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EARTH ROOT

**SOCIALIZATION OF
TECHNOLOGY IN
AGRICULTURE**
- Mehak Tiwari

**CLIMATE CHANGE
AND AGRICULTURE**
- Nimarpreet Kaur
Kalsi

**Role of Agriculture in
the Economy**
-Sunanda Maurya



About E-magazine

“Earth Root” is an open access e-magazine in the discipline of Environmental sciences published by Earth Root Foundation. The aim of the e-magazine is to provide information and upgradation of knowledge about environmental issues on wider scale and to share ideas and resources to the readers. Using essential knowledge people can lead a healthy life, which is more sustainable and can connect with ongoing efforts for stopping catastrophically the climate change. E-magazine caters to all related environmental aspects ranging from big issues like climate change, renewable energy and pollutants in the atmosphere to the health of human and living beings on Earth. We also take topics of water resources and efforts and measurement to provide optimum use of it; including large scale atmospheric circulation linked with oceans and ecology.

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TABLE OF CONTENTS

ROLE OF AGRICULTURE IN THE ECONOMY	4
CLIMATE CHANGE AND AGRICULTURE	6
SOCIALIZATION OF TECHNOLOGY IN AGRICULTURE	8



CLEAN FUEL AND ADVANCEMENTS IN RENEWABLE TECHNOLOGY	11
-----------------------------------------------------	----

BRINGING INNOVATION IN SUSTAINABLE AGRICULTURE: AGRITECH START-UPS	15
--------------------------------------------------------------------	----

TECHNOLOGICAL ADVANCEMENTS IN AGRICULTURE	17
MOVIE RECOMMENDATION	19
CROSSWORD	20



ROLE OF AGRICULTURE IN THE ECONOMY

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The agriculture sector plays a vital part in a country's economic growth cycle. This has already made a major contribution to advanced countries' economic growth, and its position in less-developed countries' economic development is vitally important. Over 7% of rural households depend on agriculture. Agriculture is a backbone of the Indian Economy as it contributes about 17% to the total GDP and provides employment to around 58% of the population. Indian agriculture has registered impressive growth over the last few decades. The food grain production has increased from 51 million tones (MT) in 1950-51 to 250 MT during 2011-12 highest ever since independence.

In the financial year 2016, the states of the U.P had the highest production of Cereals, lentils, and pulses growing over 44 million metric tons. The total production of food grains in the country amounted to about 252 million metric tons that year. The share of agriculture in GDP increased to 19.9% in 2020-2021 from 17.8% in 2019-20. The last time the contribution of the agriculture sector to GDP was 20% was in 2003-04.



1. Providing Employment: When there is an increase in the agriculture sector, its production, more employment opportunities will also be generated. Direct employment in the crop rising, agriculture expansion also provides work in the other sphere.

2. Create effective demand: Agriculture sector growth will tend to increase farmers' purchasing power which will help the country's non-agricultural sector expand. It will provide a more productive market. It is well recognized that the majority of people in underdeveloped countries rely on agriculture and it is they who must be able to afford to consume the goods produced. It will, therefore, help boost non-agricultural sector production.

Similarly, an improvement in cash crop productivity can pave the way for the promotion of the exchange economy that can help the growth of the non-agriculture sector. Agricultural goods such as chemicals, farm equipment, etc. also improve agricultural dead-outs.

3. Stimulates industrial expansion: Expansion in the agriculture sector also led to the expansion of the industrial sector. When agriculturalists have savings, they can buy consumer goods, and invest in industries. This result is an indirect expansion of the industrial sector.



4. Supply of foreign exchange: Agriculture can contribute greatly to earning foreign currency through exporting currency through the export of agriculture products.

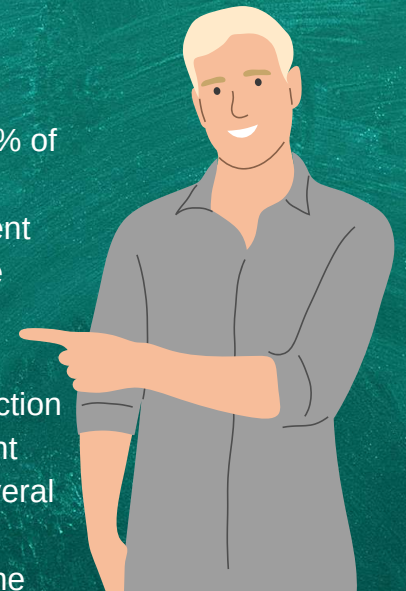
The requirements for the expansion of exports can be easily met by adding a crop or two within the existing crop pattern and that too with perhaps no additional capital investments. Further, since such exports have to cater to the existing and familiar international market, no additional costs are involved to discover or nurture a new market.

