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"The earth, the air, the land, and the water are not an inheritance from our forefathers but on loan from our children. So we have to handover to them at least as it was handed over to us. - Mahatma Gandhi

Agriculture, commonly referred to as farming, is a form of art and science and contributes a major part in reshaping a part of our Earth in terms of cultivating and harvesting plants and crops, and providing a suitable environment for livestock for their growth, wellness of humans and economic gain. Human lifestyles without agriculture cannot be considered, as it affords fundamental necessities like meals for us to live a healthy life. Hence, it increases the importance of agronomical culture in our lives. Agriculture is said to be a significant sector of Indian livelihood and economy. Agriculture or farming has contributed to almost 17% of the total Gross Domestic Product (GDP) and over 60% of the population is employed in agriculture. Indian agriculture has been noted for remarkable growth over the past few decades (Nawaz and Farooq, 2021).

According to Barrett (2021), agriculture is a major productive unit that integrates nature's gifts such as land, air, light, rainwater, temperature, humidity and others into a single primary unit. This primary unit is very crucial for human beings. After feeding on these fundamental units, the secondary producing units consist of animals, poultry, birds, and insects that may produce concentrated end products like meat, milk, eggs, honey, wool, hide, silk, and lac, among other things. Food, fuel, fiber, furniture, raw resources and waste products for and from industry, money, and flood control are all provided by agriculture. An atmosphere of freedom, justice, and freshness; plenty of food preventing starvation; and arguments that end in camaraderie. Together with these factors, it also takes into account the creation of jobs, economics, education, ecology, energy consumption, equipment use, earning for production, protection, processing, consumption, preservation, and the fight against waste, as well as commerce and transportation. Draft power, agricultural machinery, irrigation water, fertilizers, manures, chemicals (pesticides, herbicides, growth hormones), and electricity for preservation are the cultural energies of production.

Today, India has an excess of food grains. It was made possible by the Green Revolution in the 1960s, which substantially escalated the crop production, primarily wheat and rice. Food grain production increased from 82 million tonnes (MT) in the late 1960s to 316 MT in 2021-22. Nevertheless, a sharp rise in the application of inorganic fertilizers was noted to attain this gradual production (Edwards, 2020). Farmers were encouraged to employ chemical pesticides and fertilizers in addition to enlarging their farming acreage and implementing high-yielding wheat and rice types. This initiated "unintended but harmful consequences on agriculture and human health". Pesticides and fertilizers increased soil concentrations of heavy metals (like lead, arsenic, and cadmium); soils grew more alkaline, killed beneficial bacteria, and became unusable in many places. (Aryal et al., 2021).

The enhanced use of pesticides leads to environmental damage and the development of resistance among insects. Pesticides have also harmed beneficial organisms in the soil. Moreover, the monoculture of high-yielding seeds has necessitated the external application of chemical fertilizers, which further deteriorates soil health by destroying soil organisms. This includes rhizobia, responsible for nitrogen fixation, and other microorganisms crucial for making phosphates available to plants. Over time, these practices have led to a reduction in crop yields. Additionally, the damaged soil is susceptible to erosion by water and wind. As a result, there's a continuous need for enhanced quantities of manures, most of them end up being washed or bleached into surface and underground water resources (Jadon and Verma, 2021).

Doss (2018) highlights that modern chemical-based farms prioritize productivity over traditional land stewardship practices. Although the approach of high input for high returns is yielding diminishing productivity for farmers worldwide, unfortunately, this productivity-centric approach often overlooks four crucial considerations: the impact on the land itself, the quality and safety of the food produced, the health and well-being of consumers, and the communities that may suffer from the consequences of unsustainable farming practices.

For several reasons, Consumers are increasingly seeking safer and more environmentally friendly food options produced by local systems. Organically grown food products are perceived to meet these demands, leading to a surge in popularity for organic farming practices in recent years. Organic foods have emerged as a preferred choice for both consumers and farmers alike, aligning with the trend towards adopting a greener lifestyle (Das et al., 2020).

Sustainable development has become a worldwide priority for more than a decade, with sustainable agriculture being a critical component in achieving this objective. According to the Food and Agriculture Organization (FAO), 2016 the sustainable agriculture involves the fruitful management of resources to meet fluctuating human requirements while preserving or enhancing environmental quality and conserving natural resources (Umesha et al., 2018). Almost all the definitions of sustainable agriculture highlight the maintenance of agricultural growth rates that can meet the food demand of all living organisms without alleviating the essential resources.

Organic farming is one of the main approaches that aligns with the major objectives of sustainable agriculture. While many techniques used in organic farming, such as intercropping, mulching, and integrating crops and livestock, are not new and have been practiced in traditional agriculture systems, organic farming is distinguished by its adherence to laws and certification programs that prohibit the use of synthetic inputs. In organic farming, soil health is recognized as a central theme, highlighting the importance of nurturing and preserving soil quality (Eyhorn et al., 2019).

