ASSEMENT OF AGRICULTURE POLLUTION

Thesis submitted in partial fulfillment of the

Bachelor Degree of Science In CHEMISTRY

Under

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Jyoti Vihar, Sambalpur

BY

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SELF ATTESTATION

I, SANJUKTA SAHOO, Roll NO-S05320CHE001 hereby declare that the work which is being presented in the report entitled"Assesment of agriculture pollution in partial fulfillment for the award of the degree of bachelor of science in chemistry under Sambalpur university , Jyotivihar, Sambalpur is entirely original and was carried out under the supervision of Mrs. Namita Sah, Lecture, Department of chemistry, Sarbati Devi Women's College, Rajgangpur, Odisha.

Place

Signature

Date

CERTIFICATE

This is to certify that the dissertation entitled Assesment of agriculture pollution being submitted by SANJUKTA SAHOO to the Department of Chemistry, Sarbati Devi Women's College, Rajgangpur, Odisha, for the award of the degree of bachelor of science in Chemistry is a record of bonafied research carried out by him under my supervision and guidance.

Signature of Supervisor

Signature of Head of dept.

Signature Of external

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Place

Signature

Date

Contents: -

ABSTRACT

Agriculture always stands ahead to fulfil all the needs of the humans. It is the basic strategy altering which a number of modified crops are produced now a day to fulfil the need of increasing population. We are knowingly utilizing several techniques to improve crop yield which may harm us and our environment. The by products of the agriculture practices are disturbing the natural components of the environment that is ultimately affecting us in many ways. These by products as pollutants are uncontrolled when left untreated. They cause devastation of ecosystems, farm land, livestock and environment all around us. Therefore, we should keep some tab and check on these practices to maintain our surrounding healthy and long living because healthy environment is necessary for the better health and vigor of its organisms.

INTRODUCTION

Since the origin of life and thereafter humans everyone needed energy to maintain and sustain them. Before chlorophyll evolution, hetero phagy and chemo phagy were some of the most basic means of energy acquisition. When humans evolved, they invented several means necessary and helpful for their daily lives. Agriculture was one of the important parts among all of them. He could cultivate and grow plants and crops to obtain food from them. Since time immemorial, he left the composition of soil and land undistributed for thousands of years, but as soon as the food demand increased with time and increasing population, he tried to integrate several tools and techniques in order to enhance crop yield irrespective of its impacts and hazards. Now, this led the disturbance in natural composition of not only the soil and land but also affected the nearby livestock, ecosystem, flora, fauna and environment. This led the resultant excessive integration of tools and techniques in Agriculture pollution.

CAUSES OF AGRICULTURE POLLUTION

Agriculture pollution is defined as the contaminated by products of agriculture such as growing and raising crops, livestock, animal feed and bio fuel crops left untreated and released in the open environment. There is no any single strategy or technique responsible for agriculture pollution ;however it is altogether means simultaneous malpractices that as residual by products when released untreated, fall into the category of agriculture pollutant. Some important of them are discussed below.

Contaminated Water:

Likewise animals, plants also need water for their survival. Most of their water requirement is fulfilled by natural water resources like pond, river, canals, local reservoirs and rain. A large amount of this available natural water is clean and safe. Except these, other resources may be polluted with organic compounds and heavy metals. Even these natural resources are also getting polluted because of the drainage of industrial waste and effluents released directly into them. In the case of unavailability of the natural fresh or clean water resources, farmers use this polluted water for irrigation of their crop. As a result, crop is directly exposed to the water polluted with harmful substances like mercury, lead, arsenic, cadmium etc. This becomes poisonous for the crop and as residue for us when we are exposed to these plant products.

Pesticides

Pests are the major threat to agriculture. To overcome them several techniques are applied regularly in the field. However application of pesticides is considered one of the simple, easy and effective strategies against several pest species. This is because of easy availability of them at local stores. In contrast to this, these pesticides are hazardous not only for pests but also for the plants, animals and environment. Many of these pesticides are a residue leave long lasting effect in the affected field. This not only kills the harmful but the beneficial insects and organisms also. These when mixed water, seeps down into the ground and makes the ground water toxic. When these as a effluent released in the local drainage system of farm, makes the nearby soil and water reservoirs polluted and toxic. When human and their livestock feed upon these plant and crop products, they suffer from several health concerns like asthma, cancer, skin infections, allergy and many more.

Fertilizers

To improve crop yield, farmers use several chemicals as fertilizer. These chemicals likewise pesticides are also harmful for us. These fertilizers when used excessive can be left behind for prolonged period in the soil, which when mixed with water for irrigation, seeps down to the ground water and make it polluted. Excessive fertilizers make the plant succulent which seemed to be attractive for several pest species. These residual chemicals when released in drainage, makes the nearby water reservoirs polluted.