5. Helpful to reduce Inequality: In a country that is predominantly agricultural and overpopulated, there is greater inequality of income between the rural and urban areas of the country. To reduce this inequality of income, it is necessary to accord higher priority to agriculture. The prosperity of agriculture would raise the income of the majority of the rural population and thus the disparity in income may be reduced to a certain extent.



FACTS

- It contributes 25% of India's GDP.
- It is still dependent principally on the monsoons.
- The growth in agriculture production has been stagnant for the earlier several years.
- The drought in the north and western parts in FY09 created shortages in the supply of food grains.



6. Agriculture helpful in phasing out Economic Depression: During the Depression, industrial production can be stopped or reduced but agricultural production continues as it produces necessities of life. Thus it continues to create effective demand even during adverse conditions in the economy.

CLIMATE CHANGE AND AGRICULTURE

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Climate change refers to long-term shifts in temperatures and weather patterns. These shifts may be natural, such as through variations in the solar cycle. But since the 1800s, human activities have been the main driver of climate change, primarily due to burning fossil fuels like coal, oil, and gas.

Burning fossil fuels generates greenhouse gas emissions that act like a blanket wrapped around the Earth, trapping the sun's heat and raising temperatures.

Examples of greenhouse gas emissions that are causing climate change include carbon dioxide and methane. These come from using gasoline for driving a car or coal for heating a building, for example. Clearing land and forests can also release carbon dioxide. Landfills for garbage are a major source of methane emissions.

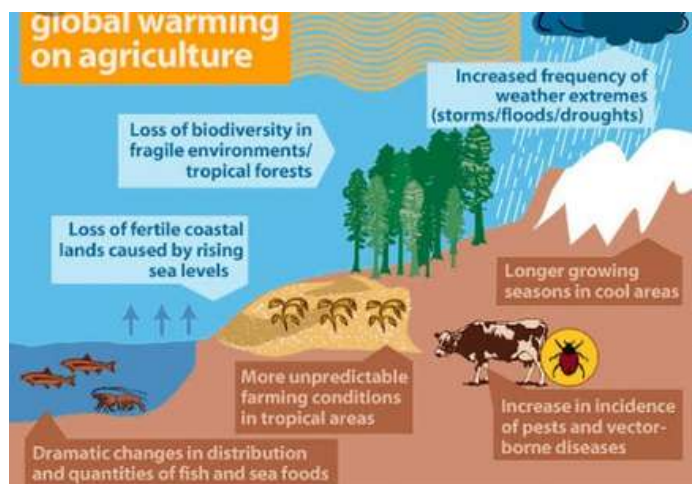
Greenhouse gas concentrations are at their highest levels in 2 million years and emissions continue to rise. As a result, the Earth is now about 1.1°C warmer than it was in the late 1800s. The last decade (2011-2020) was the warmest on record.

Many people think climate change mainly means warmer temperatures. But temperature rise is only the beginning of the story.

Because the Earth is a system, where everything is connected, changes in one area can influence changes in all others.



The consequences of climate change now include, among others, intense droughts, water scarcity, severe fires, rising sea levels, flooding, melting polar ice, catastrophic storms, and declining biodiversity.



source: agrivi

AGRICULTURE

Agriculture, with its allied sectors, is unquestionably the largest livelihood provider in India, more so in the vast rural areas. It also contributes a significant figure to the Gross Domestic Product (GDP). Sustainable agriculture, in terms of food security, rural employment, and environmentally sustainable technologies such as soil conservation, sustainable natural resource management, and biodiversity protection, are essential for holistic rural development. Indian agriculture and allied activities have witnessed a green revolution, a white revolution, a yellow revolution, and a blue revolution.

This section provides information on agricultural produces; machinery, research, etc. Detailed information on the government policies, schemes, agriculture loans, market prices, animal husbandry, fisheries, horticulture, loans & credit, sericulture, etc. is also available.

CLIMATE CHANGE AND AGRICULTURE

CAUSES, IMPACTS AND INTERVENTIONS



source: oecd.org

FACTS

- Agriculture is the largest employer in the world.
- India is the 2nd largest agricultural producer and 7th largest exporter of agricultural goods.
- Farmers need to produce 70% more food than today to feed the world's growing population by 2050.
- Agriculture is the single largest employer in the world.
- There are 914 million acres of farmland just in the U.S.
- The average U.S. farmer can feed 155 people.
- Beef farming accounts for 29% of American farms.



SOCIALIZATION OF TECHNOLOGY IN AGRICULTURE

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“Technology for us is a medium to empower the people of the country. For us, technology is the mainstay of making the country Atma Nirbhar.”