The practice of organic farming in India is not yet new and it has roots dating back to the ancient era. It signifies that the farming system focused on the cultivation of land for harvesting plants and also prioritizing the health of the soil. Organic farming utilizes organic wastes such as crop residues, animal manure, and farm wastes, as well as other biological materials and beneficial microbes (biofertilizers), to nourish the soil and promote sustainable crop production in an eco-friendly and pollution-free environment (Nagar et al., 2020).

Organic agriculture is characterized by the Food and Agriculture Organization (FAO) as a distinct system of production management that fosters and improves the health of the agro-ecosystem, encompassing biological cycles, biodiversity, and soil biological activity. This is accomplished by eliminating all artificial off-farm inputs and using only mechanical, biological, and agronomic techniques applied on the farm. (Santhoshkumar et al., 2017).

The necessity for organic agricultural practices in India stems from the unsustainable nature of conventional agricultural practices and the ecological harm they inflict. The current conventional agriculture system, widely practiced worldwide, originated in Western nations, driven by socio-economic factors emphasizing wealth accumulation. However, this model, inherently self-destructive and unsustainable, has been adopted globally. Modern farming techniques, particularly perfected by American settlers who displaced native populations in the

US, heavily rely on large-scale mechanization fuelled by fossil fuels. This mechanization, necessitated by the appropriation of large farms by immigrants, leads to monoculture practices, reducing biodiversity and relying heavily on chemical inputs like fertilizers and pesticides. The high costs associated with machinery drive a need for increased productivity, resulting in the cultivation of only high-yield crops that demand excessive chemical inputs (Khadda, 2021).

The introduction of artificial fertilizers provided immediate benefits to agriculture, but their long-term use led to detrimental effects such as soil toxicity and reduced fertility. Regarding these challenges, the conception of organic farming acquired acceptance as a sustainable alternative. Organic fertilizers offer several advantages: they are cost-effective, amplify soil texture and structure, improve air quality and circulation, enhance water retention capacity, and stimulate strong root development. These added fertilizers can be sourced from various natural materials including minerals, animal waste, sewage sludge, and plant residues. The incorporation of vegetables, animals, and organic matter into the soil has significantly enriched soil organic content, further enhancing soil health and fertility (Assefa and Tadesse, 2019).

According to Shaji et al., (2021), organic fertilizers vary from the use of chemical fertilizers. Because, organic fertilizers are derived from by-products of vegetables, animals, or minerals. These organic materials decompose naturally, providing nutrients and minerals to the soil. When maintaining a lawn or garden, ensuring that it receives all necessary nutrients is essential for healthy growth. While regular soil contains some nutrients, fertilizers help ensure a balanced and accessible nutrient supply for plants. One of the advantages of organic fertilizer is its slow-release nature compared to chemical fertilizers. This gradual process allows plants to naturally absorb nutrients without the risk of over-fertilization, which can harm plants. Additionally, organic fertilizers improve soil drainage and air circulation. Establishing a compost pile offers a sustainable way to manage food waste while contributing to soil health and plant growth. Unlike synthetic fertilizers, which contain non-biodegradable chemical components that can enter into the soil and harm wildlife, organic fertilizers pose no such risk. They are safer for children and pets playing in the garden and do not contribute to soil acidity or kill beneficial soil microorganisms. Furthermore, organic fertilizers enhance soil structure and sustain beneficial microorganisms, which aid in nutrient release and overall soil health.

In many agricultural regions, groundwater pollution often results from the exploitation of synthetic pesticides and fertilizers. However, organic fertilizers contribute to greater

biodiversity, improve soil structure, and enhance water infiltration, thus reducing the risk of groundwater contamination. Well-managed organic farming systems with superior nutrient-retention capabilities further mitigate the threat of groundwater pollution. Additionally, climate change is maintained by organic agriculture by sequestering carbon sources in the soil by various methods. Organic farming practices increase carbon return to the topsoil, enhancing yield and promoting storage of carbon.

Furthermore, integrating animals and plants optimizes energy and nutrient cycling in the sector of agricultural production. The structures that provide food and place, coupled with the absence of pesticide usage, fascinate diverse species to organic areas, including beneficial organisms such as pollinators and pest predators, thereby fostering ecosystem health. The likelihood of utilizing expensive fertilizers diminishes in households with sufficient labor to apply manure. Moreover, the application of both fertilizer and manure tends to increase with parcel size, reflecting the influence of various factors on their usage patterns (Sharma and Singhvi, 2017).

