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THE IMPACT OF ORGANIC FARMING ON NATURAL RESOURCES

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Abstract

More and more people are starting to see organic farming as a viable option for long-term food security since it does not use synthetic fertilisers, pesticides, or genetically modified organisms. Soil, water, biodiversity, and energy consumption are just a few of the natural resource effects of organic farming that this article thoroughly examines. Soil fertility and health are the primary foci of this investigation into organic agricultural methods. Research shows that as compared to conventional farming, organic farming improves soil structure, decreases erosion, and increases soil organic matter accumulation. Soil microbial diversity and beneficial organisms are preserved through organic farming, which promotes long-term soil health, because synthetic pesticides and fertilisers are avoided. Next, we take a look at how organic farming impacts our water resources. By reducing nutrient runoff and pesticide leaching, organic farming techniques including crop rotation, cover cropping, and decreased tillage can help minimise water pollution, according to research. In addition, organic systems help save soil moisture and increase infiltration rates, which means better water retention and less watering needs. The next step is to look at how organic farming affects biodiversity. Insects, birds, and soil creatures that contribute to higher biodiversity can find a home on organic farms. Organic farmers don't use synthetic pesticides, which means less negative effects on non-target species and more pollinators—which are essential to the health of ecosystems and the pollination of crops. We conclude by talking about how organic farming affects energy use. However, on general, less energy is needed per unit area for organic farming. While there may be some energy savings by using less synthetic inputs and mechanical interventions, there may be issues with labour intensity and transportation that cancel out any benefits. Nevertheless, there are ways to decrease energy use even more, such as by integrating renewable energy sources and making biological systems more energy efficient.

keywords: *Organic, farming, natural*

Introduction:

A lot of people have been looking at organic farming as a viable alternative to conventional farming because it is better for the environment and can last longer. It is an all-encompassing method of growing food that aims to improve soil health and biodiversity while reducing negative environmental impacts. Conventional farming relies heavily on synthetic fertilisers, pesticides, and genetically modified organisms (GMOs), while organic farming prioritises natural and traditional agricultural practices. What happens to the available natural resources as a result of organic farming is a hotly debated topic. Organic farmers argue that their practices help conserve natural resources in many ways, including by reducing energy consumption, improving water quality, and preserving soil. Yet, sceptics have raised concerns about organic farming's efficiency and scalability, arguing that it cannot meet the global need for food without further depleting natural resources. Soil, water, and biodiversity are just a few of the natural resources that are examined in this research on the impacts of organic farming. Examining the scientific evidence supporting organic farming's environmental benefits, the

essay also considers the challenges and limitations associated with organic farming's widespread acceptance. Through a comprehensive evaluation of the numerous pros and cons of organic farming, this research aims to enhance comprehension of the function of organic farming in fostering sustainability and protecting natural resources.

Globally, the agriculture sector has been under growing pressure in recent years to address the negative effects of conventional farming methods on the environment. The degradation of soil, contamination of water sources, and extinction of species are all examples of these negative environmental effects. To address these issues, improve rural life, and ensure food security, organic farming has recently gained popularity.

One of the most crucial areas where organic farming has proven its worth is in soil conservation. Crop rotation, cover crops, and the use of compost and organic materials are some of the methods used in organic farming to maintain soil fertility and structure. These techniques have the potential to promote soil biodiversity, decrease erosion, and enhance water retention. There is evidence that organic farming techniques improve soil structure, microbial diversity, and soil organic matter levels compared to conventional agricultural methods. Several research have demonstrated these results.

Furthermore, by decreasing the need of synthetic fertilisers and pesticides, organic farming can improve water quality. While these pesticides are being used for agricultural, they might seep into streams and pollute groundwater. Organic farms employ water conservation measures such as mulching and drip irrigation to reduce water loss. In general, organic farms tend to consume less water. By decreasing fertiliser runoff and filtering contaminants, organic farming aids in the preservation of aquatic habitats and ecosystems. One way to achieve this goal is by promoting healthier soil ecosystems, which help to keep aquatic habitats safe.

More species richness and abundance have been found as a result of organic farming compared to conventional agriculture. All of this relates to how crucial biodiversity is. By preserving natural ecosystems both on and off farms and by reducing the use of chemical inputs, organic farming creates an ideal habitat for many different kinds of plants, insects, birds, and other animals. Organic farming is better for the environment because of this. Agricultural output relies on ecosystem services like as pollination and pest control, which are provided by this biodiversity, in addition to bolstering the stability and resilience of ecosystems.

Organic farming does have some good environmental impacts, but it isn't without its share of challenges and limitations. Some have raised concerns about organic farming's ability to meet the global need for food due to claims that its yields are sometimes lower than conventional agriculture. The transition to organic farming can also be more time-consuming and costly for farmers, especially when they don't have government incentives and support. There are concerns about the scalability and suitability of organic farming in some contexts, as it may not be suitable for all agroecological zones and agricultural systems.

Organic ethos

It is a systems approach to agricultural production that is aiming towards a production that is sustainable on all fronts: economically, socially, and ecologically. Organic agriculture is becoming increasingly popular. In accordance with the definition provided by the International Federation of Organic Agriculture Movements (IFOAM), organic agriculture is defined as "... an approach that is based upon a set of processes that results in a sustainable ecosystem, safe food, good nutrition, animal welfare, and social justice." Therefore, organic

production is more than just a method of production that either includes or excludes particular ingredients. (Anon., 2002b).

