

THE EFFECT OF CHEMICAL FERTILIZERS ON ENVIRONMENT AND HUMAN HEALTH

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Abstract: Rapid loss of environmental quality today is perhaps the most serious threat humanity has ever faced in the history of mankind. Plants must have light, moisture and nutrients to grow. The sun provides light. Moisture comes from rainfall or irrigation. Nutrients come from fertilizers, compost or manure. If plants are not growing well, fertilizing them will help only if a lack of nutrients is the cause of the problem. Plants grown in poorly drained soils, in excessive shade, or in competition with tree roots will not respond to fertilizer. Fertilizers are either organic or inorganic. Examples of organic fertilizers include manure (poultry, cow or horse), bone meal, cottonseed, or other naturally occurring materials. Inorganic fertilizers are manmade products. They usually have a higher nutrient content. Fertilizers are natural or artificial substance containing the chemical elements that improve growth and productiveness of plants. Fertilizers enhance the natural fertility of the soil or replace the chemical elements taken from the soil by previous crops. Mixed fertilizers can be produced by chemically reacting different ingredients and utilizing the chemical reaction as the binding force; or simply by mechanically blending together straight fertilizers. The fertilizer industry is composed of multi-product manufacturing plants. The adverse effect of these synthetic chemicals on human health and environment can only be reduced or eliminated by adopting new agricultural technological practices such as shifting from chemical intensive agriculture which includes the use of organic inputs such as manure, biofertilizers, biopesticides, slow release fertilizer and nanofertilizers etc. Fertilization among these activities remains a priority at all times. Recent studies, however, excessive use of fertilizers is the need for additional land outside the public and environmental health of the reported adverse affects. Excessive fertilization and mindless, but there were soil salinity, heavy metal accumulation, water eutrophication and accumulation of nitrate, to consider in terms of air pollution in the air of gases containing nitrogen and sulfur, giving and can lead to problems such as the greenhouse effect. In this review, aims to reveal environmental and health problems caused by improper fertilization provides recommendation toward solving these problems. The present study carried out by opting organic farming will create a healthy natural environment and Human health for the present as well as future generation.

Keywords: Environmental pollution, Effect of Chemical fertilizers on Natural Resources, Human health, Organic Fertilizer.

1. Introduction:

Fertilization increases efficiency and obtains better quality of product recovery in agricultural activities. It is one of the most important ways. Non-organic fertilizers mainly contain phosphate, nitrate, ammonium and potassium salts. Fertilizer industry is considered to be source of natural radionuclides and heavy metals as a potential source. It contains a large majority of the heavy metals like Hg, Cd, As, Pb, Cu, Ni, and Cu; natural radionuclide like ²³⁸U, ²³²Th, and ²¹⁰Po [1-2]. However, in recent years, fertilizer consumption increased exponentially throughout the world, causes serious environmental problems. Fertilization may affect the accumulation of heavy metals in soil and plant system. Plants absorb the fertilizers through the soil, they can enter the food chain. Thus, fertilization leads to water, soil and air. If the supply of chemical fertilizers is adapted to the adsorption capacity of the soil (the soil reacts as an ion exchanger) there is no danger on pollution. However if the supply of these fertilizers exceeds the capacity of the soil it may contaminate the ground water and possibly the surface water (rivers lakes) with all the adverse effect.

For the next 30 years, more fertilizer will be used to obtain more products. Excessive use of chemical fertilizers in agriculture, resulting in a large number of environmental problems because some fertilizers contain heavy metals (eg. cadmium and chromium) and high concentrations of radionuclides. Later these fertilizers agro-ecosystem constitutes the main source of heavy metals and radionuclides in plants and some results in the accumulation of inorganic pollutants [3]. Greenhouses, aquaculture especially large amounts of chemical fertilizers used during the peak season, so dangerously polluted well water, especially water resources, crop production quantity and quality of product deteriorates [4]