- Mr. Narendra Modi (Prime Minister of India)

In India after all, who doesn't know about agriculture? Agriculture - the amazing field of art and science of cultivating the soil, growing crops, and raising livestock which includes the preparation of plant and animal products for people to use and their distribution to markets. Agriculture provides most of the world's food and fabrics. Agriculture was the key development in the rise of sedentary human civilization, whereby farming of domesticated species created food surpluses that enabled people to live in cities. The history of agriculture began thousands of years ago. After gathering wild grains beginning at least 105,000 years ago, nascent farmers began to plant them around 11,500 years ago. Society has never left the side of agriculture and both are interdependent. Without one, the other cannot exist. Festivals like Pongal, Makar Sankranti, and Baisakhi are celebrated in culture-rich diverse countries like India to celebrate this



agricultural diversity. In the archeological findings by Archeological Survey Of India, during the discovery of the reigns of Mohenjodaro and the Indus valley civilization the findings tell a tale that how much people valued crops, reared animals, and gave value and importance to this field. India was also an agricultural productive country earlier whose economy was dependent on this but with time, this status also changed. Now combining a new word technology with this agriculture a new world and a new field have emerged that is

Agricultural technology or agrotechnology (abbreviated agtech, agritech, AgriTech, or agrotech) is the use of technology in agriculture, horticulture, and aquaculture to improve yield, efficiency, and profitability. Agricultural technology can be products, services, or applications derived from agriculture that improve various input/output processes. So let's know more about how this socialization of technology has helped us?

FACTS

Major technologies that are most commonly being utilized by farms include:

- Harvest automation
- Autonomous tractors
- Seeding and weeding
- Drones



Why Is There A Need For Socialization Of Technology In Agriculture?

Technology has changed the whole system of agriculture by introducing new techniques and methods in areas like pesticides, fertilizers, seed technology, etc. Mechanization makes the work easier to efficiently tilling, and harvest and also reduces manual labor. Technology has also improved the irrigation methods, the transportation systems in agriculture, the fast and processing machinery that helps in reducing the wastages, etc, and impacts the effects in visible areas.

The other ways that the New-age technologies focus on improving agriculture in a better way are precision agriculture, robotics, and many more. The new advancements that have increased in agriculture are:

- Artificial Intelligence helps in predicting climate /weather reports: The use of AI is an advanced technique in agriculture to assist, gather and several measures taken for weather or climate information. The vital information related to temperature, soil, rainfall, humidity, etc is gathered through machines like drones, remote sensors, etc.



- Technology can help India's foreign exchange and improve the economy of the country.
- Rise in production once the technology paves for the betterment of the farmers.
- For labour and mechanisation, the technology works differently and economically by reducing cost and time.
- Technology helps by telling in detail about the weather forecasting information, agriculture drone, phase tracking, automated irrigation, etc.

Technological Facilities That Proves To Be Helpful Towards Agriculture:

- Mobile Application for farmers has proved to work fastly with the appropriate functioning of smartphones through monitoring them properly. Another function of technology is that the farmers can use this facility by tracking through satellite images. You can easily check the crops by predicting the environmental conditions.



- Controlling Crop Irrigation System Through Advanced Technological Mobile Applications. It gives certain information about the perfect irrigation system and planning to work properly on the farm.

CONCLUSION

Technology in the modern form is useful to the farmers and good for the agricultural fields. It is very important and comes in useful agriculture and secured form. It is also an achievable and highly progressed form. Farmers also look for the best opportunities in the field for updating and various farm mechanization. It is also very important for the farmers and another growing network for the benefit of the farmers and other users. The farmers are more interested. Some technologies still need to be developed for some areas. There are some more areas where technology is already performing great work for farm uses. Modern technology supports in providing the new and the fastest technique used in the farms. This is what the green revolution was talking about and we are doing this finally!! Rise in production once the technology paves for the betterment of the farmers.



CLEAN FUEL AND ADVANCEMENTS IN RENEWABLE TECHNOLOGY

Manisha Mani
Packaging technologist

Air pollution is one of the greatest environmental threats, indoor smoke is a serious health risk for some 2.6 billion people who cook and heat their homes with biomass, kerosene fuels, and coal. Air pollution affects the cardiovascular and respiratory health of the population. It causes diseases like stroke, heart disease, lung cancer, and both chronic and acute respiratory diseases, including asthma. Ambient (outdoor) air pollution in both cities and rural areas was estimated to cause 4.2 million premature deaths worldwide, this mortality is due to exposure to fine particulate matter of 2.5 microns or less in diameter (PM2.5), which cause cardiovascular and respiratory disease, and cancers. In addition to outdoor air pollution, indoor smoke from household air pollution is a serious health risk for some 2.6 billion people who cook and heat their homes with biomass fuels and coal. Greenhouse gases (GHGs) like carbon dioxide, methane, nitrous oxide, and ozone are a set of gases that accumulate in the lower layer of the atmosphere, the troposphere, and absorb infrared radiation, which contributes to increasing the average temperature of the Earth's surfaces and are the result of excessive fossil fuel combustion



