so that the core of the seed doesn't dry out. Through the impregnation, germination is started which would be ended if the seeds completely dried out. Bulbs may be planted immediately after being treated with the solution.

# FERTILIZERS:

In addition to the above, plants can be fertilized with a mixture of Agnihotra ash, stinging nettles and water. This special liquid fertilizer strengthens the plants. The stinging nettles are fermented i.e., decomposed in the water for 7-14 days, depending on weather conditions and the amount of nettles needed. This mixture should then be diluted to a solution with a ratio of 1:9. In other words, 1 part stinging nettle solution is mixed with 9 parts water and filtered with a fine screen (sieve) into a spraying container or watering can.

# EFFECTS OF HOMA FARMING ON ENVIRONMENT:

*Homa application is a practical contribution to environment protection because they purify the atmosphere and improve the quality of air, water and soil.

*The pyramid form and the copper act as a generator of negative ions these ions have a harmonizing effect on the environment and a positive effect on well being of people.

*Cow dung contains the substance similar to pencillin which has a disinfecting effect and reduce pathogenic bacteria.

*According to vedic scriptures cow dung reduces the radioactive radiations.

*Bees are also attracted to the homa energies. They enable them to fulfill their task of pollinating plants more effectively. In addition to this, bees produce a special hormone in the homa atmosphere which consumed through the honey and strengths the immune system of the people.

It is concluded that Mankind has poisoned the nature and soil with artificial fertilizers. Effects of chemicals are well known like damaged ozone layer, dying forests, extinction of plant and animal species etc. Homa farning is helpful in purifying the atmosphere, soil and water. Homa farming is also helpful in the reduction of pests in the fields. The soil in homa atmosphere holds moisture better than the conventional farmer's field. Bees also get attracted to homa atmosphere which ultimately increases the rate of pollination. Homa farming can be helpful in attaining higher yields without using chemicals. HOMA is the way to save our planet from POLLUTION.

# PROFITS IN ORGANIC FARMING

## CONCEPT AND SUCCESS STORIES

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University Institute of Agricultural Sciences,
Chandigarh University (Mohali) Punjab

## ORGANIC FARMING

Organic production is a holistic system designed to optimize the productivity and fitness of diverse communities within the agro-ecosystem, including soil organisms, plants, livestock and people. The principal goal of organic production is to develop enterprises that are sustainable and harmonious with the environment.

Organic farming is very profitable. But to gain these profits care should be taken & all the agronomic practices i.e., from soil management techniques, selection of planting material, selection of varieties, planting methods, weed management, disease management to pest control everything has to be done organically. Use of chemicals is prohibited in organic farming. Different soil building practices such as crop rotations, intercropping, mixed cropping, symbiotic associations, use of cover crops, use of organic fertilizers and minimum tillage are central to organic practices.The crop should be selected according to the climatic conditions of the growing area. Farmers can consult the agriculture department of their area for the better understanding of the practices involved in organic farming.

## PROFITS IN ORGANIC FARMING THE SUCCESS STORIES

### Success Story 1

### "ORGANIC FARMING BROUGHT HUGE PROFIT FOR ME"

**- Story of Renupada Bagdi**

At the age of 70, Renupada Bagdi of Doniapur village in Birbhum district of West Bengal is on a mission to convince his fellow farmers to take up organic farming just like he did few years ago. He knows from his experience that chemical fertilizers do not yield upto the extent as the companies make it out to be. Chemicals just deteriorate the soil and the produce while organic farming results in healthy and nutritious food and also saves the environment.

Renupada Bagdi did farming by using chemical fertilizers for around 30-35 years. He said that he didn't found conventional farming profitable as he could grow only a single crop. He hardly used to earn around Rs 3,000 per month which was barely enough to meet the expenses of his family.

In the beginning he was not convinced about organic farming when a team from the Development Research Communication and Services Centre (DRCSC), a non-governmental development organization, first approached him with the idea of organic farming in 2012. He was worried that it could not only hamper his farming but could also destroy his land making it unfit for further cultivation. Contrary to his expectations, it brought huge profits for him. His income soared from Rs 3,000 to Rs 12,000 every month because he started growing multiple crops on his farm in one season. And he started motivating his fellow farmers to practice organic farming on their farms.