The belief that produce cultivated organically is safer and more nutrient-dense than produce grown conventionally seems to be the main driver of the rising customer demand. Comparably, it has been noted that applying inorganic fertilizer degrades the texture and structure of the soil, which frequently results in increased acidity from nutrient leaching and soil erosion. Because of nutrient imbalance and soil degradation, all of these variables lower crop yields. When compared to soils fertilized traditionally, manured soils have higher amounts of organic matter, lower bulk densities, increased porosity and hydraulic conductivity, and superior aggregate stability. Crop growth would be optimized by improvements in each of these soil quality markers. One of the major advantages of using manure as an organic nutrient source is its ability to sustain or boost soil organic matter levels (Eyinade et al., 2021).

Both organic and synthetic fertilizers impact soil properties and agriculture, each offering distinct benefits. Nonetheless, inorganic fertilizers generally have more drawbacks compared to organic ones. Organic fertilizers, which come from sources like animal waste, human excreta, or plant materials such as compost and manure, are crucial to organic farming. This farming method strives to balance various goals, including organic, environmental, social, and cultural aspects, by minimizing the use of synthetic inputs like chemical fertilizers, pesticides, growth regulators, and feed additives. Instead, it focuses on natural practices such as

crop rotation, utilizing crop residues, animal manures, legumes, green manures, off-farm organic wastes, and mineral-rich rocks to enrich the soil.

For instance, compost supplies plants with water, air, organic matter, and microorganisms, which boosts their growth and supports a healthy soil environment that helps repel insects, plant diseases, and weeds. Numerous organic materials act as both fertilizers and soil conditioners, benefiting both soil and plants. Organic soils typically have higher microbial biomass compared to conventionally managed soils. As carbon-based compounds, organic fertilizers improve plant productivity and growth quality. Additionally, many organic fertilizers can be produced locally or on the farm, ensuring that the resulting food is free from harmful chemicals.

On par with Chen et al., (2020), the recommendation that the use of organic fertilizers or a combination of organic and synthetic fertilizers is more beneficial than relying solely on artificial fertilizers. This approach helps preserve soil properties and increase soil productivity, aligning with the principles of sustainable agriculture.

Over the past forty years, various environmental issues such as pollution, global warming, ozone layer depletion, acid rain, deforestation, and desertification have garnered significant attention from scientists, policymakers, and the general public worldwide. These issues are viewed as major threats to the Earth's life-supporting environment, making our survival increasingly precarious. Addressing these challenges requires a comprehensive understanding of how our environment functions and a detailed grasp of these problems' dynamics. Since no other field of study fully addresses these needs, environmental science emerged as a distinct academic discipline to bridge this gap (Torres et al., 2019).

Currently, the world faces a range of environmental issues, from localized concerns like groundwater depletion to global challenges such as climate change. Addressing these issues requires widespread environmental awareness, with people needing to understand the causes, impacts, and solutions related to various environmental problems (Yadav et al., 2021). Protecting our environment from harmful gases, chemicals, and waste is crucial for maintaining long-term health. The environment encompasses both living and non-living elements. People have different perspectives on what constitutes the environment—some view it as nature, while others see it as wilderness or landscapes. For some, it includes rural areas, forests, and greenery. In essence, the environment consists of everything around us, including rural and urban areas, diverse landscapes, and all living and non-living things. It encompasses plants, air, water, soil,

animals, birds, oceans, humans, and all other organisms, forming the geographical space we often refer to as our surroundings (Kazemi and Ghorbanpour, 2017).

The environment is continually influenced by three primary factors: the hydrologic process, the atmospheric process, and the geomorphic process. The study of the interactions between nature and living organisms is referred to as ecology. Maintaining a balanced environmental cycle helps in leading a healthy lifestyle and ensures the well-being of animals and birds. However, it is our duty as humans to preserve and enhance the natural world. Nearly every country seeks economic development, which underscores the importance of preserving and managing biodiversity. To address this, governmental bodies and various environmental protection organizations run annual awareness campaigns to safeguard and preserve our environment. Additionally, laws are established to improve public response and awareness (Chakraborty, 2021).

In the 1970s, there was a strong national effort to reduce the country's reliance on imported food, leading to a singular focus on boosting agricultural production. In India, agriculture and related sectors employ 65% of the workforce and contribute 30% to the national income. With population growth and rising incomes, the demand for food grains and agricultural raw materials for industry is expected to increase. However, the land available for cultivation is fixed at 140 million hectares and cannot be expanded, while urbanization and industrialization are likely to reduce the area of arable land. Although science and technology have enhanced agricultural output from existing land, it has become increasingly clear that these gains have come at the expense of the environment and natural resources crucial for sustaining life. It is now evident that the current approach to economic development, which overlooks ecological and environmental considerations, cannot maintain progress without significantly compromising the fundamental elements that support all life on Earth (Giller et al., 2021).