FOSSIL FUELS AND ITS ENVIRONMENTAL IMPACT

Fossil fuels are nonrenewable energy formed from prehistoric biomass that accumulated at the bottom of water bodies faster than ambient microbes could remineralize and recycle it. Coal and petroleum theoretically exhibit formation-specific source signatures resulting from the accumulation of characteristics associated with the prehistoric biomass, depositional environment, and formation conditions. The chemical composition and the source signatures of fossil fuels vary considerably around the world. Fossil fuels are a finite source of energy and are going to deplete with time, possibly running out in a couple of decades. The importance of environmentally friendly biofuels has been realized in the last few decades. The highest change in fossil fuel consumption has happened and is predicted that it will continue to happen in natural gas, a cleaner fossil fuel compared to oil and coal; however, extraction of and burning of all fossil fuel forms have serious environmental consequences, which will require further and

closer attention as more unconventional fossil fuel resources are explored and their overall consumption expands further. Fossil fuels constitute more carbon content and hence emit carbon dioxide as by-product after combustion.

CLEAN FUEL TECHNOLOGY

Bioenergy is defined as renewable energy produced from natural sources capable of replacing fossil energy. Bioenergy is a key strategy for climate change mitigation in many national and international climate change and renewable energy policies. Ensuring that bioenergy offers the required holistic emission reduction, context, specific and long-term approaches are necessary to understand synergies and trade-offs between the bioenergy and related agricultural and forestry systems. Public policy and markets have led to clean energy technologies being economically competitive. Decades of early stimulus policies and public R&D investments played an important role in the progress achieved to date. Markets structures in the industry are evolving in response. The distributed nature of wind and solar resources is providing customers new options outside of traditional utilities, whereas ownership of 470 Advances in Clean Energy Technologies conventional assets are consolidating to manage new risks from clean energy.

SOLAR POWER

Solar energy is generated by nuclear reactions within the body of the sun. This energy reaches the surface of the earth in the form of electromagnetic radiation. The sunlight which reaches the earth's surface comprises 50% visible radiation and 47% infrared. Solar power is the conversion of sunlight into electricity. There are two ways of doing this-

1.) Concentrated Solar Power (CSP), in which sunlight is focused on an area containing water which is converted into steam and is used to generate power, as in a thermal power plant. CSP produces concentrated solar beam irradiation to heat liquid, solid, or gas as in a regular TPS. The best sites for CSP are in equatorial belt cloud-free regions.

2.) PV cells, in which light is converted into electricity using photovoltaic cells (PV). Solar cells produce DC power, which fluctuates according to the intensity of irradiated light. This requires an inverter to produce power at the desired voltage frequency and phase. PV Systems are connected to the grid. They need batteries for backup. Centralized, distributed, on-grid, and off-grid are several options for solar power installations.

As with several other renewable technologies, solar energy is intermittent; it is only available during hours of daylight. In many parts of the world where there is a good solar resource, high levels of sunlight often coincide with a peak in demand for air conditioning, so solar power, particularly in the form of rooftop solar panels, can provide synchronized peak power.



WIND ENERGY

Modern technologies are making the extraction of wind energy much more efficient. The wind is free, so only installation cost is involved and running costs are low. Wind energy is the most convenient resource to generate electrical energy in remote locations, where conventional power lines cannot be extended due to environmental and economic considerations. A windmill converts the energy in wind into electrical energy or mechanical energy to pump water or grind cereals. The most common windmills in operation today generate power from three-blade, horizontal-axis windmills with the nacelle mounted on steel towers that can be cylindrical steel plates or lattice towers. The main disadvantage of wind energy is varying and unreliable wind speed. When the strength of the wind is too low to support a wind turbine, little electricity is generated.



BIOMASS

Biomass is a natural carbonous resource. It is used to produce syngas. Biomass is a complex natural renewable material with enormous chemical variability. Its potential for energy production varies on the process used, which may involve elementary or highly sophisticated technologies. Biomass is any kind of organic feedstock that can be replenished or renewed naturally. Biomass to liquids (BTL) is a thermochemical process, currently moving from pilot scale to demonstration scale worldwide, that can convert a range of biomass types to a range of fuels and chemicals. The uptake of BtL can help decarbonize the transport fuel sector and is of considerable interest worldwide as policy increasingly focuses on the environmental implications of biofuel use.