Soil erosion and sedimentation

Soil profile includes the components eg soil arranged in several layers. The top most layer is considered suitable for the growth and development of cultivated crops and plants. Erosion caused by agriculture malpractices, water, wind, flood etc. Disturbs and removes the top most fertile soil profile and carry them to other places under pressure of the wind or soil. There it is deposited as sediment into several layers, which in turn alters the natural soil profile of that area. This erosion and sedimentation occurring continuously every year and ultimately decline the soil fertility.

Weeds

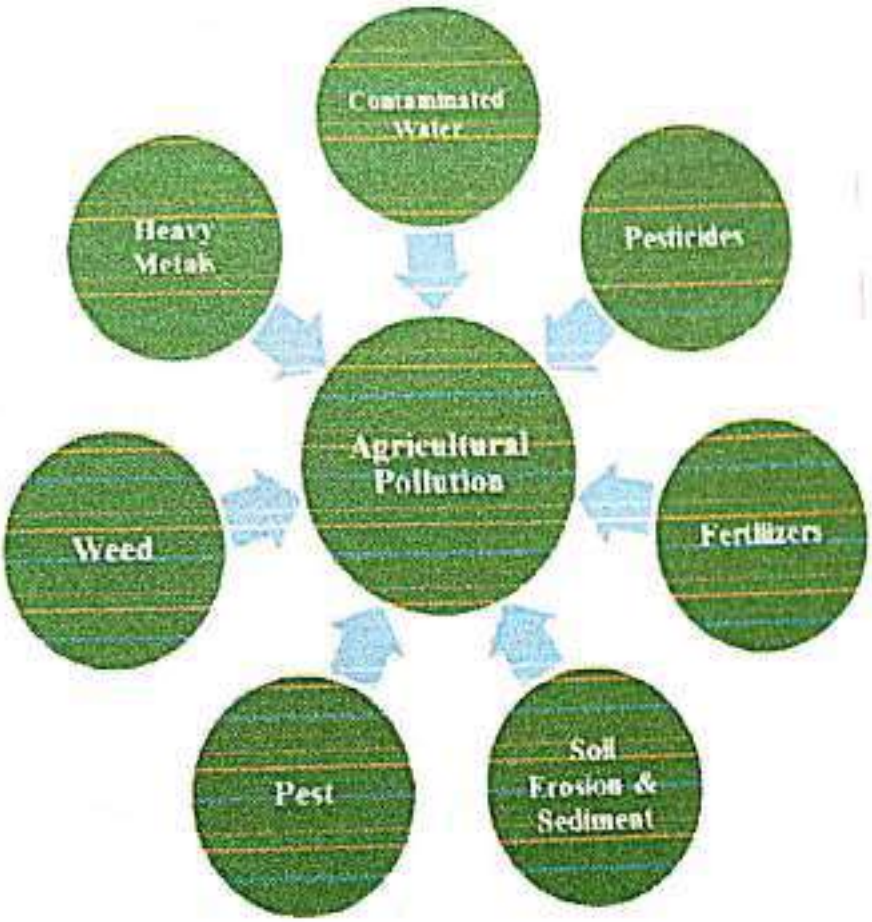
Agriculture practices focus the cultivation of the particular crop in area or farm land. It is supplied and nourished with several necessary nutritive components and fertilizers. Weeds are the plants, shrubs or herbs that are grown naturally and simultaneously with other crops at a time and place unwanted. They are responsible for sharing the nutritive content of the available soil and thus making the depletion of nutritive elements necessary for cultivated crops. These as a sole cause act as agriculture pollution for the crop or plants cultivated.

Pests

Any organism whose population increases at a level, above which it start causing noticeable harm to man and its livestock is called pest. Agriculture pests fall into the categories of microorganisms, invertebrates and vertebrates. Microorganisms include algae, bacteria and fungi. Major invertebrate pest are included in parasites and arthropods. Vertebrate pests include mammals and birds. All of these affect the natural growth of the plant and alter the natural energy cycle, food web and food chain in agro ecosystem. To manage these all, several pesticides are applied which are hazardous for man and its livestock. Thus they also considered as a major agriculture pollutant.

Heavy Metals

To make the crop yield better we use fertilizers, chemicals, manures etc. In the field. These contain several heavy metals (like cadmium, arsenic etc.) harmful for us. Irrigation of soil has also reported to cause selenium deposition in soil. These heavy metals are seeped into to ground water and make it toxic. Plants absorb these heavy metals which affect their natural growth. When humans and their cattle feed upon theses plant products, may suffer many health issues.