Total world consumption of Nitrogen (N), phosphorous (P₂O₅), and potassium (K₂O) in 1998/1999 was 81, 14 and 18 Tg/yr, respectively [4]. Modern systems of agriculture use large amounts of fossil fuel energy, water, chemical fertilizers and pesticides to produce huge quantities of crop or live stock. Mechanized and chemical based farming, commercial farming, contract farming and genetic farming swing biotechnology are the types of modern agriculture. Keeping in mind that the amount of land used for food production and changed very slightly over the past few decades [5], and may even have decreased in parts of the world due to urbanization [6], the nutrient load per unit area is steadily increasing. This is help to the improvement of food production and save the money. Globalization and the new market economy have influenced the dietary habits of the people in the developing countries. The new diverse demands of exotic species of crops, vegetables and fruits have introduced changes in the traditional agriculture patterns and practices. If we eat a lot, our body naturally bloats up and tells us to exercise and come back to shape. When we exercise too much, our body tells us to slow down and relax. If there is rain, we also get the Sun, each and everything works fine till a balance is maintained. And we all know the consequences of imbalance. A classic example for the same would be the rise

in global warming due to various reasons, including deforestation, same is the case with fertilizers. The problem is that humans tend to use too much of fertilizers in the soil because they have to cater to the global demand of food. As mentioned already, more than half of the total yield production is out of synthetic or inorganic fertilizers which contain components like nitrogen, potassium, sulfur, calcium, magnesium, and so on. These chemicals and minerals, although help in boosting the growth of plants, they also have their drastic side effects in the long run ^[5] ^[6].

2. Effect of Chemical Fertilizers on Environmental Pollution:

Pollution is contamination of air, water or soil by substance that are harmful to living organisms. In simple manner any direct or indirect alteration in any property, any component from the environment, which disturbs the original functioning of the same. This change is also harmful to man or any living organism. Pollution means the substance in any form of matter. i.e. solid, liquid or gaseous which cause the pollution.

A fertilizer is a natural or synthetic substance that is applied to soils to supply one or more nutrients essential to the growth of plants. They contain main plant macronutrients like N, P₂O₅, K₂O. they also contain secondary plant micronutrients Ca, Mg, S and micronutrients like Cu, Fe, Mn, Md, Zn, and B. in general, fertilizers can be categorized as organic fertilizers and chemical (or inorganic) fertilizers. Organic fertilizers are not used commercially due to lower productivity. These fertilizers break down in nature, making them less effective for commercial purpose, but far more eco-friendly. Instead, conventional agriculture uses chemical fertilizers have a widespread detrimental effect is eutrophication or hypertrophication of fresh water, meaning that bodies of fresh water become heavily enriched with minerals and nutrients due to runoff from land. The chemical found in chemical fertilizers, especially nitrate, are the main contributors to water pollution in general.

3. Effect of Chemical Fertilizers on Natural Resources:

The environmental factors which fulfill the needs of human and help to improve life style are called resources. The World agricultural systems is using a large number of chemicals such a fertilizers, pesticides, herbicides to achieve more production per unit area but using more doses than optimum or recommended of these chemicals and fertilizers leads to several problems like environment pollution (soil, water, air pollution), reduced input efficiency, decreased food quality, resistance development in different weeds, diseases, insects, soil degradation, micronutrient deficiency in soil, toxicity to different beneficial living organism present above and below the soil surface, less income from the production, etc. Despite these many problems, there is also a challenge to is a need to produce nutrition rich and chemicals free agricultural produce for the human and animal consumption without deteriorating are natural resources that is why emphasis should be laid on the production of food rich in quality as well as quantity.