### Success Story 2

### PUNE BROTHERS QUIT HIGH PAYING JOBS FOR ORGANIC FARMING & EARNING ABOUT RS 30 LAKHS PER MONTH

**Satyajit and Ajinka Hange** grew up alternating between two very different worlds. One was their Anglo-Indian boarding school in Pune city and the other was their rural agrarian family.From kindergarten to post-graduation, the sibling-duo lived in the city. Having completed their Masters in Business Administration (MBA) from Pune University, they climbed the corporate ladder to work for top MNCs like Citibank, DBS, HD FC, and HSBC for nearly a decade. The monthly paycheck and lifestyle were cushy but there wasn't satisfaction or inner peace. Their weekend trips to the village had instilled a love for farming in them. Then they decided to do organic farming.Initially the Hange brothers started practicing organic farming on a small piece of land. Now they are doing organic farming on a 20-acre farm, making an annual turnover of Rs 3 crore

**"The big switch".**

In Western Maharashtra, where sugarcane was chemically grown on a large scale, the Hange brothers decided to go natural with a mixed fruit orchard. It was water-efficient, required lesser tilling and had a longer shelf-life. For the first four years, they ran into losses. The middlemen had turned them helpless. With no logistics, the two brothers put the papayas in a commercial tempo and turned to the local haathgaadi (hand-cart) vendors under bridges. They worked with these street vendors for eight months, until the head of a Star Bazaar tasted the papayas. A meeting with the owner of the enterprise went from 15 minutes to nearly two hours. They were given a rack at each of the mall outlets with no extra charge or rent. They moved on to have a successful stint selling with top retailers, but over the time, they realized that there were hardly any dedicated organic markets which would fetch them the price their top-notch produce was worth. Ajinkya said that they thought that **"On the floor of a mall, our produce was being sold like any other crop which was grown chemically. To us, we were growing gold. So we wanted someone who would sell that gold with the same vigour".**

Soon, they distanced themselves from middlemen and retail chains and worked for their produce to reach their customer's doorstep.

Today, their customer base, in addition to the hundreds of organic food enthusiasts, includes top business tycoons and A-listers from Bollywood too.

It is concluded that Organic farming is very profitable, but for this farmers need to take some precautions and lots of care. All the agronomic practices should be practiced organically. Use of chemicals should be avoided. It is necessary for the organic growers to get their produce certified. If growers are making efforts wholeheartedly then organic farming can actually change their lives by increasing their income and raising their standard of living.

# THE DIGITAL AGRICULTURE

**Hiteshvari V. Korat**
**Ph.D. Scholar, Department of Agronomy, Junagadh Agricultural University, Junagadh**

## INTRODUCTION

Agriculture has undergone a series of revolutions that have driven yield and profitability anduse efficiency to levels previously unattainable. The first agricultural revolution enabled humanity to settle and transition from hunting and gathering to planting and sustaining (Pre1900s). Further revolutions introduced mechanization (1920), then followed by the development of new, more resistant crop varieties and the use of agrochemicals ("The Green Revolution" of the 1960s), complemented by the rise of genetic modification technologies. The latest is called "digital agricultural revolution" could help humanity to survive and thrive long into the future. Digital agriculture offers new opportunities through the ubiquitous availability of highly interconnected and data intensive computational technologies. Digital agriculture refers to tools that digitally collect, analyze, store, and share electronic information with the use of new and advanced technologies, integrated into one system to enable farmers and other stakeholders within the agriculture value chain to improve food production. Sometimes known as smart farming or e-agriculture. Digital agriculture includes precision agriculture. Unlike precision agriculture, digital agriculture impacts on entire agri-food chain-before, during and after on farm production.

"Agriculture 4.0" indicating its role as the fourth major agricultural revolution. Frankelius considers 2015 as the starting point of the fourth agricultural revolution.Here we classified digital technologies according to the following structure, based on the complexity and stage of penetration of these technologies in the agri-food sector.