Contaminated Water
Heavy Metals
Pesticides
Agricultural Pollution
Weed
Fertilizers
Pest
Soil Erosion & Sediment

EFFECTS OF AGRICULTURE POLLUTION

- Agriculture pollution poses several health issues in humans and other organisms.
- Agriculture waste water as effluent pollutes the nearby water reservoir and kills the aquatic plants and animals.
- When mixed with drinking water, can be hazardous for various organisms.
- Oxygen level in polluted water drop down and cause the death of aquatic organisms.
- Result in eutrophication that deleteriously affects the aquatic ecosystem.
- Excessive use of fertilizers and chemicals affect the soil fertility and make the plant succulent for more pest attack.
- Chemicals as agriculture pollutants kill the beneficial insects and microorganism necessary for crop growth.
- Tools, techniques and machinery used in agriculture practices cause air pollution. Emission of greenhouse gas concentration.
- Nitrogen oxides and ammonia released by farm animals and soil effluent categorically increase the greenhouse gas concentration.
- Excessive use of fertilizer are pesticides as a residual by product kills several organisms which ultimately affects the biodiversity.
- Agriculture pollutants have several deleterious effects on plants, animals, ecosystem and environment.

TYPES OF POLLUTION

What Is Water Pollution?

Water pollution occurs when harmful substances—often chemicals or microorganisms—contaminate a stream, river, lake, ocean, aquifer, or other body of water, degrading water quality and rendering it toxic to humans or the environment.

This widespread problem of water pollution is jeopardizing our health. Unsafe water kills more people each year than war and all other forms of violence combined. Meanwhile, our drinkable water sources are finite: Less than 1 percent of the earth's freshwater is actually accessible to us. Without action, the challenges will only increase by 2050, when global demand for freshwater is expected to be one-third greater than it is now.

What type of water is being impacted?

Groundwater pollution

When rain falls and seeps deep into the earth, filling the cracks, crevices, and porous spaces of an aquifer (basically an underground storehouse of water), it becomes groundwater—one of our least visible but most important natural resources. Nearly 40 percent of Americans rely on groundwater, pumped to the earth's surface, for drinking water. For some folks in rural areas, it's their only freshwater source. Groundwater gets polluted when contaminants—from pesticides and fertilizers to waste leached from landfills and septic systems—make their way into an aquifer, rendering it unsafe for human use. Ridding groundwater of contaminants can be difficult to impossible, as well as costly. Once polluted, an aquifer may be unusable for decades, or even thousands of years. Groundwater can also spread contamination far from the original polluting source as it seeps into streams, lakes, and oceans.