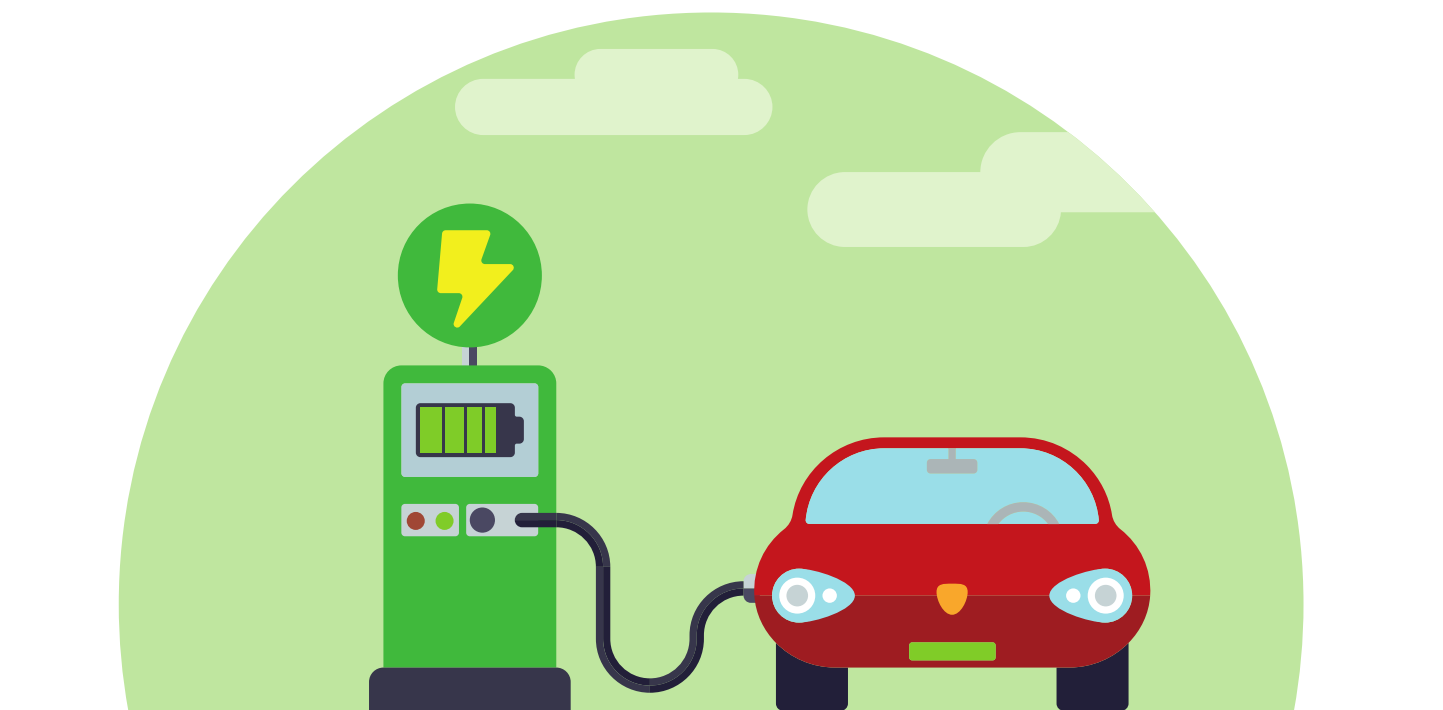


HYDROGEN

Hydrogen and fuel cells could make the most important contribution in the transportation sector, where the introduction of alternative energy sources such as renewables has been most elusive. Hydrogen does not generally exist in the free state rather it occurs in compounds which means other energy sources have to be used to separate it. As an energy carrier, hydrogen has many applications which can be categorized as stationary, mobile, backup, or specialty. Storage is another concern for hydrogen and methods for storage are still under construction. Hydrogen has a much lower density than gasoline so it must be stored either in the liquid state at low temperature or as compressed gas. This complicates the feasibility of the transport and widespread use of hydrogen. Hydrogen can be burned in internal combustion engines (ICE) or converted to electricity in fuel cells. A fuel cell is a device that uses the chemical reaction between hydrogen and oxygen to produce electricity.



When renewable energy sources such as solar, wind, and other forms, distributed generation, energy storage and their related technologies, and demand responses are integrated with transmission and distribution systems, several benefits can be realized. By using advanced system design, planning, and operation, we reap several benefits. Utilization of clean power instead of conventional fuel-based power generation carbon emission is reduced. Better utilization of assets results in a cost of production is reduced and peak demand is also reduced. The system reliability, resiliency, and security are increased. Oil consumption can be reduced by plug-in electric vehicle operation.



BRINGING INNOVATION IN SUSTAINABLE AGRICULTURE: AGRITECH START-UPS

Ritika Sen

Freelance Content Writer

In this techno-bright era wherever there is "tech" associated with any field, it sounds fascinating itself. Sustainable agriculture refers to farming in such a sustainable way that not only today but the future food and textile needs of people are being taken care of. And when there is a term named "AgriTech (Agriculture Technology)", it mainly directs to using technology in agriculture, horticulture, and aquaculture. The major aim of using such technology is to improve the yield, efficiency, and hence profitability. This may be done by the means of making applications, products, or services for various processes involved.