Fertilizer use is no doubt beneficial to plant in providing deficient nutrients; also they have several other conveniences such as the cheaper source of nutrient, higher nutrient content and its solubility hence immediate acceptable than organic fertilizer. There is abundance of evidence that inorganic fertilizers can improve the yield of crop significantly ^[7]. Fertilizers raise soil fertility so that the yield of crops is independent and no longer be limited by the deficient amounts of plant nutrients^[8]. Despite these benefits, fertilizer has several negative effects on the environment because of its growing consumption and lowering nutrient use efficiency. Therefore, the major challenge in intensive agricultural production systems is to combine intensive cultivation with high nutrient use efficiency. To live a happy and prosperous life, man needs appropriate natural and social health. Technological progress, has led to degradation of almost all natural resources. Consumption of natural resources by few groups of people is completely against the principle of sustainable development which includes equality to all and purity of resources.

3.3. Effect of Chemical Fertilizers on Water Pollution:

Water is the most essential component for human existence. The earth is called as 'Blue Planet' because of water which covers almost three fourth of earth's surface. Water is not only essential for survival of all living things but is also the source of economic wealth and the creator of beautiful environment. Chemical fertilizers contain phosphates, nitrates that can actually be the main reason behind water pollution. Nitrate leaching particularly linked to agricultural practices such as fertilizing and cultivation. Irrigated agricultural land in some of the arid and semiarid regions, increased amounts of nitrate accumulation in the soil used and along with the evaporation of water. According to the conditions, nitrate accumulated leached in varying amounts. It reaches the depth of soil. In the soil, fertilizers converted to nitrate through nitrification by microorganisms. Due to negatively charge of nitrate can reach ground water. Even in ideal conditions, Plants use 50% of nitrogenous fertilizers applied to soil, 2-20% lost evaporation, 15-25% react organic compounds in the clay soil and the remaining 2-10% interfere surface and ground water^[9].

One of the most important parameters of the pollution of water is nitrate which is the basic component of fertilizer. Both the nitrate concentration of groundwater and surface water is increased by agricultural activities. Nitrate is the most common form of dissolved nitrogen in groundwater. However, it can be found in the form of nitrite (NO₂⁻), nitrogen (N₂), nitrogen oxide (N₂O) and organic nitrogen. A nitrate from drinking water of the body is absorbed in the intestinal tract 4-12h and is attack by the kidneys. The mechanism, as well as the salivary glands can concentrate nitrate. As a result, the mouth is reduced to nitrite in the anaerobic environment^[9].

Increased amounts of nitrogen and phosphorous compounds in water as a result of the increase in the amount of higher aquatic plants and algae formation and degradation of water quality and water environment in the event of life is defined as eutrophication. Eutrophication in the bottom layer, oxygen-free environment as a result, not suitable for drinking and water supply, reduction in the number of living species in the aquatic environment fish kills, proliferation of unwanted species, odor problem, the media appear to be unsuitable for recreation^[10].

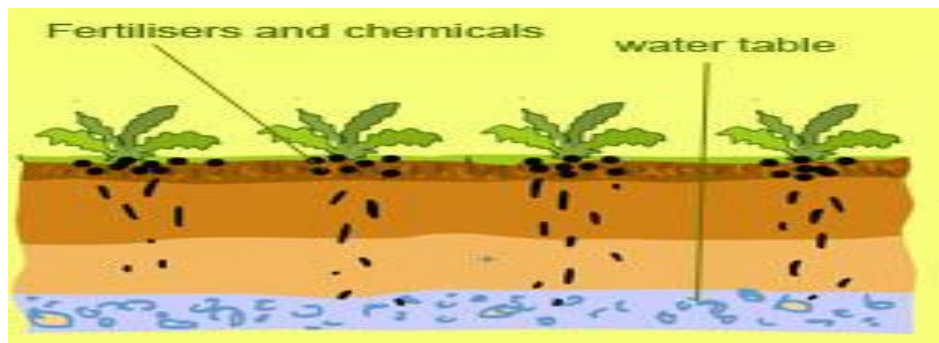


Figure 1. Sources of water pollution.