The adverse impacts of development are well-documented and increasingly evident. India, in particular, must pay close attention to these issues due to the fact that agriculture provides the primary livelihood for 6-7 million people and serves as the backbone of the nation's economic growth. Historically, people lived in closer harmony with nature, enjoying healthier and cleaner environments with abundant flora and fauna. However, if we examine the transformation of metropolitan cities and large towns over the past fifty years, as recounted by the older generation, the changes are stark and concerning. Essential resources such as land, water, and air—critical for sustaining human life—have deteriorated significantly, posing

serious threats to the livelihoods of millions across the country. The ecological and environmental consequences of development have garnered substantial global attention and are widely publicized (Gupta, 2019).

The extensive use of inorganic fertilizers during and after the Green Revolution (GR) led to significant environmental and ecological issues, including soil acidification, degradation, and water eutrophication, which have critically undermined agricultural sustainability (Lu and Tian, 2017). The excess nutrients from these fertilizers have resulted in increased emissions of nitrous oxide (N_2O) from agricultural activities, a significant contributor to human-caused greenhouse gas emissions (Kudeyarov, 2020).

It is estimated that about 60% of nitrogen pollution stems from crop production, especially due to the use of nitrogen (N) fertilizers. Therefore, agricultural development strategies must address these issues alongside efforts for climate change adaptation and mitigation. In South Asia (SA), nitrogen fertilizer use has risen over the past thirty years (Takeshima et al., 2021). The Green Revolution's focus on inorganic fertilizers, irrigation, and improved crop genetics was intended to boost crop productivity in SA. However, many farmers in the region are not familiar with the scientifically recommended fertilizer application rates. Instead, they often apply fertilizers based on their personal judgment and the availability and affordability of products in the market (Kishore et al., 2019).

The negative impacts of modern agricultural practices on both farm environments and the broader health of living organisms have been extensively documented worldwide. The widespread use of technology, especially chemical fertilizers and pesticides, has led many to voice concerns about their adverse environmental effects. These issues include soil erosion, water scarcity, salinization, soil contamination, and genetic erosion (Kalyani, 2021). Ecosystems play a crucial role in supporting agriculture by growing crops and vegetables. Historically, waste products were recycled and decomposed into compost for agricultural use. The environment has always provided numerous benefits to humans, and we continue to rely on nature for various personal needs.

Gupta (2019) highlights that pollution of air, water, and soil is rapidly worsening and having severe impacts on the environment. Harmful greenhouse gases are contributing to the greenhouse effect, while the depletion of the ozone layer allows direct ultraviolet rays from the sun to reach the Earth, leading to accelerated snowmelt and increased risks of skin diseases and infections in both humans and animals.

Ecology focuses on the interactions between plants and animals and their role in maintaining environmental balance. Humans must manage natural resources responsibly, minimizing damage and using nature sustainably for survival. Rural areas face various environmental challenges, including poor sanitation, the conversion of agricultural land to residential areas, inadequate drainage, excessive use of pesticides and fertilizers, salinization, desertification, and land degradation. These issues are exacerbated by the unsustainable practices of modern farming methods in India, which have severely impacted both agricultural productivity and the environment (Mendez et al., 2021).

Maji et al. (2020) emphasize that if environmental degradation is not addressed with corrective and reformative measures, it could lead to the extinction of life. We are confronted with numerous environmental challenges, and it is crucial to educate the nation about these issues to promote eco-friendly practices. Key challenges include the growing population, poverty, agricultural expansion, the need for groundwater, development, forest degradation, land degradation, the need for institutional reorientation, loss of genetic diversity, adverse effects of urbanization, air and water pollution, indoor air pollution, and changes in land use patterns.

Somasundaram et al. (2021) highlight that organic agriculture is a form of sustainable agriculture, incorporating techniques such as inter-cropping, crop rotation, double digging, mulching, and the integration of crops and livestock, which are also used in various other agricultural systems. What distinguishes organic agriculture, as defined by various regulations and certification programs, is that:

- The use of nearly all synthetic inputs is prohibited, and
- Soil-building crop rotations are required.

The fundamental principles of organic farming dictate that natural inputs are permitted while synthetic inputs are generally banned, though there are exceptions for both categories. Some natural substances deemed harmful to human health or the environment by certification programs, such as arsenic, are prohibited. Conversely, certain synthetic substances deemed essential and aligned with organic principles, such as insect pheromones, are permitted. Certification programs maintain lists of approved synthetic inputs and banned natural substances, and these lists are currently being reviewed by the Codex. Additionally, many certification programs require extra environmental protection measures to meet these standards.

Although many farmers in developing countries avoid using synthetic inputs, this practice alone does not qualify their operations as organic (Walia, 2022).