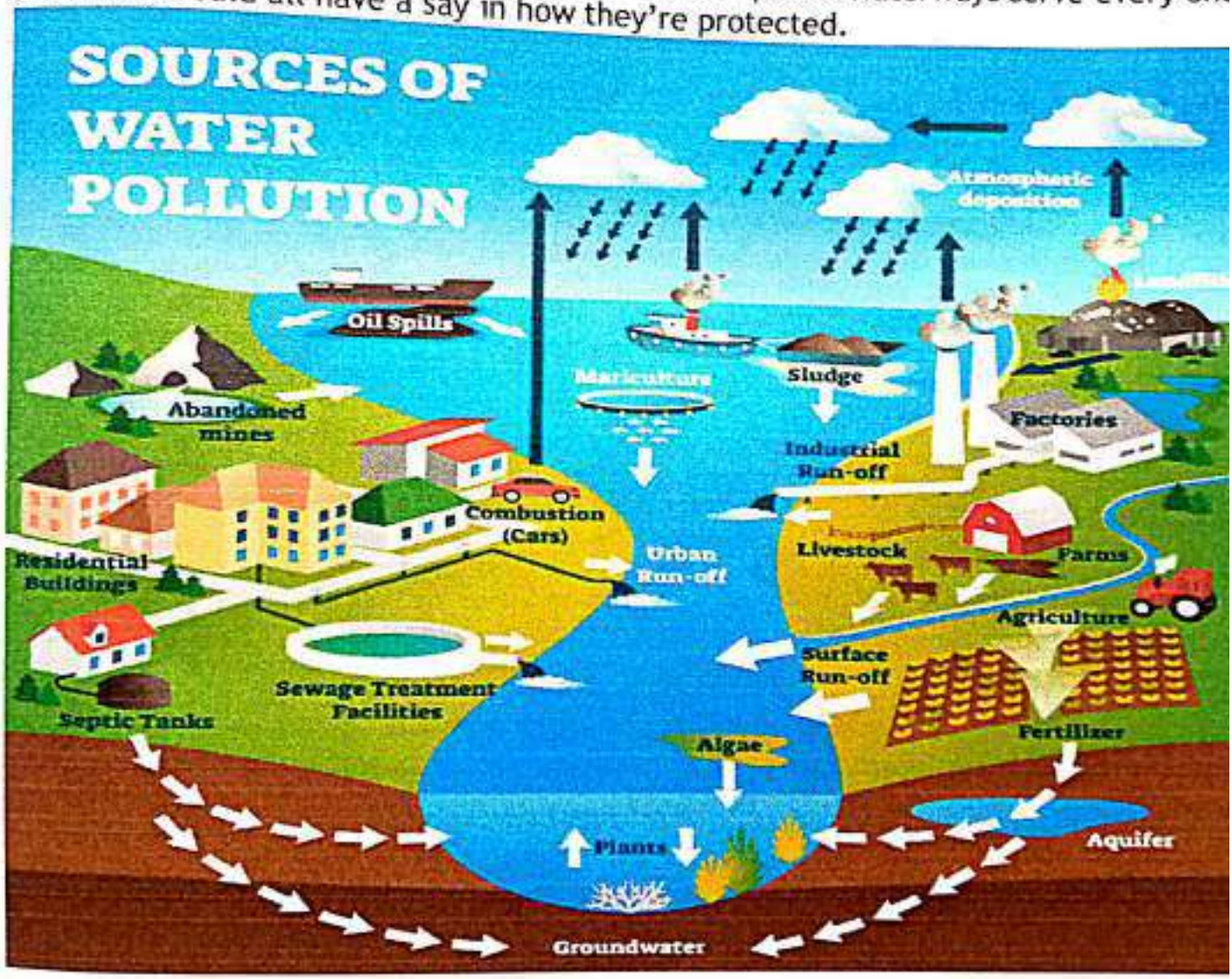
Surface water pollution

Covering about 70 percent of the earth, surface water is what fills our oceans, lakes, rivers, and all those other blue bits on the world map. Surface water from freshwater sources (that is, from sources other than the ocean) accounts for more than 60 percent of the water delivered to American homes. But a significant pool of that water is in peril. According to the most recent surveys on national water quality from the U.S. Environmental Protection Agency, nearly half of our rivers and streams and more than one-third of our lakes are polluted and unfit for swimming, fishing, and drinking. Nutrient pollution, which includes nitrates and phosphates, is the leading

What Can You Do to Prevent Water Pollution?

One of the most effective ways to stand up for our waters is to speak out in support of the Clean Water Act, which has helped hold polluters accountable for five decades—despite attempts by destructive industries to gut its authority. But we also need regulations that keep pace with modern-day challenges, including microplastics, PFAS, pharmaceuticals, and other contaminants our wastewater treatment plants weren't built to handle, not to mention polluted water that's dumped untreated.

Tell the federal government, the U.S. Army Corps of Engineers, and your local elected officials that you support water protections and investments in infrastructure, like wastewater treatment, lead-pipe removal programs, and stormwater-abating green infrastructure. Also, learn how you and those around you can get involved in the policymaking process. Our public waterways serve every one of us. We should all have a say in how they're protected.



type of contamination in these freshwater sources. While plants and animals need these nutrients to grow, they have become a major pollutant due to farm waste and fertilizer runoff. Municipal and industrial waste discharges contribute their fair share of toxins as well. There's also all the random junk that industry and individuals dump directly into waterways.

What Is Soil Pollution?

Soil pollution is defined as the presence of toxic chemicals (pollutants or contaminants) in soil, in high enough concentrations to pose a risk to human health and/or the ecosystem. In the case of contaminants which occur naturally in soil, even when their levels are not high enough to pose a risk, soil pollution is still said to occur if the levels of the contaminants in soil exceed the levels that should naturally be present.

Types of Soil Pollutants

Soil pollution consists of pollutants and contaminants. The main pollutants of the soil are the biological agents and some of the human activities. Soil contaminants are all products of soil pollutants that contaminate the soil. Human activities that pollute the soil range from agricultural practices that infest the crops with pesticide chemicals to urban or industrial wastes or radioactive emissions that contaminate the soil with various toxic substances.

Soil Pollution Facts

Soil acts as a natural sink for contaminants, by accumulating and sometimes concentrating contaminants which end up in soil from various sources. Tiny amounts of contaminants accumulate in the soil and - depending on the environmental conditions (including soil types) and the degradability of the released contaminant - can reach high levels and pollute the soil. If the soil is contaminated, home-grown vegetables and fruits may become polluted too. This happens because most of the soil pollutants present in the soil are extracted by the plants along with water every time they feed. Thus, it is always prudent to test the soil before starting to grow anything edible. This is especially important if your garden is located near an industrial or mining area, or within 1 mile of a main airport, harbor, landfill, or foundry.

What Is Air Pollution?

Air pollution refers to the release of pollutants into the air—pollutants which are detrimental to human health and the planet as a whole. According to the World Health Organization (WHO), each year air pollution is responsible for nearly seven million deaths around the globe. Nine out of ten human beings currently breathe air that exceeds the WHO's guideline limits for pollutants, with those living in low- and middle-income countries suffering the most. In the United States, the Clean Air Act, established in 1970, authorizes the U.S. Environmental Protection Agency (EPA) to safeguard public health by regulating the emissions of these harmful air pollutants.

Effects of Air Pollution

The effects of air pollution on the human body vary depending on the type of pollutant and the length and level of exposure—as well as other factors, including a person's individual health risks and the cumulative impacts of multiple pollutants or stressors.