1.Mobile devices and social media;
2.Precision agriculture and remote sensing technologies (IoT, GNSS, RTK, VRT, PLF, UAV
3.and satellite imagery);
4.Big Data, cloud, analytics and Cyber security;
5.Integration and coordination (block chain, ERP, financing and insurance systems);





# EFFECTS OF DIGITAL AGRICULTURE ADOPTION

The FAO estimates the world will need to produce 56% more food to feed over 9 billion in 2050. Furthermore, the world faces intersecting challenges like malnutrition, climate change, food waste and changing diets. To produces a 'sustainable food future' the world must increase food production while cutting GHG emissions and maintaining the land used in agriculture. Digital agriculture could address these challenges by making the agricultural value chain more efficient, equitable and environmentally sustainable.

On-farm precision agriculture technologies can minimize inputs required for a given yield through variable rate application, real time recommendation. Digital agriculture improves labour productivity through decreased labour requirements by automation. Off-farm digital agriculture has the potential to improve environmental monitoring and food system traceability.

Food calories produces in a year, 25% are wasted between on-farm production and consumers. Traceability systems facilitates better identification of supply side weakness and therefore, reduced food waste. Ensuring food safety, quality and authenticity has become an important regulatory requirement in high income countries. Use of RFID tags and blockchain technologies to certify agri food products characteristics could provide near real time quality signal to consumers and able to get consume trust. Producers who can leverage environmental certification could sell their products at a premium, because blockchain technologies could enable greater trust in labels like 'sustainable', 'organic' or 'fair trade' means it helps to improved producer welfare.

Digital agriculture can help to achieve sustainable development goals by providing farmers with more real-time information about their farms, allowing them to make better decisions. Technology allows for improved crop production by understanding soil health. It allows farmers to use fewer pesticides on their crops. Soil and weather monitoring reduces water waste. Digital agriculture ideally leads to economic growth by allowing farmers to get the most production out of their land. The loss of agricultural jobs can be offset by new job opportunities in manufacturing and maintaining the necessary technology for the work. Digital agriculture also enables individual farmers to work in concert, collecting and sharing data using technology.

# FARM OPERATIONS FOR SEPTEMBER

## Paddy :

1. Rogue out the weeds and off type plants from the field.

2. Give timely and not excessive irrigation for higher yield and stop irrigation two weeks before harvesting.

3. Planthoppers sometime become serious in paddy and the crop dries up in patches. The plant hoppers can be controlled by spraying 94 ml Pexalon 10 SC (Triflumezopyrim) or 120g Chess 50 WG (Pymetrozine) or 40 ml of Confidor/Crocodile 17.8 SL (Imidacloprid) or 800 ml of Ekalux/Quinalmass 25 EC (Quinalphos) in 100 litres of water per acre. For better results, direct the spray towards the base of the plants.

4. Paddy stem borers cause dead hearts and white erect ears near maturity. If the paddy fields show more than 5% dead hearts during vegetative stage, spray 20 ml Fame 480 SC or 170g Mortar 75 SG or one litre of Coroban/Dursban/Lethal/Chlorguard /Durmat/Classic / Force 20 EC in 100 litres of water/acre. In basmati rice, when 2% dead hearts are noticed these pests can be controlled by applying any of above insecticide or 60 ml Coragen 20 SC (Chlorantraniliprole) in 100 litres of water per acre or 4 kg Ferterra 0.4 GR (Chlorantraniliprole) or 6 kg Regent/Mortel/Mifpro G/Mahavir GR 0.3 G (Fipronil) or 10 kg Padan/Kritap/ Sanvex/Caldan/Nidan/Marktap/Miftap 4 G (Cartap hydrochloride) or Dursban 10 G (Chlorpyriphos) or 4 kg Vibrant 4 GR (Thiocyclam hydrogen oxalate) per acre in standing water. Fame 480 SC/ Martar 75 SG/ Coragen 20 SC/Padan / Kritap / Sanvex / Caldan / Nidan / Marktap 4 G Regent / Mortel/Mifpro G/Mahavir GR 0.3 G / Dursban 10 G / Ferterra 0.4 GR or Vibrant 4 GR also control leaf folder effectively.