Organic farming is becoming increasingly crucial as harmful chemicals and pesticides continue to pollute the soil and environment. This method offers an alternative by enriching the soil with organic compost and avoiding chemical contaminants. Since soil is the foundation for many food crops, produce grown in organic soils tends to be healthier. Organic farming promotes a sustainable rural environment, enhances soil health, and fosters ecological balance. In India, this agricultural practice has historical roots, and its potential for reducing various pollutants and achieving sustainability is well-recognized. Organic farming has minimal negative impact on the economy and supports biodiversity conservation. By decreasing the exposure of toxic substances to humans, animals, and the environment, it significantly contributes to rural vitality. Farms adopting organic practices can potentially double family income compared to conventional methods. Additionally, organic farming is cost-effective, yields premium returns on products, provides pesticide residue-free food, reduces pollution, and creates job opportunities (Singh, 2021).

In 2016, India had 1.5 million hectares of organic farmland and expanded this by an additional 0.3 million hectares within the same year. According to the World of Organic Agriculture Report 2021, India contributes 30% of the world's total organic production, covering 2.30 million hectares, yet this only represents 2.59% of the nation's total cultivation area. The country also has approximately 835,000 certified organic producers. The production of organic products and the extent of cultivated organic land have been steadily increasing over the years (Willer, 2018).

Agricultural development policies in developing nations should focus on enhancing land productivity, reducing costs, and improving product efficiency while minimizing harm to humans and the environment (Manida and Nedumaran ,2020). Over the past decade, organic farming has garnered growing interest as it is seen as a potential solution to various agricultural challenges. This farming method offers benefits such as environmental protection, resource conservation, and better food quality (Charyulu and Dwivedi, 2016). Organic farming is not only a consumer demand but also addresses the needs of farmers. It could be a crucial element in transforming rural agriculture into a sustainable system, helping to cover conversion costs and ensure soil sustainability (Yadav et al., 2020). Many farmers, especially those with limited

resources, find it difficult to afford conventional fertilizers and chemicals, making organic farming an attractive option for those with small or fragmented landholdings (Singh, 2018).

Mendon et al. (2020) suggest that organic farming is a unique approach that balances environmental sustainability while mitigating risks to consumer safety, thereby fostering a positive perception among customers. Varkey (2020) notes that both developing and developed countries are increasingly focusing on the environmental sustainability of agricultural methods and practices. However, traditional farming wisdom regarding indigenous practices is being re-evaluated due to various emerging factors.

Mahatma Gandhi famously remarked that there is enough to meet everyone's needs but not enough to satisfy everyone's greed, a statement that resonates deeply with the current global food security situation. Although the world's food supply is generally considered adequate to meet present demands, about 842 million people, or one in eight globally, suffer from chronic hunger and lack enough food to live an active life. In India, despite being self-sufficient in food production, approximately 231 million out of 1.3 billion people remain undernourished (Vidal and Harrington, 2016). With India's population projected to reach 1.5 billion by 2025, food security is becoming an increasingly critical social issue. Byrnes and Bumb (2017) emphasize that food production must be significantly ramped up to keep pace with the growing population.

Ruel et al., (2017) points out that rapid population growth and urban migration have heightened the demand for food, shelter, water, and other essentials. By the early 21st century, more than half of the global population resides in urban areas, and uncontrolled urbanization often leads to issues such as poverty, malnutrition, social insecurity, and unemployment. According to Pillay and Kumar (2018), current food grain self-sufficiency may be unsustainable without developing agricultural systems that maintain and enhance soil fertility and productivity, incorporating more biological principles to ensure future food production. Intensive farming practices aimed at boosting food production have adverse environmental impacts, including soil erosion, salinity, and nutrient depletion. The Green Revolution, which led to over-exploitation of land and water resources, further exacerbated the problem by increasing the use of fertilizers and pesticides. This shift in cultivation methods has caused land degradation and water body contamination, particularly in hilly regions, due to the indiscriminate use of these chemicals. The reliance on synthetic fertilizers also reduces the nutritional quality of food and can lead to health issues for consumers, either immediately or

over time, necessitating consideration of non-toxic alternatives. The lasting environmental damage caused by these practices remains a significant concern (Hasnat et al., 2018).

According to Thiripurasundari and Divya (2014), growing awareness of the symbiotic relationship between health and environmental issues with agriculture has led to an increase in organic food production, which has also recently emerged as an attractive source of income. In an environmentally and socially responsible manner, organic products are grown without the use of inorganic fertilizers or pesticides. Organic farming tends to function at the grassroots level, maintains the soil's reproductive and regenerative ability, retains plant quality and sound soil management, and provides vital nutrients that are resistant to diseases.

Aguilera et al., (2015) project that organic farming aimed at producing organic food will help to reduce greenhouse gas emissions, in particular nitrogen oxide. Since no artificial nitrogen fertilizers are used, the depletion of nutrients and energy consumption is decreased by 30-70 per cent per unit of ground. It can also avoid the loss of nutrients and water through high organic matter content and soil cover, making the soil more prone to floods, droughts, and soil degradation. Organic farming practices reduce the pressure on soil, water, and biodiversity without reducing agricultural production and food nutritional value. The judicious use of organic manure-farm yard manure, compost, crop residues, and vermicompost obtained from biodegradable wastes can enhance production.