Smog and soot

These are the two most prevalent types of air pollution. Smog (sometimes referred to as ground-level ozone) occurs when emissions from combusting fossil fuels react with sunlight. Soot (also known as particulate matter) is made up of tiny particles of chemicals, soil, smoke, dust, or allergens—in the form of either gas or solids—that are carried in the air. The sources of smog and soot are similar. "Both come from cars and trucks, factories, power plants, incinerators, engines, generally anything that combusts fossil fuels such as coal, gas, or natural gas," Walke says.

Smog can irritate the eyes and throat and also damage the lungs, especially those of children, senior citizens, and people who work or exercise outdoors. It's even worse for people who have asthma or allergies: these extra pollutants can intensify their symptoms and trigger asthma attacks. The tiniest airborne particles in soot, whether gaseous or solid, are especially dangerous because they can penetrate the lungs and bloodstream and worsen bronchitis, lead to heart attacks, and even hasten death. In 2020 a report from Harvard's T. H. Chan School of Public Health showed COVID-19 mortality rates in areas with more soot pollution were higher than in areas with even slightly less, showing a correlation between the virus's deadliness and long-term exposure to fine particulate matter and illuminating an environmental justice issue.

Because highways and polluting facilities have historically been sited in or next to low-income neighborhoods and communities of color, the negative effects of this pollution have been disproportionately experienced by the people who live in these communities. In 2019 the Union of Concerned Scientists found that soot exposure was 34 percent higher for Asian Americans, on average, than for other Americans. For Black people, the exposure rate was 24 percent higher; for Latinos, 23 percent higher.

Greenhouse gases

By trapping the earth's heat in the atmosphere, greenhouse gases lead to warmer temperatures, which in turn lead to the hallmarks of climate change: rising sea levels, more extreme weather, heat-related deaths, and the increased transmission of infectious diseases. In 2018 carbon dioxide accounted for 81 percent of the country's total greenhouse gas emissions, and methane made up 10 percent. "Carbon dioxide comes from combusting fossil fuels, and methane comes from natural and industrial sources, including large amounts that are released during oil and gas drilling," Walke says. "We emit far larger amounts of carbon dioxide, but methane is significantly more potent, so it's also very destructive." Another class of greenhouse gases, hydrofluorocarbons (HFCs), are thousands of times more powerful than carbon dioxide in their ability to trap heat. In October 2016 more than 140 countries reached an agreement to reduce the use of these chemicals—which are found in air conditioners and refrigerators—and develop greener alternatives over time. Though

President Trump was unwilling to sign on to this agreement, a bipartisan group of senators overrode his objections in 2020 and set the United States on track to slash HFCs by 85 percent by 2035. According to David Doniger, senior strategic director of NRDC's Climate and Clean Energy program, "the agreed-to HFC phasedown will avoid the equivalent of more than 80 billion tons of carbon dioxide over the next 35 years."

Controlling Air Pollution

In the United States, the Clean Air Act has been a crucial tool for reducing air pollution since its passage in 1970, although fossil-fuel interests aided by industry-friendly lawmakers have frequently attempted to weaken its many protections. Ensuring that this bedrock environmental law remains intact and properly enforced will always be key to maintaining and improving our air quality.

But the best, most effective way to control air pollution is to speed up our transition to cleaner fuels and industrial processes. By switching over to renewable energy sources (such as wind and solar power), maximizing fuel efficiency in our vehicles, and replacing more and more of our gasoline-powered cars and trucks with electric versions, we'll be limiting air pollution at its source while also curbing the global warming that heightens so many of its worst health impacts.

And what about the economic costs of controlling air pollution? According to a report on the Clean Air Act commissioned by NRDC, the annual benefits of cleaner air are up to 32 times greater than the cost of clean-air regulations. Those benefits include up to 370,000 avoided premature deaths, 189,000 fewer hospital admissions for cardiac and respiratory illnesses, and net economic benefits of up to $3.8 trillion for the U.S. economy every year.

WHAT ARE AGRICULTURAL BEST MANAGEMENT PRACTICES?

Agricultural Best Management Practices (BMPs) are practical measures that producers can take to reduce the amount of fertilizers, pesticides, animal waste, and other pollutants entering our water resources. They are designed to improve water quality while maintaining agricultural production. The Florida Department of Agriculture and Consumer Services (FDACS) has adopted BMPs for most commodities in the state. Each BMP manual covers key aspects of water quality and water conservation. Typical practices include:

- **Nutrient Management** to determine nutrient needs and sources as well as manage nutrient applications (including manure) to minimize impacts to water resources.
- **Irrigation Management** to address the method and scheduling of irrigation to reduce water and nutrient losses to the environment.
- **Water Resource Protection** using buffers, setbacks, and swales to reduce or prevent the transport of sediments and nutrients from production areas to waterbodies.