5. Control leaf folder when leaf damage reaches 10 % by spraying 20 ml Fame 480 SC (Flubendiamide) or 170g Mortar 75 SG (Cartap hydrochloride) or one litre of Coroban/Durmet/Force 20 EC (Chlorpyriphos) in 100 litres of water per acre.

6. To save the crop from sheath blight, keep the bunds of the fields clean by removing grass. On noticing the disease symptoms spray the crop with Nativo 75 WG @ 80 g or Lustre 37.5 SE @ 320 ml or Amistar Top 325 SC or Tilt/Bumper 25 EC Folicur/Orius 25 EC or Monceren @ 200ml or Bavistin @ 200 g in 200 litres of water per acre. Repeat the spray after 15 days interval.

7. If high humidity and cloudy weather persists, the crop may be sprayed at boot stage with Kocide 46 DF (Chopper hydroxide) @ 500 g in 200 litres of water per acre to control false smut.

## Sugarcane :

1. Sow early varieties of mustard such as Pusa mustard-25,Pusa mustard-27,Pusa mustard-28 and Pusa Tarak in this month.

2. For weed control,spray 2.2 litres /ha of Fluchloralin in 600-800 litres of water before sowing.

3. For preventing white rust,treat the seeds with Metalaxyl(Apron 35 SD) @ 6 g/kg of seeds or Bavistin @ 2g/kg of seeds.

4. If weed control is not done before sowing,spray 3.3 litres of Pendimethalin(30 EC) in 600-800 litres of water 1-2 days after sowing.





## Toria :

1. September is the optimum period for sowing of toria. Use short duration variety TL 17, PBT 37 and TL 15 for better yield and getting the field vacated well in time.

2. Toria may be sown after applying 55 kg urea and 50 kg single superphosphate per acre. If single superphosphate is not available, apply gypsum @ 50 kg per acre particularly in sulphur deficient soils along with nitrogen and phosphatic fertilizers.

3. For getting higher productivity, grow toria + gobhi sarson as intercrops at 22.5 cm row spacing by mid- September.

## FODDER PRODUCTION :

1. Prepare the land for the sowing of berseem during last week of September. Mix oats and sarson/ raya in berseem to get first cutting early. Berseem seed should be free from Kashni seed. Inoculate the berseem seed with Rhizobium culture. Apply 22 kg urea and 185 kg super phosphate/acre at the time of sowing berseem. If 6 tonnes of FYM has been applied then 125 kg superphosphate/acre will be sufficient. Where rye grass has been mixed in berseem apply 22 kg urea/acre after each cutting.

2. Sow maize for fodder production upto mid September to have fodder for the scarcity period.

3. Preserve the surplus green fodder of maize or bajra as silage or hay to supplement the shortage of green fodder.

## Potato :

1. The climatic conditions are ideal for sowing early varieties. Take out seed potato from the cold storage in the first fortnight of this month and spread in ventilated place under diffused sunlight in thin layers. Turn the surface of tubers once in a day and allow buds to sprout for a week. Sprouts should attain 0.5 - 1.0 cm length before sowing.

2. Use healthy and disease free seed

3. Disinfect the tubers before sowing with 0.25 % solution of Monceren (250ml per 100 litre water) or 0.083 % of Emesto Prime (83 ml per 100 litre water) for 10 minutes to check black scurf of potato.

4. Application of FYM @ 20 tonnes per acre or green manuring is beneficial for this crop. Drill 82.5 kg urea, 155 kg superphosphate and 40 kg muriate of potash per acre at the time of sowing and remaining urea of 82.5kg at the time of earthing-up.

5. For weed control, use Gramoxone/Kabuto 24 SL (paraquat) @ 500-750 ml per acre at the stage when most of the weeds have emerged and potato crop showed 5-10 % emergence. Use 250 to 300 litres of water in knap sack sprayer fitted with flat fan nozzle and 100 litres of water with power sprayer.

## Garlic :

In the second fortnight of this month, apply 20 tonnes of well rotten farmyard manure per acre along with 40 kg urea, 155 kg superphosphate per acre at sowing. Apply two split doses of urea @ 40kg at 30 and 60 days of sowing. Dibble or drill 225 to 250 kg healthy cloves of garlic in wattar condition on ridges. Keep lines 15 cm and plants 7.5 cm apart. Irrigate immediately after sowing.