The land of India as described in the song "Mere Desh ki Dharti" is the second-largest agricultural land in the world. On average around 60% of this nation's population runs their homes from agriculture.

The agriculture sector in India is suffering. It is suffering a lot because of lack of infrastructure, tangled supply chain management, and the Indian farmers being not so much known to marketing strategies for their crop's sale. But by fusion of this improvised technology over the years, agritech start-ups have given a new boon to the agriculture sector.

The various top leading agritech start-ups which are bringing new aspects to the agriculture sector are:-

1. SFarmsIndia - web application mainly for listing and fraction trading.

2.Farm2Farm- start-up-growing microgreens

3.KhetiGaadi-platform for buying, selling, comparing and reviewing tractors and farm machinery.

4.Bombay Hemp Company- social enterprise-research and promotion of industrial hemp

5.Aarav Unmanned Systems- drone start-up-manufacturing aerial vehicles

6.Crofarm- start-up-Farm to Business venture

7.Aibono- company- farming related services

8.Cropin- start-up-integrating agricultural sector and ICT(Information and Communication Technology)

9.Agricxlab- online B2B Platform-connects cold storage owners with bulk buyers for agriculture-based products



Source- Bytable marketplace

10.Fasal- AI-powered platform for agriculture ecosystem

11. Ninjacart- agriculture supply chain company

12.GoldFarm- app providing the equipment related to farming through farm agents by booking.

13. Intello Labs- quality check of food using AI

14. Agrowave- company connecting farmers to business

15.Waycool- start-up and food distribution company- fixing supply chain

16.BigHaat- digital marketplace for farmer's guidance related to farming

17.BharatAgri- application providing personalized farming solutions

18. Bijak- exchange platform for agriculture commodities between buyers and sellers.

19. Ergos- company- providing digitalized solutions for storage and management of food grains

20.Clover Ventures- company- deals in creation and management of farm networks

21.FreshoKartz- marketplace for fresh farm produced products

22.MeraKisan- marketplace for wide range of farm-fresh products

FACTS

Innovation can provide an opportunity for agriculture producers to increase the productivity while better managing natural resources. This helps to ensure long term viability and reduces the negative environmental impacts of production, such as pollutants and waste.



TECHNOLOGICAL ADVANCEMENTS IN AGRICULTURE

Aditi Avasthi

Shyama Prasad Mukherji College

“The advance of technology is based on making it fit in so that you don't even notice it, so it's part of everyday life.”

-Bill Gates



The agriculture sector serves as the backbone of many other major industries. The food processing industries, textiles, furniture, and to some extent the drug and cosmetic industries are all dependent upon agriculture for raw materials. Agriculture sector also provides a market for other industries such as fertilizer, and other equipment manufacturing units and thus becomes one of a vital contributor to the economy. Hence, technological advancements become crucial to not only speed up the process but also to increase efficiency. In recent years, many developments have taken place. Some of the latest ones include automated irrigation systems, remote monitoring of crops

using sensors, merging of datasets, genetically modifying crops with the help of biotechnology, and practicing precision agriculture.



Automated irrigation systems make use of water judiciously and ensure better distribution of water. Remote monitoring of crops employs drones and satellites to keep a check on their crops using an app or simply browser and provide fertilizer and water accordingly. Merging genomic datasets with other factors like weather, water, temperature, soil composition, and so on can lead to predictions on how agriculture production can be improved. Usage of genetically modified crops certainly produces crops with higher yields and nutritional value. Precision agriculture involves taking inputs of crop yield against the variability of elements such as moisture content of the soil, water, fertilizer, etc. Farmers can save a lot of money on the input and yet have better yields with the help of this analysis. With the overall mechanization of agriculture and automation of industrial processes, the productivity of agriculture has increased multi-folds.

It is to be noted that these technological advancements have to be used in moderation, sustainably, and analyse so that it doesn't lead to other issues.

FACTS

In recent years, the adoption of digital technologies in precision agriculture has been adjusting the ways that farmers treat crops and manage fields. One doesn't have to be an expert to see how the technology has changed the concept of farming making it more profitable, efficient, safer, and simple. Among other technologies, farmers have picked five they deem to be the best:

- GIS software and GPS agriculture
- Satellite imagery
- Drone and other aerial imagery
- Farming software and online data
- Merging datasets



MOVIE RECOMMENDATION

FARMLAND

Mehak Tiwari

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Movies have great importance in our lives, they reflect us, and our culture, make us visualize society, and help in introspection and retrospection of our lives, and not so surprisingly some are so captivating that it forces us to think. Farmland is one such movie.