In developing countries, organic farming is regarded as a means to cut production costs by optimizing the use of farm resources and offering a sustainable livelihood for small landholders. The 2007 report from the Food and Agriculture Organization's Conference on Organic Agriculture and Food Security indicates that organic farming can enhance food security for medium and small-scale farmers in these areas. Organic farming is increasingly seen as a viable alternative to conventional methods, emerging as a replacement for chemical-intensive farming practices. It is valued for its promises of producing food without residues and maintaining soil and water free from contaminants (Setboonsarng and Gregorio, 2017).

The organic fraction of household wastes such as kitchen and food waste can be used as potential fertilizers for organic farming owing to their high level of organic matter and nutrients. The remarkable contribution of fertilizer prepared with household waste would gradually promote soil enrichment, good yield and sustainable farming practices; it also protects the environment from dumping of waste (Hajam et al., 2023; Kuligowski et al., 2023).

Growing awareness about the environmental and health risks linked to agrochemicals, coupled with consumer demand for safe and non-toxic food, has driven a global interest in alternative farming methods. Among these, organic farming stands out as a particularly eco-friendly approach. The demand for organic food is rising steadily in both developed and developing nations, with an average annual growth rate of 20-25% globally. Certified organic products are now produced in over 130 countries (Yadav, 2017).

Nanda and Berruti (2021) specify that a major part of Municipal Solid Waste consists of biodegradable waste. Out of 3,000 million tonnes of solid waste produced, more than 60 percent was decomposable. Biodegradable waste which is decomposable has its origin from plant and animal sources.

Waste management involves the treatment of solid waste and provides methods for recycling materials. Unfortunately, as society becomes more advanced, simple expedients are no longer sufficient. The waste becomes more complex, and it grows in volume at an alarming rate to the point when few people who explore around on the local dump can no longer make much of a contribution to the disposal of waste. To fully harness the material's potential, technology needs to be actively involved from the start. This effort necessitates mechanical handling systems, along with sorting, control, and processing mechanisms (Saha et al., 2017).

Waters (2020) assures that people living in houses should be encouraged to regenerate their waste at the source, that is separation of food waste and remaining waste. This process is followed in almost all the developed nations and a person not following this process is liable for his/her waste not being collected on that day. In this regard, the Honourable Supreme Court of India has also released guidelines mentioning the duty of every citizen to store/dispose of their waste separately into different garbage bins/bags. The concept of integrated waste management is to keep society clean and make India a nation practicing recycling by 2019 supported by the Swachh Bharat Abhiyan. The complete process of recycling waste not only saves the environment but also reduces the cost of fresh raw materials production, thus saving huge amounts of energy required in manufacturing raw materials.

According to Reno (2015), domestic waste encompasses household waste produced from everyday activities. Recycling of domestic and biodegradable waste, including plant materials, household refuse, and food scraps, helps decrease the volume of waste directed to landfills and is a rapidly expanding field. The compost produced from this process is a safe, sanitized, and humus-like substance that is rich in organic matter and free of unpleasant odors.

This compost results from the composting of segregated bio-waste. Bio-waste recycling is widely regarded as environmentally advantageous because allowing organic waste to decompose in landfills has detrimental effects on both the environment and the economy.

Ermolaev et al., (2019) states that composting does not only have agricultural benefits but also combats climate change. When plant and kitchen waste is shipped to landfill sites, it turns into carbon dioxide and methane, two of the most common greenhouse gases. Composting of plants locks up the carbon from the atmosphere for decades and when organic waste is composted, plant nutrients are made available and pathogens are destroyed (Brunton, 2018).

Composting is highly regarded as an effective method for soil enhancement, as it supplies stable organic matter that significantly improves the soil's physical, chemical, and biological characteristics, leading to better soil quality and increased crop yields. It is typically carried out in pits of various sizes and is commonly known as the "Coimbatore method". Vermicomposting, on the other hand, is a method used to safely dispose of organic waste by converting it into rich manure. In vermicomposting bins, red worms feed on food scraps, yard trimmings, and other organic composting materials. Large quantities of organic waste generated by neighbourhoods are collected by the corporation from restaurants, packing plants, cafeterias, and market waste, and then composted by shaping the organic waste into long rows called 'windrows composting (source: www.agritech.tnau.ac.in)

Barman et al., (2020) opine that vermicomposting is a biological process wherein earthworms coexist with microorganisms to convert organic waste into a valuable product. It is considered a low-cost and environmentally friendly waste treatment system. The end product of composting can have fertilizing benefits and acts as an excellent agent for soil conditioning. Additionally, it is odourless and moisture absorbent. Foods produced using these types of organic fertilizers are nutrient-rich, and their consumption can help improve nutritional status, especially micronutrient status, leading to increased productivity, growth, and survival of children, as well as a marked reduction in morbidity and mortality among mothers.