3.2. Effect of Chemical Fertilizers on Air Pollution:

Acid rain: acidic precipitation that occurs when the pollutants sulphur dioxide (SO_2) and nitrogen oxide (NO_2) reacts with water in the atmosphere. Increased ozone concentrations at ground levels: an increase in surface ozone that contribute to smog. Our planet earth is only one place which provides life supporting system. Biospheres contain all life supporting system for all creatures. Biosphere is a inter linked sphere and includes air, water, soil, sunlight. The Atmosphere is the area of field above the ground level of earth. It is the sources of air which mainly contains six industrial gases viz. Nitrogen (N_2), Oxygen (O_2), Neon (Ne), Argon (Ar), Krypton (Kr) and xenon (Xe). The mass of earth's atmosphere is approximately 5×10^{15} tons, So that the supply of these gaseous is unlimited. Atmosphere plays a vital role in biosphere. It provides suitable condition for better and healthy environment.

It is known to be one of the most important inputs of fertilizers in agricultural production. When it is applied inadequate, rates of productivity and quality are caused significant losses. When it is too much applied, it causes air pollution by nitrogen oxides (NO , N_2O , NO_2) emissions. Nowadays, there are some gases in the atmosphere. Their names are water vapor, carbon dioxide, methane, hydrogen sulfide (H_2S) with chloro-fluoro hydrocarbons, such as halon gases associated with these compounds. Also there are some gases on lower layers of tropospheric ozone. These gases contribution to the greenhouses effect. As a global, atmospheric N_2O increases from 0.2 to 0.3% each year. Also in case of excessive use of nitrogenous fertilizers, especially nitrate content of levels of the plant would threaten human health level reaches the leafy vegetables eaten. Calcareous and alkaline soils, especially applied to the soil surface structure and ammonium fertilizers with urea, can result in evaporation of NH_3 . Evaporation of ammonia, a large number of soil and environmental factors can be controlled and directly proportional to the concentration of ammonia in the soil solution.

Ammonia emission from fertilized lands, adjacent to result in depositing on ecosystems and vegetation damage. NH_3 may be oxidized and turn into nitric acid, sulfuric acid from industrial sources, create acid rain after the chemical transformations. Acid rain can damage vegetation. Also, it can damage organisms that they live in both lakes and reservoirs^[11]. Excess amount of NH_3 react with Volatile organic compounds, Nitrogen oxide & sulfur dioxide to convert health harming particulate matter ($\text{PM}_{2.5}$) is an air pollutant that is a concern for people's health when level in an air are high shown in Figure 3.



Figure 2. Ammonia (NH_3) can combine with volatile organic compounds (VOC), nitrogen oxides (NO_x) and sulfur dioxide in the air to form health-harming small particles ($\text{PM}_{2.5}$).

3.1. Effect of Chemical Fertilizers on Soil Pollution:

Modern agricultural practices such as application of chemical synthetic fertilizers, pesticides, herbicides and soil conditioning reagents are responsible for soil pollution. This practice converts the fertile soil into non-fertile soils. According to the researches and studies the effects of chemical fertilizers on the soil is not immediately obvious. Because soils have strong buffering power due to their components. Over the time, it states that emerged from the pollution, deterioration of soil fertility, soil degradation reactions occurring in the soil leads to deterioration of the balance of the current element. In addition, toxic substances accumulate within the vegetables and causing negative effects in humans and animals are fed^[12]. Soil structure in agricultural productivity is very important and it is regarded as an indicator. Unconsciously, the fertilizing, soil, just as in the deterioration of the structure is caused

by industrial emissions. Especially NaNO_3 , NH_4NO_3 , KCl , K_2SO_4 , NH_4Cl demolish the structure, such as fertilizers, soil, soil structure, deterioration is difficult to obtain high-quality and efficient product.

Particularly high level of sodium and potassium containing fertilizers, make a negative impact on soil, pH, soil structure deterioration and the increasing feature of acid irrigation or other agricultural operations or from the benefits derived from it is not possible or very scarce. Continuous use of acid-forming nitrogen fertilizers causes a decrease in soil p^{H} , liming, if not carried to prevent the declining efficiency of field crops. Basic use of fertilizers in the soil leads to an increase in pH. increases in soil and plants, seedlings pH circuit of a sudden drop in the yield and quality drops, but causes harmfulness. In addition expanding the size of soil pollution by accumulation in the soil^[13].