Agricultural Best Management Practices (BMPs)

Agricultural "Best Management Practices" are site specific, economically feasible practices that are applied by farmers while accounting for environmental and public health impacts.

Best Management Practices are an industry driven effort to maintain agricultural production in a profitable, environmentally sensitive and sustainable manner. BMPs are not meant to be regulatory as every farm operation and site is different and may require special practices. But BMPs are meant to provide guidance as to practices that farmers can strive towards implementing on their farms.

The following links connect to guidance documents which provide farmers and producers with the latest guidance to benefit their operation. They will change, and be updated, as practices and technology change.

Best Management Practices

- Backyard Poultry Keepers BMPs
- Cranberry best Management Practices
- Dairy Best Management Practices
- Greenhouse Best Management Practices
- Livestock and Poultry
- MA Beekeepers Association Best Beekeeping Practices

- Maple Best Management Practices
- Nursery Best Management Practices
- Orchard Best Management Practices
- Shellfish Best Management Practices
- Small Fruit Best Management Practices
- Small Livestock Best Management Practices
- Turf Best Management Practices
- Vegetable Best Management Practices

Top 13 Innovations in Agriculture/Farming in 2023

Feeding the rapidly increasing global population amid the climate crisis requires the speed and accuracy that technology provides. New innovations in agriculture have shown us how technology can help us build more sustainable food systems and improve food security in every corner of the world.

What would have become of the vertical farming industry if not for technologies such as big data analytics, robotics, the internet of things IoT, and artificial intelligence? With Geographic Information Systems (GIS), we can get high-resolution and location-specific views of the farm field. Through smart farming techniques, we can now prevent crop losses on a large scale, speed up harvest time, and manage farm resources with precision (no pun intended).

Top 13 Innovations in Agriculture

From the invention of plows to milking machines, innovations have played a considerable role in agricultural development. Here are some of the latest trends in agriculture technology which are predicted to influence farming globally in 2023 and beyond.

FARM AUTOMATION

Automation is already a major part of the farming process, but it will become even more important in the coming years. Farmers are already using drones to monitor their crops, and advanced sensors can tell them exactly when they need to water or fertilize their fields. These devices can also be used to monitor soil quality and ensure that crops aren't affected by drought or other environmental factors.

The increased level of automation will allow farmers to focus more on other aspects of their business than traditional manual labor tasks like watering, seeding, and harvesting.

BLOCKCHAIN

Blockchain technologies are used in agriculture to track plant information from the farms to the shelf. Powered by a decentralized database, this technology helps regulate the quality of food and its shelf life. The auditable database allows growers and marketers to monitor farm produce throughout the supply chain.

In recent times, Hyperledger, an open-source blockchain framework, has been adopted by Walmart to help the retail giant detect unwholesome food in real time before it gets to the consumer. In addition, to encourage chemical-free farm products and improve transparency in its agric supply chain, India, the world's largest fruits and vegetables producer, is planning to adopt blockchain technologies in all its Agri exports.

IOT IN AGRICULTURE

IoT is used as a smart farming solution for monitoring the crop field from anywhere. It involves using sensors to track soil moisture, crop health, livestock conditions, temperature, etc.

IoT technologies make it possible to create automated irrigation structures where water resources can be managed efficiently. By collecting crop data such as moisture and temperature, IoT technologies can help determine the right amount of water for crops every season.

GEOGRAPHIC INFORMATION SYSTEMS (GIS) IN AGRICULTURE

GIS in agriculture relies on technology such as drones and satellites to understand crop position and types, fertilization level, soil status, and related information. With data generated from GIS remote sensing devices and software, farmers can determine the best location for crop planting in the field and make informed decisions on how to improve soil nutrition.

In livestock rearing, GIS software monitors the movement of animals. This, in turn, will help farmers track animals' health, fertility, or nutrition.

AI/ML & DATA SCIENCE IN AGRICULTURE TECHNOLOGY

Agricultural forecasting is made easy when farmers deploy AI/ML & data science technology. The use of 3D laser scanning and spectral imaging/spectral analysis, for example, can help farmers predict weather scenarios and optimize the use of resources required for irrigation, fertilization, and pest control.

Through AI/ML & data science technology, farmers can analyze their fields for the best locations for planting seeds. They can use computer vision to recognize plants' optimal height, width, and spacing. This data can then be used to optimize their growing methods.

REGENERATIVE AGRICULTURE

The World Economic Forum describes regenerative agriculture as the way forward to decarbonize the food system and make farming resilient to climate shocks. This unconventional farming practice work based on five fundamental principles.