## Dairy Farming

1. Healthy animals usually come in heat within 50-60 days after parturition. Observe such animals for heat symptoms and get the animals inseminated within 12 to 18 hrs after onset of heat in order to reduce calving interval.

2. Animals usually lose weight after calving during first 100 days. Hence farmers should follow practices of good management and balanced feeding e.g. quality green fodder, balance feed and mineral mixture so that the weight loss is minimum.

3. Provide dry bedding to young calves and follow the recommended practices of de- worming and vaccination.

4. In case of tick infestation, control it by spraying Asuntol (1 g/litre of water) or Butox (2 ml/litre of water) on the animals as well as in the sheds and repeat the spray after 10-15 days. Do not spray animals below six months of age. Animal sheds especially corners, crevices etc. should also be sprayed. Strictly follow the manufacturers instructions while spraying the insecticides. Keep the animal sheds and surroundings clean to keep the fly population under control.

5. For prophylaxis against trypanosomasis (surra) disease, consult the local veterinarian. Since the disease is transmitted by flies, so spray insecticides to keep the flies away.

6. Protect udder of animals from mastitis by proper sanitation and using teat dip by the solution of 100 ml povidone or iodine plus 20 ml glycerine.

7. Deworm the adult animals regularly at an interval of four months with broad spectrum anthelmintics, keeping in view the prevalence of endoparasites in your area.

## Poultry

1. Light plays an important role in egg production. Provide 14-16 hours of total light to layers, including the day light. Gradually go on increasing the light when egg production starts.

2. Provide extra grit in the hoppers to avoid production of thin shelled eggs.

3. Stir the litter regularly to avoid dampness. At the same time, sufficient air movement should be made possible inside the poultry shed.

4. It is best season to raise the broilers. Get your broiler chicks from a reputed hatchery.
5. Protect the sheds from rodents as they eat feed meant for poultry.

## Compiled by: Mohit Bharadwaj

Source- Punjab Agriculture university,Ludhiana



# A Pond's Story from 'Dusk To Dawn'

[1]Palwinder Singh, [2]Sarvpriya Singh and [3]A P S Dhaliwal
[1,2,3]Krishi Vigyan Kendra, Bathinda

This is the story of a beautiful pond located in the Chotian village of Bathinda district. A few years ago it was a stinking pond as the sewage water of the village used to flow into the pond and pond became a breeding site for mosquitoes. The pond was rebuilt by Mr. Rajveer Singh resident of village Mehraj after acquiring training from Krishi Vigyan Kendra, Bathinda. His father Sh. Nachhatar Singh was a simple farmer and was engaged in his ancestral occupation of farming but Rajveer Singh's thinking was to do something different from traditional farming. After doing graduation in 1998, he started looking for job. Meanwhile, he came in contact with the scientists of Krishi Vigyan Kendra, Bathinda. He got training in Fish production organized by the 'Krishi Vigyan Kendra, Bathinda' in collaboration with Department of Fisheries, Bathinda in the year 2000. Then he took that pond on lease from Chotian village panchayat in the year 2005 and started rearing fish in it. At that time, total Rs. 30,000 was spent for the maintainenance of the pond. The banks of the pond were paved with bricks and the bottom was kept as kacha floor. Trees were planted to strengthen the banks of the fish pond. Pond was filled with water and fish prawn was released into it. The plantations of different types of shade trees helped to change the microclimatic conditions nearby the pond during summer season.

Presently, this pond generates additional income of Rs. 90,000 per annum to the village from the fresh sale of fishes. Progressive farmer Mr. Rajveer Singh said that the fish pond of the village is very effective for the fast growth of fishes due to the availability of natural conditions & nutrients as per the requirement of fish development and helps in earliness in market. Fishes become marketable after six months of release of the fish prawn and are sold at Rs. 10-12 thousand per quintal. This profession also provides employment to rural youth/farmers/women for fishing and other cultural operations.