The environment is our heritage, a legacy of a pristine, mineral-rich, and resourceful world handed down by our ancestors. It is unethical to leave behind a polluted and degraded environment for future generations. It is our fundamental responsibility to preserve a healthy environment and pass it on as a legacy. Understanding the intricate connections between soil, plants, water, and microorganisms, as well as the broader relationships between plants and

animals, including humans, is essential. This comprehensive understanding underpins the principles of organic farming.

Agricultural sustainability is founded on the principle of meeting our present needs without compromising the ability of future generations to meet their own needs. Climate change exacerbates the challenges faced in rural areas, leading to reduced water availability, shorter growing seasons, more frequent extreme weather events, and production risks. Thus, achieving short-term economic benefits must be balanced with long-term stewardship of both natural and human resources.

For agriculture to be truly sustainable, social, economic, and environmental sustainability must be integrated. Currently, impoverished farmers are often forced to deplete natural resources like soil fertility to survive, which ultimately undermines their long-term livelihood. Societies need to promote more sustainable farming practices by developing policies that address social, environmental, and economic factors. The active engagement and involvement of the rural community is extremely important for the acceptability of effective organic farming training with a scientific understanding of every component of organic farming. Moreover, self-sufficiency in local food systems through organic farming could be encouraging in light of the global food crisis and rising food prices.

The current state of rural areas is one of economic, agricultural, and environmental decline. The development of sustainable agriculture offers a chance to reconsider the value of marginal and small farmers and rural communities. To build strong economies in rural areas, economic support strategies that support more diversified agricultural output on family farms are required.

Conservation and careful administration of the land, water, plant, animal, and atmospheric life support systems may be necessary to maintain ecological equilibrium. Land is the most crucial natural resource for economic expansion; a nation's economic well-being is mostly dependent on its land production. Land must supply all of the needs for food, energy, and other necessities. Land is therefore nature's most valuable asset. The growing human population is continuously polluting the valuable land.

Waste from home, agricultural, and industrial human activities is enormous. Tonnes of garbage are produced annually as a result of various human activities. Because of changes in

lifestyle and eating habits, the waste produced by these activities in more developed societies is more complicated and diverse. In recent years, these activities have increased the amount of garbage per capita and altered its quality. Additionally, they contribute to global warming and local pollution.

The yearly waste output has been seen to increase in proportion to the development in population and urbanisation, and challenges linked to disposal have become complex as more land is required for the final disposal of these solid wastes. At this period of limited land availability for human habitation, waste may soon compete for land space.

U.S. Environment Protection Agency (2012) has defined waste management as "Reducing the amount of material entering the waste stream by redesigning products or pattern of production or consumption". Waste management is a distinct practice which focuses on delaying the rate of consumption of natural resources. All waste material, whether they are solid, liquid, gaseous or radioactive fall within the limit of waste management (http://en.wikipedia.org/wiki/Waste_management).Sincethe accumulation of waste material is directly proportional to the growth of cities, it is high time that strong methods should be adopted for proper management of biodegradable waste to minimize the hazardous situation to the maximum extent. Hence, the evolution of an environmentally feasible household waste disposal method to manage the waste is an urgent task

Waste management refers to the many methods and processes of dealing with waste at every stage from generation through collection to final disposal. Waste needs to be managed in order to prevent contact with humans or their immediate environment. Therefore, the main purpose of waste management is to isolate waste from humans and the environment, and consequently, safeguard individual, family and community health. In addition, the aesthetic value of a better exterior and a clean physical environment is important for our emotional wellbeing (www.labspace.open.ac.uk, 2011).

The process of turning garbage into new products in a way that causes the original material to lose its identity and transform into a useful product is known as waste recycling. It should be understood that garbage is a valuable resource that may be recycled to create "wealth."

In recent years, farmers have expressed an interest in making organic manure by composting organic waste. Vermicomposting is becoming increasingly popular as a composting

technology. The use of earthworms not only reduces composting times, increases volume reduction, and improves the quality of the final decomposed product, but it also has social and environmental benefits such as farm waste recycling, better leisure utilisation, and the creation of employment opportunities for youth and additional income for women.

Domestic waste, comprising 30-40% of household waste, often overflows and becomes dirty, attracting street dogs and rag pickers. Most waste is biodegradable, causing issues with segregation and contamination of water tables and soil. Recycling, composting, and reusing reusable plastic waste can reduce waste, save time and money, and improve landscape and soil quality. Composting alone can reduce waste by 80%, making responsible citizens responsible for the environment.

Health encompasses physical, mental, and social well-being, not just disease absence. People are becoming more aware of health-related issues, such as food habits, due to harmful chemicals and the growing awareness of organic food consumption. Organic food is produced without conventional pesticides, chemical fertilizers, ionizing radiations, food additives, or genetically modified organisms, focusing on the entire production process.