Nitrate and phosphates from the artificial fertilizers run-off the agricultural fields and discharged into the nearest water bodies causing the eutrophication^[13]. Due to higher concentration of nitrates in the drinking water causes methahaemolobinaemia in human beings. Consumption of vegetables grown in NO_3 rich soil may cause this disease especially in children. These pollutants remain active in soil for the thousands of years. Given large amounts of potassium fertilizers in the soil of Ca and Fe with Zn disrupt the balance of nutrients by the plants and prevent the receipt. However, the negative effects on organisms, given the variety of worms and soil mite has been devastating and lethal effect.



Figure 3. Soil Pollution Hidden Reality



Figure 4. Soil Pollution

4. Effect of Chemical Fertilizers on Human Health:

Fertilizers are a mixture of toxic chemicals which are absorbed into the plants, leading toxins to enter the food chain via vegetables and cereals and water creating health affects increase and spread rapidly-contaminated water may contain high level of nitrates and nitrites, causing hemoglobin disorders. Heavy metals such as Mercury, Lead, Cadmium and Uranium have been found in fertilizers^[14], which can cause disturbances in the kidneys, lungs and liver and cause cancer. Over 29 popular fertilizers tested positive for 22 toxic heavy metals, including silver, nickel, selenium, thallium and vanadium, all directly linked to human health hazards. Ammonium Nitrate exposure causes other health problems such as eye and skin irritation, producing a burning sensation. Inhalation exposure can result in irritation of the nose, throat, and lungs. One can also experience nausea, vomiting, flushing of the face and neck, headache, nervousness, uncontrolled muscle movements, faintness and collapse. Potassium Chloride interferes with nerve impulses, and interrupts with virtually all bodily functions and mainly affects heart functioning. It can cause all kinds of gastric and stomach pains, dizziness, bloody diarrhea, convulsions, headaches, mental impairments, redness or itching of the skin of eyes^[14].

Cadmium ultimately enters the human tissues resulting in diseases such as trachea-bronchitis, pneumonitis, pulmonary edema, renal failure, osteoporosis, and many others. Lettuce (*Lactuca sativa* L.), found in great quantities in countries like Brazil and others in South America, uptake Cd very easily, with an average amount of 870mg Cd/kg. Yet, human being, via the gastrointestinal system, only uptake about 5% of the Cd through food^[15]. However, those lacking iron can uptake up to 6% more. Hence, this can be harmful to them because Cadmium poisoning, which comes from its excessive intake, can lead to kidney, bone and pulmonary damage^[16]. The "Itai-Itai" (it hurts-it hurts, in Japanese), discovered in Japan in the year of 1912, is caused by Cadmium poisoning, which results in acute pain in the joints and spine^[17].

Chemical fertilizers have minimum effect on human health compared to insecticides, herbicides and pesticides considering their decomposition products in soil, thereby jeopardising the rhizosphere biology to damage the crop ecosystem to near repairable limit. Yes, they do have toxic effect on ground water through their leaching, if not applied as per soil test-crop response based module. In principle, everybody agrees that the effect of utilizing chemicals in agriculture produces long-term negative effects. The good impression of organic farming and the bad impact of chemical fertilizer in Maharashtra were on dialogue for several years. It is said that the usage of chemical fertilizer in Maharashtra is much higher than the world average. There is no argument that the benefits of organic fertilizer in agriculture outweigh the synthetic man-made chemical fertilizer by leaps and bounds. Organic fertilizers are beneficial to the environment; boost both nutrient efficiency and organic matter content in the soil, enhance the quality of the produce, and provide many other benefits and advantages to society at large.