- Promote biodiversity through the integration of animals and plants
- Improve soil health by adopting all options that will reduce soil disturbance
- Practice soil conservation by keeping the soil surface covered as much as possible
- Practice crop diversity by growing varieties of crops on the same field
- Maintain living roots by planting perennial crops or cover crops

CONTROLLED ENVIRONMENT AGRICULTURE (CEA)

Controlled Environment Agriculture (CEA) is a method of cultivating plants in a fully regulated environment. It is also known as 'vertical farming or indoor farming.' In this type of cultivation, all the plant's needs are met by artificially providing them with water, nutrients, and light using hydroponic, aquaponic, and aeroponic techniques.

CEA has proven to reduce some of the challenges faced in conventional farming. For example, it greatly reduces water consumption depending on the farm setup. In fact, some vertical farms use 70% to 95% less water than what's typically required in traditional outdoor farms.

In addition to optimal water usage, CEA protects plants from adverse weather conditions and helps maximize the use of space for cultivation.

AGRICULTURAL ROBOTICS

In 2022, the global market size of agricultural robotics was nearly $5 billion. The need to meet the increasing global food demand is one of the major driving forces for the wide application and adoption of agriculture robotics.

Many farming activities performed by humans can now be done by agricultural robots (agribots), maximizing productivity and saving enormous resources. Today, agribots are used in seed planting, crop harvesting, weeding, sorting and packaging, livestock management, etc.

DRONES

Unmanned Aerial Vehicles or drones are increasingly becoming useful in crop and livestock management. For example, farmers can use sensor-equipped drones to monitor the growth of plants, detect disease stress, monitor field temperature, and spray pesticides or fertilizers at desired locations on the field.

In animal husbandry, drones are used to observe grasslands and track animal movements on big ranches. Some drones have thermal imaging cameras to detect sick animals with high body temperatures.

The inherent benefits and the rise of drones in farm operations lie in their ability to help farmers acquire comprehensive data to make timely decisions.

PRECISION AGRICULTURE

The increase in the global population has led to increased food production per capita. However, this has also led to water shortages due to irrigation purposes. To combat these issues, farmers are turning towards precision agriculture as it can save them both time and money.

Precision agriculture is a rapidly evolving farm management system that involves the use of sensor technology, AI, GIS, and IoT to collect and analyze data about the soil, plants, and animals. It allows for more targeted use of inputs such as water, fertilizer, plant nutrients, pesticides, seeds, and labor. Precision agriculture deviates from conventional agriculture practices, where a uniform method is employed over a large area regardless of soil quality or topography variations.

AGRICULTURAL BIOTECHNOLOGY

Although there is a growing concern about the health impact of agricultural biotechnology, the use of genetic engineering to improve plants or animals will remain a trend in modern farming. Why? The appeal of this method is in its capacity to increase production and improve global food security. Moreover, genetically modified organisms have been proven safe for human health.

The major challenge that could render GMOs unsafe for consumption is farmers' failure to comply with regulatory standards when practicing agricultural biotechnology. Otherwise, agricultural biotechnology can improve the quality of farm produce and help create more climate-resilient crops.

BIG DATA & ANALYTICS

The farm is becoming a data factory, with sensors and other technology collecting thousands of data points about everything from soil quality to humidity and crop yields. Big data & analytics can help farmers decide when to plant and harvest, how much water or fertilizer to use, and how much seed they should sow.

Farming operations are subject to weather and environmental changes, which are difficult to access, especially for large farms. Applying big data and analytics in agriculture help farmers predict water cycles or rainfall patterns.

CONNECTIVITY TECHNOLOGIES

In today's information-driven world, agriculture production should be based on a knowledge- and data-driven approach. Farmers need to be able to communicate with each other, vendors, and customers to produce more food efficiently. This can be done through connectivity technologies.

Connectivity technologies, such as mobile devices, satellite technology, and internet-based platforms, allow farmers to share information to make better decisions about how they grow their crops or raise their livestock. These technologies also enable farmers to reach out to potential buyers or sell directly to consumers.

GLOBAL PERSPECTIVE

In the twenty-first century, it is evident that world agricultural systems will have to supply sufficient food for a population somewhere between 7.5 and 12 billion. Projections for world agriculture in the first half of the twenty-first century very widely, largely depending on assumptions about yield growth. An investigation of the patterns of yield growth for major cereal crops offers evidence that the pattern is logistic, implying that an upper limit to yields is being approached. This pattern is consistent with ecological limits on soil fertility, water availability, and nutrient uptake. It is also evident that current agricultural production is imposing serious strains on ecosystems, with widespread soil degradation, water overdraft and pollution, and ecological impacts such as loss of biodiversity and the proliferation of resistant pest species. The issue therefore is not simply the balance of supply and demand in agriculture. It is the need to develop ecologically sustainable agricultural systems which can provide an agricultural output about twice present aggregate levels (allowing for per capita growth in consumption). This level of output would support a population of about 8 billion. In addition, a population policy which can avert any much higher growth is essential. Evidence exists to show that ecologically sustainable cropping systems can supply overall outputs comparable to intensive high-input agriculture. (The measure of overall output is distinct from the more commonly used measure of single-crop yields.) This evidence, however, is more compelling for temperate zones with good soils. Much more research is needed on sustainable agriculture for tropical and arid zones. Agricultural policies need to be reformulated to meet the new goal of sustainability. These sustainable agriculture policies must be developed in tandem with population policies to ensure that population growth remains in the lower ranges of current projections.