An alarming rise in the environmental and health risks associated with the exploitation of chemical pesticides necessitates the utilization of alternative farming methods (Mendon et al., 2020). The usage of chemical fertilizers and pesticides may lead to various issues including, soil erosion, water scarcity, salinization, soil contamination, and genetic erosion (Kalyani, 2021). Often, it may end up with urban migration due to poverty, malnutrition, social insecurity, and unemployment (Ruel et al., 2017). Hence, organic farming practices could be adopted to promote the livelihood of the rural populations.

The research gap identified in this study revolves around training, awareness, and understanding among farmers regarding the preparation and utilization of organic waste as organic farming inputs. While various organic fertilizers, growth boosters, and pesticides are available, farmers often lack knowledge about their proper preparation methods and application techniques. This knowledge gap poses a significant hurdle to the widespread adoption of organic farming, which is essential for promoting sustainability and environmental conservation in agriculture. By addressing this research gap through the development and implementation of a comprehensive training and awareness programme on organic waste management practices. This study aims to empower the farmers with the necessary knowledge and skills to effectively utilize organic waste as inputs in their farming operations. Addressing this gap is essential for

encouraging the adoption of sustainable organic waste management practices and improving the resilience and productivity of farming systems. In addition, the conversion of household wastes into valuable organic fertilizers, growth boosters, and pesticides has reduced their cost input to maintain their lands and crops. Thus, in turn, it positively enhances the livelihood of the selected rural households.

Based on the available knowledge, the current study addresses the aforementioned issues in a novel way by providing a comprehensive training and awareness program to selected farmers to equip them with specialised techniques for integrating the conversion of household wastes into valuable organic fertilisers, growth boosters, and pesticides, thereby lowering their cost input to maintain their lands and crops. Encourage farmers to transition from inorganic to organic farming techniques with a zero expenditure.

Farmers are aware of the availability of organic waste, but they believed that transforming organic waste into organic fertilizers and pesticides was a challenging task. That must be eliminated from their minds, and they may recognize the significance of organic farming for agricultural and environmental sustainability. The new notion is how valuable natural resources may be when they are available for free—how to use natural resources in a beneficial way. This research was successful in raising awareness and influencing farmers' attitudes about organic farming. The next generation will consume chemical-free food, retain good health, keep the environment clean, and protect our younger future.

Many earlier research studies proved that organic farming was the best solution for agricultural and environmental sustainability. However, many rural farmers are still not aware of using their farm resources as organic fertilizer, boosters, and pesticides. Hence, the present study helps to fill the research gap regarding the requirement for awareness on organic waste management among rural households , which in turn improves their standard of living and leads to national prosperity. Therefore, the present study on "**Creating Awareness on Organic Waste Management Practices among Selected Rural Households"** is an attempt in this direction, involving farmers as change agents to foster desirable organic agricultural practices with the following general and specific objectives:

General objectives: to

- enhance the health of the people living in the selected rural areas.
- reduce environmental pollution and make rural areas clean.

- promote recycling and reuse of organic waste as organic farming inputs.
- generate employment opportunities for rural households by adopting cost-effective, eco-friendly and environmentally sound organic waste management practices.

Specific objectives include: to

- identify the farming practices and organic waste management practices of marginalized farmers, smallholders, and large farmers.
- analysing organic waste management that contributes to the provision of organic agricultural inputs
- identify differences in agricultural practices before and after awareness on organic waste management between marginal farmers, small farmers, and large farmers.
- analyse the impact of organic waste management on the knowledge, attitudes, acceptance, and opinions of adoption before and after the awareness between marginal farmers, small farmers, and large farmers.
- identify the economic impact before and after the awareness programmes between marginal farmers, small farmers, and large farmers.

Hypotheses framed for the study

Hypothesis 1: The average knowledge scores will not confirm any significant differences before and after the awareness programmes

Hypothesis 2: The average attitude scores will not prove any significant differences before and after the awareness programmes

Hypothesis 3 : Awareness programmes will significantly improve the acceptance to adopt organic waste management practices and organic farming

Study Limitations

1. During the block-level awareness programmes, the number of farmers was limited.
2. Transportation constraints limit field visits.

Inclusion criteria

Farmers who own agricultural land and also interested in organic waste management practices.

It is intended that this study would contribute to environmental protection, population health and well-being, and an improvement in the standard of life for rural families. It is critical to raise knowledge about the correct disposal of organic waste as organic farming inputs such as organic fertiliser, growth stimulants, and pesticides, which leads to resource recovery and economic potential.

At best, we believe that communities, families, and, most importantly, children will gain greatly.

"Air is the Guru, water, our Father and the great earth, our Mother."

- Julian Huxley, 1923

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