A study by the University of Wisconsin suggests that typical concentrations of nitrate (a common fertilizer) and a pesticide in the groundwater may compromise the nervous, endocrine, and immune system of young children and developing fetuses. Further, it was revealed that high levels of sodium nitrate in groundwater can cause gastric cancer and testicular cancer. The biggest human health reported for chemical fertilizers have been the blue syndrome caused by high concentrations of nitrate. Some susceptible

individuals might be in risk due to high concentrations of potassium (kidney dysfunction or other diseases, such as heart disease, coronary artery disease, hypertension, diabetes, adrenal insufficiency, and pre-existing hyperkalaemia)^[18].

As discussed, the use of organic-based fertilizer in agriculture immensely benefits both growers, consumers, and the environment in many ways. Organic fertilizer boosts both nutrient efficiency and organic substance content in the soil. It also nurtures the soil with natural matter that reduces the dependency on destructive chemical inputs and increases soil fertility to plant growth. Organic fertilizer also improves the efficiency of nutrients use to produce healthier food.

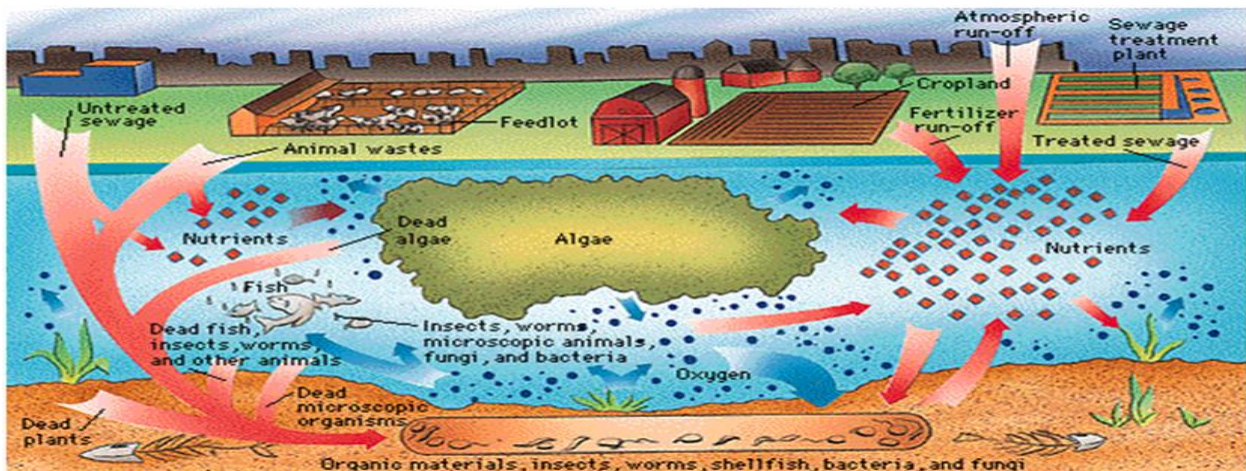


Figure 5. Effect of Chemical Fertilizer on Human Health.

5. Need to Use Organic Fertilizers:

Organic fertilizers are fertilizers that are naturally produced and contain carbon (C). Fertilizers are materials that can be added to soil or plants, in order to provide nutrients and sustain growth. Typical organic fertilizers include mineral sources, all animal waste including meat processing, manure, slurry, and guano, plant based fertilizers, such as compost, and biosolids. There is also other a biotic non-chemical, fertilizer methods that meet the Principles of Organic Agriculture, which determines whether a fertilizer can be used for commercial organic agriculture^[19].

The main organic fertilizers are, mineral, peat, animal wastes, plant wastes from agriculture, and treated sewage sludge.

5.1. Minerals:

Minerals can be mined or fossil products of animal activity, such as greensand (anaerobic marine deposits), some limestones (fossil shell deposits), and some rock phosphates (fossil guano). Adding limestone or "liming" a soil is a way to raise pH seven by rising the pH of a soil^[20], microbial growth can be stimulated, which in turn increases biological processes, enabling nutrients to flow more freely through the soil. When nutrients flow freely they are more accessible to plants and therefore can increase plant health and mass. If the soil is already pH balanced, liming the soil would be ineffective.