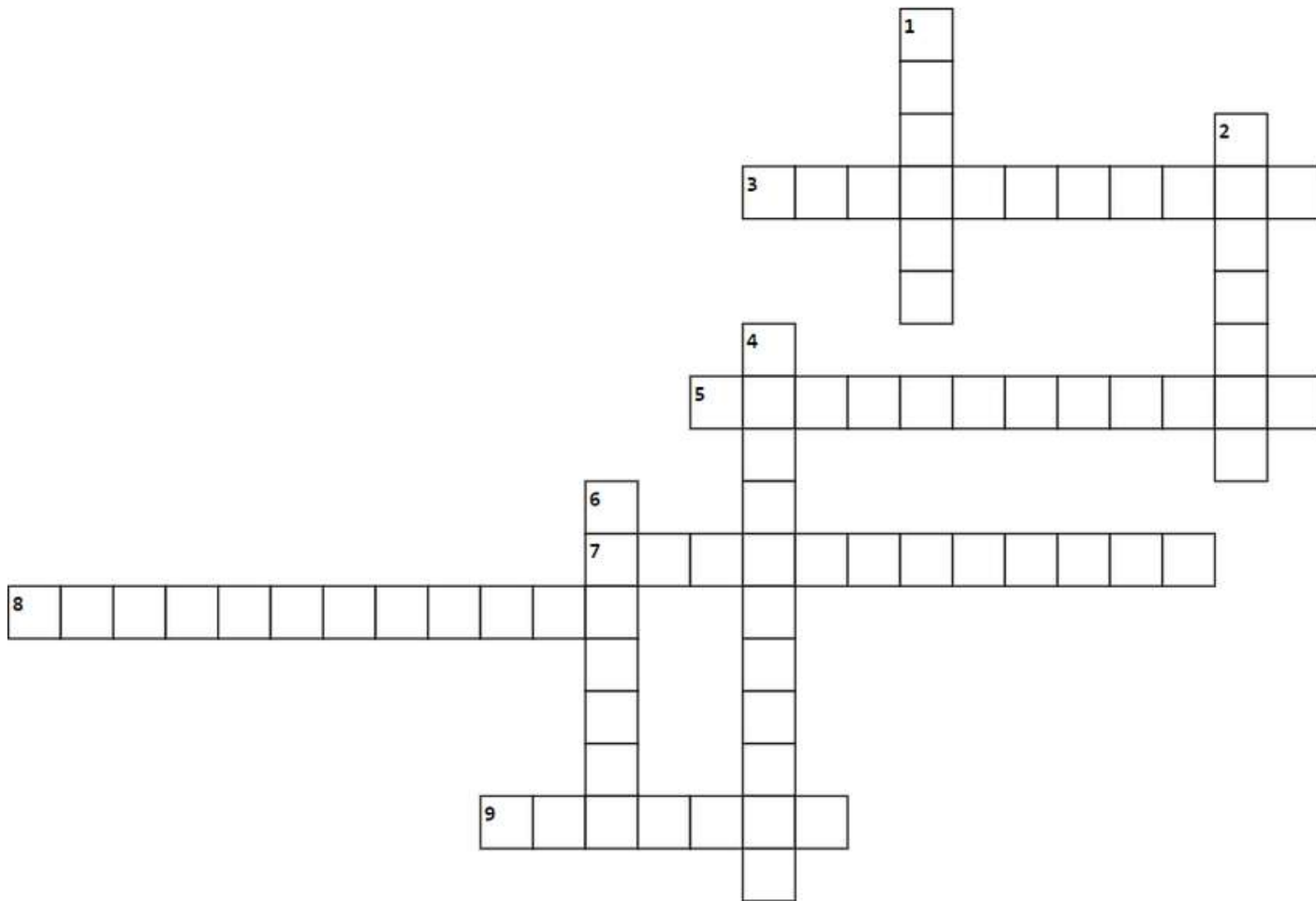
Farmland is a documentary film having a running time of 77 minutes which was released in 2014. The movie is directed and produced by Mr. James Moll who is also an Emmy and academy award winner for the movies such as "The holocaust". The movie revolves around the lives of Six farmers and Ranchers who are in the age group of 20s and 30s across the United States and describing their experiences of and views on modern agriculture.

The goal of the film is to bridge the gap between food growers and food consumers that is the farmer and us. Each character shows and explains what it is like to farm and ranch with modern agriculture practices. Not just this but the movie also talks about some controversial topics such as genetically modified crops, the use of antibiotics in animal feeds, and the treatment of farm animals.

The movie is also subject to propaganda since the movie is funded by U.S. Farmers & Ranchers Alliance which basically is defined as an organisation which is a new trade association made up of some of the biggest players in the food industry by the critics and more looks like an advertisement but for a country like ours, where once we were only dependent on agriculture and now the value is depleting, the farmers are getting ignored for them we should watch this. Farming has to be done not just for this generation but for the future generation as well that was the main idea which was conveyed.