Additionally, the fish pond also increased the income of the family, who lives near the pond as now they are indulged in the surveillance activity of the pond. The total area of the fish pond is about 6 acres and graced with different historic trees especially Bohr/Banyan, Peepal and Tahli which are declining now-a-days. These trees also provide shelter to a large number of birds, which have a distinct charm to their surroundings due to their chirping. That is why not only the people of Chotian village but also from the surrounding villages come for morning and evening walks in this enchanting environment. In summer season, villagers take their animals for bath in this pond. The excrement of these animals contributes





to the diet of the fishes. But water always remains clean in the pond because of the fishes. The biggest advantage of this pond is that the water constantly percolates from kaccha floor which helps in raising the water level. Due to this venture, the people of Rajveer Singh's village are now seeing his profession like a miracle.

In future, Mr. Singh is planning to irrigate the adjoining panchayati land (about 10 acre) from pond to various crops grown under this area and moreover, there are less requirement of fertilizer due to availability of enough nutrients for the crops which ultimately decrease the cost of cultivation. Therefore, cleaning of old ponds of the villages for fish farming is very beneficial for saving water which is a precious gift of nature and at the same time it provides employment, wealth and clean environment.

In addition to this, smelly ponds can be converted into beautiful lakes. It also conveys a message that "Nothing is impossible if we decided to do something with determination". Nowadays, due to the tremendous advantages of this concept it is being popularized in nearby villages. Besides of this, it also changes the old pond of the village into a beneficial occupation of fish farming.

# SON OF A FARMER'S FAMILY QUALIFIED ODISHA PSC:

## A SUCCESS STORY

### Abhishek Dehal

Er. Sundeep Kumar Jojo is from lalaikhaman village located in Hatibari Tehsil of Sundargarh district in Odisha. In November, 2019 he qualified the examination (written exam and interview) of Odisha Agricultural Engineers Service Association (OAES), conducted by (OPSC) Odisha Public Service Commission. Now he is posted as Assistant Agriculture Engineer or equivalent cadre in khariar town, Nuapada district, Odisha. He is an alumnus of Sam Higginbottom University of Agriculture Technology and Sciences, (SHUATS), Prayagraj (Allahabad), formerly known as Allahabad Agricultural Institute, Uttar Pradesh, India.

From his childhood he was very much interested in fixing equipments which were not working and he is doing so till now. So, looking at that his parents used to say that "ladka engineer banega". Basically, He is from a farmer's family, his Grandfather is a successful farmer, he used to work with him in the field during his school vacations and this has developed his interest in Agriculture. His grandfather used to say him that "If one day a farmer will not go to his work, many people will suffer from hunger".

After completing 12th in science stream, he decided to study Agriculture Engineering course. He appeared and qualified the entrance exam of SHUATS (Sam Higginbottom University of Agriculture, Technology and Sciences, Naini, Prayagraj (Allahabad), Uttar Pradesh. He chose to study B.Tech in Agriculture Engineering. He completed his B.Tech in Agriculture Engineering in the year 2017. He said that from school to college days he was never brightest in studies, he was an average student but he never gave up. Because he strongly believe that "You don't lose when you fail, you lose when you quit". This belief of him helped him always. During four years of engineering, his teachers from Department of Agriculture and Technology have guided him towards his goal. After graduating from college, he started taking coaching for competitive exams and besides that he was also working as a mechanic in a car service centre for his pocket money. After his part time job, he used to study for 3-4 hours in evening.

In November, 2019 he appeared in the examination for the post of Assistant Agriculture Engineer, Odisha Agricultural Engineer's Service Association (OAES), conducted by Odisha Public Service Commission (OPSC). He qualified the written exam and interview. Now he is posted as Assistant Agriculture Engineer or equivalent cadre in khariar town, Nuapada district, Odisha.

He gave all the credits of his success to his parents for having faith in him. He showed his gratitude towards his friends for supporting & motivating him. He specially thanked his teachers and mentors of SHUATS University for their kindness and helping him at every step towards his goal. He also thanked the Almighty God for guiding and showing him the right path towards the achievement of his goal. Lastly he concluded his journey with a verse from HOLY BIBLE, "As I we all know, we cannot do anything without the help of the almighty".