5.2. Peat:

Peat, or turf, is plant material that is only partially decomposed. It is a source of organic matter. Soil with higher levels of organic matter are less likely to compact, which improves the soil aeration and water drainage, as well as assists in supporting soil microbial health. It is sometimes credited as being the most widely use organic fertilizer and by volume is the top organic amendment.

5.3. Animal Sources:

Animal sourced materials include both animal manures and residues from the slaughter of animals. Manures are derived from milk-producing dairy animals, egg-producing poultry, and animals raised for meat and hide production, or sport and recreation. Manure is an abundant resource with estimations for cattle manure in the US alone reaching two billion tons annually, and one hen has the potential to produce a cubic foot of manure every six months. By adding manure to crops it adds nitrogen, potassium, phosphorus, sulfur, magnesium and calcium. While also increasing soil stability by increasing organic material, increasing water infiltration, it can add bacteria diversity and over time reduce the impacts of soil erosion. However, there is organic manure and non-organic manure. In order for manure to be considered organic it must come from organic livestock or certified organic growers.

If organic manure is not available, they are permitted to use non-organic manure as long as the animals have room to roam, are not kept in the dark, and growers abstain from using genetically modified feeds. Fresh manure, right from the stall, can cause issues because it can be too high in ammonia, or contain bacteria from the animal's gut. This can have an adverse effect on plants as the ammonia can burn the roots and microbes from the animal's gut can harm the microorganisms in the soil, killing them, or contaminate produce, such as E. coli and salmonella. There is also a risk of introducing weeds, as seeds can pass through the gut of an animal relatively unharmed, or there can be seeds in the bedding of the livestock, which is often mixed in with the manure. Therefore, manure is required to be composted which will ideally kill any seeds or pathogens and reduce the ammonia content.

5.4. Chicken Litter:

Chicken litter, which consists of chicken manure and bedding, is an organic fertilizer that has been proposed to be superior for conditioning soil for harvest than synthetic fertilizers. It contains similar minerals to other manures, while also having trace amounts of copper, zinc, magnesium, boron, and chloride. Depending on the type of chicken litter obtained, it may contain bird remains. This type of chicken litter should not be spread on crops, and can pose a risk to grazing livestock due to botulism, a disease caused by bacteria within decaying birds.

5.5. Horse manure:

Horse manure contains the perfect balance of Carbon to Nitrogen for composting (30:1) and is a traditional garden soil amendment. However, careful organic sourcing is critical because feed (and bedding materials) from fields treated with the picolinic acid family of herbicides including aminopyralid, clopyralid, and picloram (marketed in the US as Milestone and Grazon-) can pass through a horse's digestive tract, remaining unchanged in manure and compost piles for long periods. These chemicals commonly affect potatoes, tomatoes, and beans, causing deformed plants and poor or non-existent yields. Also, horse de-wormers like Ivermectin can be detected in manure at levels harmful to beneficial insects and organisms for up to 45 days. Tainted compost can not only kill plants and beneficial organisms, but can create liability issues for owners.

5.6. Urine:

From humans as well as animals, is a fertilizer: urea in urine is a nitrogen compound, and urine also contains phosphorus and potassium. Human urine typically has about 3 times as much nitrogen as potassium, and more than 20 times as much nitrogen as phosphorus. The amount of potassium in urine is variable, and depends on the amount of potassium in the person's diet. Urine is not currently allowed to be used in any commercial agricultural operations. However, there are ongoing studies that have shown that aging urine in concealed containers for 12–16 months eliminates 99% of harmful bacteria, due to increasing urea content and therefore pH. Animals by products. When any animal is butchered, only about 40% to 60% of the live animal is converted to market product, with the remaining 40% to 60% classed as by-products. These by-products of animal slaughter, mostly inedible—blood, bone, feathers, hides, hoofs, horns, can be refined into agricultural fertilizers including blood meal, bone meal, fish meal, and feather meal.