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Agriculture awareness an important priority

If there is one thing off the farm itself that agriculture needs moving forward on, it is a better understanding of what the industry is by the non-farming public.

It is an issue that began with First World War, which was the time the exodus of people from rural Canada began.

It has been a steady process of decline for nearly a century now, and that has translated into a declining understanding of what farming actually is.

We are beginning to see people today who are two or three generations removed from any agrarian roots, and that means little appreciation of what it means to grow a bushel of wheat or to raise a steer.

While no one is expecting young people in Regina, Calgary or Toronto to suddenly head to a ranch to chase cattle, we do need to find a way to have those young people better understand about farming, so they appreciate exactly what went into putting a safe-to-eat steak on their plate.

Without such knowledge of agriculture, people can easily be drawn to support misconceptions about the industry.

So a recent announcement by Federal Agriculture Minister Gerry Ritz and Saskatchewan Agriculture Minister Lyle Stewart of more than $45,000 in funding under the Agriculture Awareness Initiative to enhance the public's perception of agriculture and its role in the economy should be applauded.

"Agriculture plays an important role in driving our economy and feeding Canadians," said Ritz in a release. "These types of projects give everyone a chance to see first-hand the social and economic benefits of our vibrant and innovative agriculture industry."

The release explained the Agriculture Awareness Initiative was developed to help producer groups promote the benefits of agriculture and help improve the public perception of the industry. A better understanding is critical to promote careers in agriculture and foster public support for the industry.

"It is important that we share accurate information about agriculture with the public, especially with youth, so they have an understanding and appreciation of where their food comes from and how it is being responsibly produced," said Stewart in the release.

"These projects will help highlight Saskatchewan's role as a supplier of safe and reliable food to help feed a growing world."

Under this program, the Saskatchewan Science Centre will receive $25,000 to enhance the experience and increase engagement with the Ag-Grow-Land exhibit. The exhibit presents themes such as Saskatchewan's role in meeting the global demand for food; innovations in agriculture relating to topics such as animal care, crop production and soils research; the business of agriculture; and food production safety.

Three other organizations have also received funding under the Agriculture Awareness Initiative: the Saskatchewan Prairie Conservation Action Plan has received $7,770 for their Adopt a Rancher Educational Program; Genome Prairie has received $6,000 for a workshop to promote an understanding of the importance of effective communication among Saskatchewan's agriculture-biotech research community; and the Canadian Western Agribition has received $7,900 for agriculture awareness initiatives at the show.

None of these programs is going to massively change how people view farming, but they each offer a small window into the industry, which may help raise the level of understanding for those involved.

Education is not about a single element, but rather, it is a life-long process. The programs here can be a starting foundation for better understanding of a critical industry, which many of us now know little about.

SOLUTIONS TO OVERCOME AGRICULTURE POLLUTION

- Public and farmer's awareness about agriculture practices.
- Minimize the use of fertilizers and pesticides.
- Prior to direct application of nutrients and fertilizers, go through the sample testing methods to ensure and assess the accurate quantity needed to apply.
- Crop rotation method should be applied.
- Pest and pesticides resistant varieties should be used.
- Deep ploughing of the soil is essential.
- Irrigation of farm with local and nearby natural water resources.
- After crop harvesting, use cover crops to prevent soil erosion.
- At the edge of farm, plantation of plant , grasses or trees to prevent nutrient loss and soil erosion through effluents.
- Management of animal and cattle waste products should be followed strictly.
- Integrated pest management practices should be followed.
- To control pest population in the field, bio control methods should be followed which utilize predator, parasites, pathogen and parasite as natural enemies of them.
- Keeping check and tabs on increasing population is also essentia because it exerts the direct pressure on the food demand, which forces the utilization of agriculture malpractices to enhance the crop yield.

Public Awareness

+

Minimized used of fertilizers

+

Minimized used of pesticides

+

Cultural practices of agriculture

+

Use crop cover after harvesting

+

Management of animal waste

+

Biological control of pests

CONCLUSION

Every living organism (whether it is consumer, predator or decomposer etc.)is directly or indirectly dependent on producers. Since the origin of agriculture, humans made it as sole cause of energy production which through several energy cycles flows through the ecosystem. Increasing population, pest attack and nutrient depletion are some of the major issues a farmer deal daily in agriculture. We should focus on the strategies like biological control, natural water resource utilization, and stop the drainage directly mixing in the aquatic bodies to prevent the health hazards faced by humans and other organisms. Agriculture pollution can be avoided or minimized when the practices applied will be concerned with the scientific and integrative management techniques.