**"Trust in the lord with all your heart and lean not to your understanding; in all your ways acknowledge him and he shall direct your path"**

**this quote itself speaks about the firm belief of Er. Sundeep Kumar Jojo in almighty.**

# AGRICULTURE STUDENTS CRACKED UPSC 2019: SUCCESS STORIES THAT CAN INSPIRE YOU


**Himani Gautam**

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The results of Union Public Service Commission (UPSC) examinations 2019 were announced on Tuesday, 4th August, 2020. Total 829 candidates have qualified the Civil Services Examination (CSE) and 88 candidates have qualified the Indian Forest Service Examination (IFoS) 2019 held by Union Public Service Commission in September and December 2019, respectively. Among the successful candidates a number of agriculture students have also qualified the examination.

## FIVE ALUMNI OF TNAU CRACKED UPSC 2019

Five alumni of the Tamil Nadu Agricultural University (TNAU) namely S Bharani, Sangeetha S, Abinaya S, Malliga S and Vengatesh Prabhu N are there among the candidates who qualified the UPSC examinations 2019. They graduated from the university and its affiliated colleges over the past six years. S Bharani has completed her BSc Agriculture at Agriculture College and Research Institute, Coimbatore in 2014 has cleared the UPSC exam (IFoS) and has got 58th rank. Sangeetha S who completed her BSc Agriculture at Agricultural College and Research Institute Madurai, in 2014 secured 499th rank.

Similarly, Abinaya S who earned All India Rank (AIR) 559, graduated with an agriculture degree at Agricultural College and Research Institute Coimbatore, in 2014. Malliga S who completed BTech Biotechnology from TNAU in 2015 came 621st. Vengatesh Prabhu N came 751st. He had completed UG in Agriculture at Anbil Dharmalingam Agricultural College and Research Institute, Trichy in 2014.

**(From left) S Bharani, Sangeetha S, Abinaya S, Malliga S and Vengatesh Prabhu N**





## FIVE ALUMNI OF MAHATMA PHULE AGRICULTURE UNIVERSITY RAHURI CLEARED UPSC 2019

Five alumni of the Mahatma Phule Agriculture University Rahuri namely Misal Sagar Bharat, Gite Mahesh Babasaheb, Jadhawar Avinash Bhimrao, Mane Navanath Shivaji and Sangram Satish Shinde have also cracked UPSC, CSE 2019. Misal Sagar Bharat secured AIR 204, Gite Mahesh Babasaheb secured AIR 399, Jadhawar Avinash Bhimrao earned AIR 433, Mane Navanath Shivaji obtained AIR 527 while Sangram Satish Shinde secured AIR 785.

### IARI, NEW DELHI STUDENT CRACKED UPSC 2019

**Khandekar Shrikant Kundalik**

Khandekar Shrikant Kundalik an agriculture student from IARI, New Delhi is also among these 829 candidates who qualified UPSC, CSE 2019 and secured AIR 231 with agriculture as an optional subject

### SUSHIL KUMAR AIR 106 UPSC, CSE 2018

**Sushil Kumar AIR 106**

### SUCCESS STORIES OF UPSC ASPIRANTS WITH ACADEMIC BACKGROUND IN AGRICULTURE

Sushil Kumar is an alumnus of IARI, New Delhi. He qualified UPSC CSE 2018 with agriculture as an optional subject. In his interview to Delhi Knowledge Track he said that there is a perception among agriculture students that due to the non availability of right study material and coaching centres it is not possible for them to score good marks in UPSC.

500 in agriculture optional. He advised UPSC aspirants to follow basic agriculture text books only. He also shared the list of books and study material he referred for paper I and II. Agronomy, Soil science, Environment science, Agriculture extension and Agricultural economics are the subjects for paper I whereas Plant Breeding & Genetics, Plant Physiology, Seed Science & Technology, Food Security & Nutrition, Horticulture, Entomology and Plant Pathology are the subjects for paper II. Sushil Kumar further said that paper I is very general whereas paper II is much vast and scientific than paper I. Therefore, aspirants need to study very selectively for Paper II. Their main focus should be on Plant Breeding & Genetics, Plant Physiology, Seed Science & Technology and Horticulture as around 70% of questions asked from these subjects only. While from Entomology and Plant Pathology they need to study only important topics like basic concepts, pest & diseases of economically important crops and stored grain crops.