5.7. Plant:

Processed organic fertilizers include compost, humic acid, grain meal, amino acids, and seaweed extracts. Other examples are natural enzyme-digested proteins. Decomposing crop residue (green manure) from prior years is another source of fertility. Compost provides little in the means of nutrients to plants, but it does provide soil stability through increasing organic matter. Compost does help microorganisms proliferate which in turn breaks down decaying plant material into substantial bio-available nutrients for plant to easily assimilate.

Grain meals can be made of corn gluten, alfalfa, cottonseed, or soybean. Most supply nitrogen and potassium, but soybean meal provides nitrogen and phosphorus. When initially spread they can cause an increase in ammonia within the soil and burn seeds, it is recommended to use these after plants have developed, to ensure crop success.

Other ARS studies have found that algae used to capture nitrogen and phosphorus runoff from agricultural fields can not only prevent water contamination of these nutrients, but also can be used as an organic fertilizer. ARS scientists originally developed the "algal turf scrubber" to reduce nutrient runoff and increase quality of water flowing into streams, rivers, and lakes. They found that these nutrient-rich algae, once dried, can be applied to cucumber and corn seedlings and result in growth comparable to that seen using synthetic fertilizers.

5.8. Treated Sewage Sludge:

Sewage sludge, also known as bio-solids, is effluent that has been treated, blended, composted, and sometimes dried until deemed biologically safe. As a fertilizer it is most commonly used on non-agricultural crops such as in silviculture or in soil remediation. Use of bio-solids in agricultural production is less common, and the National Organic Program of the USDA (NOP) has ruled that bio-solids are not permitted in organic food production in the U.S.; while biologic in origin (vs. mineral), sludge is unacceptable due to toxic metal accumulation, pharmaceuticals, hormones, and other factors. With concerns about human borne pathogens coupled with a growing preference for flush toilets and centralized sewage treatment, bio-solids have been replacing night soil (from human excreta), a traditional organic fertilizer that is minimally processed.

6. Advantages & Disadvantages of organic fertilizers:**6.1. Advantage:**

1. Balance the soil ecosystem, boosts plant health naturally
2. They are all natural.
3. The process of decomposition requires no chemical intervention.
4. Organic fertilizers don't upset the balance in the soil because they don't leave behind any artificial compounds.
5. Delivers nutrients in a slow, but sustainable rate.
6. They increase the crop yield and provide enough food to feed the large population.

6.2. Disadvantages:

1. They are expensive.
2. NPK directly affects plant growth by feeding the plant.

3. Long term use reduces the microbial activity and disturbs the pH of the soil.
4. The ingredients in the fertilizers are toxic to the skin and respiratory system.
5. Excessive use of fertilizers damages the plants and reduces soil fertility.
6. Leaching occurs and the fertilizers reach the rivers causing eutrophication.

6. Conclusion:

Today, use of fertilizers is seen as a necessary agricultural technology, because soil restores nutrients. However, firstly soil analysis should be performed carefully. After then, fertilizer should be given to soil. The structure and chemical content of the soil should be identified and the most appropriate type of fertilizers should be selected. The most suitable method should be processed. Otherwise, the fertilizer should be noted that errors will result in the loss of both energy and finance. Fertilizing should be done in time, should not be inappropriate times. For example a heavy rainfall to the seasons, fertilization, and fertilizers water will mix with the surrounding soil by leaching. For this reason, fertilizer will be lost from soil, as well as pollution of surrounding water and therefore it will result in eutrophication. Use of excessive quantity of synthetic fertilizers is harmful for human health. It is contaminating the surface water via runoff and its consequent effects. High levels of nitrates and nitrites in chemical fertilizer may cause some diseases. Development means not only economic growth, but it should be sustainable, to solve such problems everyone should have the knowledge of environment and environmental ethics. Opting organic farming will create a healthy natural environment and Human health.

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