Visually, the film uses the aspects of farming to good advantage. Pallets of chicks being spilled into a henhouse make for a particularly memorable image. Editing-wise, the decision to identify those speaking only on their third or fourth appearance is confusing. Music occasionally swells a bit too much, particularly during the harvest scenes near the end.

CROSS WORD

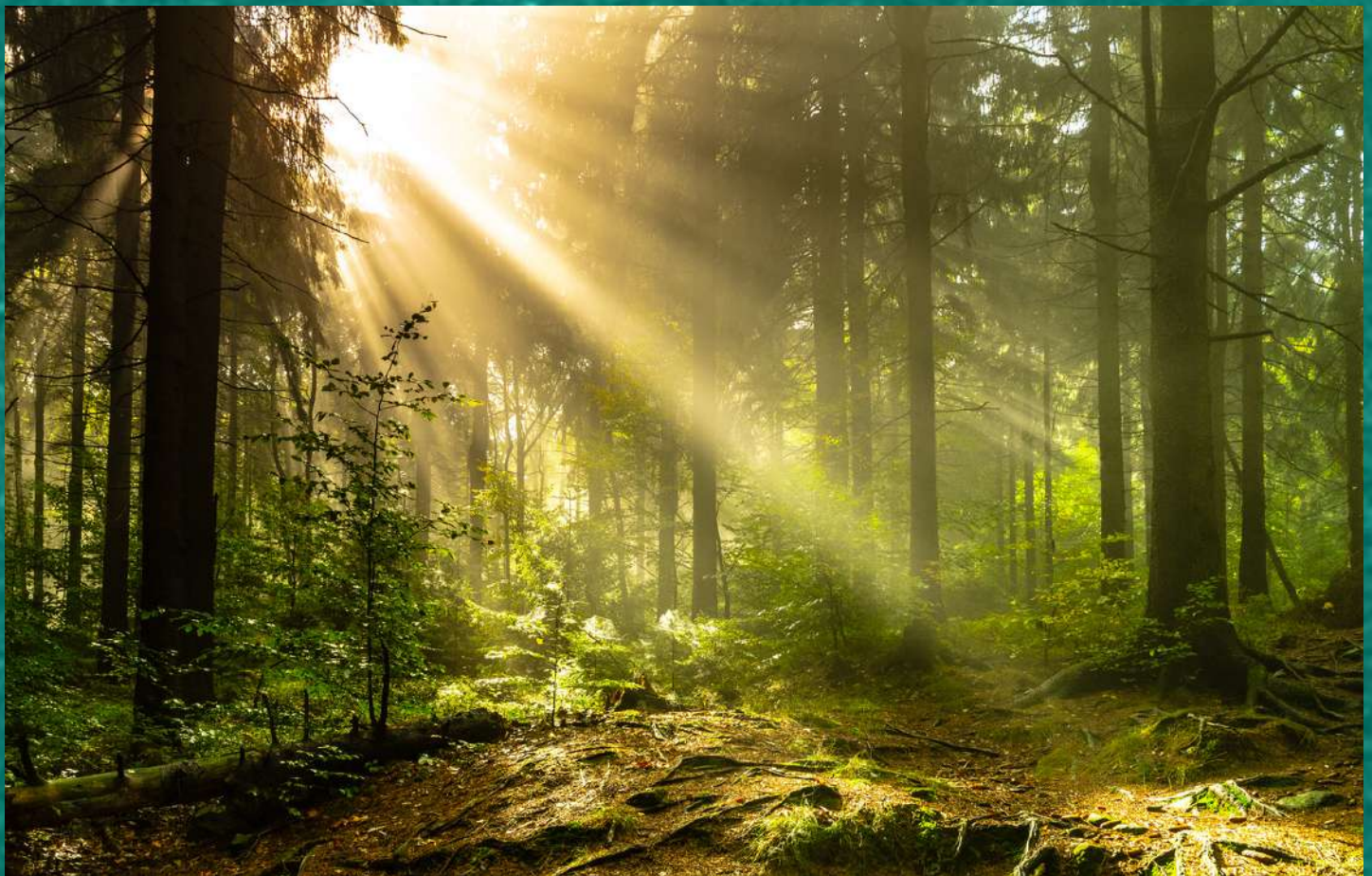


Across

- 3. The cultivation of grapes, especially for use in winemaking
- 5. The cultivation of worms to produce vermicompost
- 7. A branch of aquaculture involving the raising of fish in tanks
- 8. The cultivation of fungi to produce a variety of products that humans can use
- 9. Enclosed tracts of farmland grazed by domesticated livestock such as horses, cattle, sheep, or swine.

Down

- 1. The process of distributing seeds of crop plants in or upon an area of fertile soil
- 2. Any intentional planting of trees or shrubs that is maintained for food production.
- 4. The cultivation of silkworms with the goal of producing silk.
- 6. a group of living things that share common biological characteristics



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