### LIST OF BOOKS/STUDY MATERIAL REFERRED BY SUSHIL KUMAR FOR PAPER I :

**Agronomy** – Principles of agronomy by TY Reddy and GHS Reddy

**Soil science** – Introductory Soil Science by DK DAS

**Agriculture Extension –** Extension Communication and Management by G L RAY

**Agriculture Economics –** Economics of Farm Production and management by VT Raju and DVS Rao

## LIST OF BOOKS/STUDY MATERIAL REFERRED BY SUSHIL KUMAR FOR PAPER II :

**Plant Breeding & Genetics –** (i) Fundamentals of Plant Breeding by Phundan Singh, (ii) Essentials of Plant Breeding by Phundan Singh

**Plant Physiology –** (i) Fundamentals of Plant Physiology by Dr. VK Jain
(ii) Plant Physiology by SN Pandey and BK Sinha

**Seed Science & Technology –**
(i) Seed Technology by RL Agrawal
(ii) IARI manual of Seed Science and Technology

In addition to these books, he also referred other study materials like he studied TNAU notes for horticulture, entomology, plant pathology and post harvest management. He further explained that the syllabus of general studies consists of food policies and laws so for Food Security & Nutrition he didn't studied from any other specific source because everything was already covered under syllabus of general studies. He also studied last 10 year question papers of UPSC for better understanding of exam pattern, type of questions asked and writing practice.

## SHINDE AMIT AIR 705 CSE & AIR IFOS 73 UPSC 2017

Shinde Amit is an alumnus of the Mahatma Phule Agriculture University, Rahuri. He qualified both UPSC CSE & IFoS examination 2017 with agriculture as an optional subject. He obtained AIR 705 and AIR 73 in UPSC CSE and IFoS 2017, respectively. In his interview to Delhi Knowledge Track he said that he has done his graduation and post graduation in agriculture that's why he chose agricultureas an optional subject in UPSC. He qualified UPSC 2017 without any coaching. He and his friends used to make their own notes. For making notes, they used to divide topics among them and circulate the notes among their group.Shinde Amit has qualified both UPSC CSE and IFoS exam 2017 so he explained the difference between the paper pattern of CSE and IFoS. He said that in CSE exam questions from agriculture are usually very general, easy and analytical whereas, in case of IFoS questions from agriculture are very specific and they need to be answered on the basis of facts. In paper II of CSE questions are selective but in IFoS paper is comprehensive and questions are there from all the subjects. So, IFoS aspirants have to study all the subjects thoroughly. He added that UPSC aspirants need to study agriculture in a very scientific manner i.e. by citing examples, making flow charts and diagrams. He suggested aspirants to make their own notes as making notes will also help them in practicing writing. Further, he suggested candidates to frequently visit the websites of Ministry of Agriculture & Farmers Welfare and ICAR to check about the new schemes, varieties, techniques and their implication. He also shared the list of books and study material he referred for paper I and II.

## LIST OF BOOKS/STUDY MATERIAL REFERRED BY SHINDEY AMIT FOR PAPER I :

**Agronomy –** Principles of agronomy by TY Reddy and GHS Reddy

**Soil science –** Introductory Soil Science by DK DAS

**Agriculture Economics –** Economics of Farm Production and management by VT Raju and DVS Rao

## LIST OF BOOKS/STUDY MATERIAL REFERRED BY SHINDEY AMIT FOR PAPER II :

**Plant Breeding & Genetics –** (i) Fundamentals of Plant Breeding by Phundan Singh
(ii) Essentials of Plant Breeding by Phundan Singh

**Plant Physiology –** Plant Physiology by SN Pandey and BK Sinha

**Seed Science & Technology –** Principles of Seed Technology by Phundan Singh

In addition to these books, he referred other study material also like for Agriculture extension he studied his UG notes, TNAU & Acharya NG Ranga Agricultural University notes. For horticulture, entomology and plant pathology also he studied his own UG notes. He further explained that syllabus of general studies consists of food policies and laws so for Food Security & Nutrition he didn't studied from any other specific source. In addition to this he also studied last 10 years question papers of UPSC.

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