Organic agriculture is founded on a philosophy and a set of principles, the IFOAM principles being the most prominent example of this philosophy and set of standards. In this case:

- In order to manufacture sufficiently large amounts of food, fibre, and other items of a high grade
- To ensure that the entire production system is compatible with natural cycles and living systems, including the soil, plants, and animals that are involved in the entire process.
- To acknowledge the larger social and ecological impact that the organic production and processing system has on the environment.
- To preserve and improve the long-term fertility and biological activity of soils by the utilisation of locally adapted cultural, biological, and mechanical approaches, as opposed to relying on resources supplied by outside sources
- The utilisation of environmentally responsible production methods and the safeguarding of natural habitats for plants and animals in order to preserve and promote the natural and agricultural biodiversity that exists on the farm and in the surrounding communities.
- To guarantee the preservation and preservation of genetic variety by paying careful attention to the management of genetic resources on farms.
- The goal is to encourage the appropriate use of water and the conservation of all life that exists within it.
- To use renewable resources in manufacturing and processing systems to the greatest extent feasible, while avoiding pollution and waste products as much as possible
  In order to encourage manufacturing and distribution on a local and regional scale.
- To achieve a state of agricultural production and animal husbandry that is in perfect harmony with one another.
- In order to offer living conditions that enable animals to display the fundamental components of their intrinsic personalities and behaviours
- To make use of materials for packaging that are capable of biodegradation, recycling, and recycling.
- To ensure that all those involved in organic farming and processing have access to a quality of life that fulfils their fundamental requirements, while also providing a working environment that is safe, secure, and conducive to good health.
- To acknowledge the significance of indigenous knowledge and traditional agricultural practices, as well as to safeguard them and gain information from them;
- To provide assistance for the construction of a complete production, processing, and distribution chain that is both socially just and environmentally responsible

Traditional/Intensive Farming and Its Impact on the Natural World

Plants grown in industrial-scale monocultures are often connected with the use of modern, highly specialised agricultural technology. Soil water control, surface levelling, and the removal of woodlots, hedges, and field borders are all part of the massive agricultural landscape alteration that is required for this kind of farming. At now, this type of integrated landscape is the prevailing approach to agricultural management in several nations around the globe. The biodiversity in agricultural zones is significantly reduced due to the loss of natural

habitats for several plant and animal species brought about by the landscape disturbances mentioned earlier. Several studies have found that in well managed agricultural areas, the variety of wild plants, insects, and birds has declined dramatically. The natural equilibrium in agricultural ecosystems is disrupted when flora and fauna species are depleted, forcing farmers to utilise severe chemical control on their fields. Weeds and bugs flourish as a result. Unfortunately, the soil's life support system dies out since commonly used biocides are not selective. When there is a misalignment in the soil's natural microbiota makeup, harmful bacteria are able to flourish, which in turn leads to disease. The disturbance of soil biological processes is another mechanism that leads to organic matter loss. Under these circumstances, the only way to get the desired yields is to utilise massive amounts of synthetic fertilisers that are easily soluble in water, including nitrogen, potassium, and phosphorus. An overabundance of these makes their way into groundwater and then into bodies of water like lakes, rivers, and ponds, where they cause eutrophication, anoxia, and the gradual demise of aquatic life. The tremendous degradation of freshwater and marine ecosystems that is observed today on a global scale is closely tied to the enormous use of nitrogen and phosphorus fertilisers, which leads to eutrophication of freshwater and the formation of hypoxic zones in marine coastal waters. A strategy that promotes heavy reliance on mineral fertilisers for crop yields does not guarantee the long-term, sustainable development of agricultural output. The production of mineral fertilisers necessitates the utilisation of finite resources that cannot be restocked. Table 1 shows the most important environmental costs associated with synthetic NPK fertilisers and their massive worldwide consumption. Heavy agricultural machinery is used often in intensive farming, which leads to high fuel consumption and damages the soil's natural structure, making the land more prone to erosion. Soil biological activity, organic matter content, structural stability, erosion resistance, and yield per unit of applied fertiliser are all observed to decline as a result of intensive agricultural production practices. Several research have found evidence that supports this idea. The previously mentioned chemical pesticides are also likely to pose a serious threat to the natural world. This is because they pose a threat of accumulation in addition to being exceedingly toxic. Ground and surface water sources are contaminated by the leftovers left behind by many of these pollutants. Additionally, these remnants can collect in the tissues of living things, allowing them to reach the highest levels of the food web. They can also infiltrate the human body in this way. Organophosphorus pesticide metabolites were found in high concentrations in the urine of children whose diets included foods produced by intensive agricultural methods, commonly called conventional farming. Also, it was found that bugs, which have a short lifespan, develop a resistance to the chemicals used in pesticides quite quickly.

Table 1. Synthetic NPK fertilisers: their widespread usage and the key environmental issues

Category	Effects
Global use	The usage of synthetic nitrogen fertilisers has increased by 800% in the past 45 years. During the 2014–2015 harvest season, 183 million tonnes of NPK were used worldwide.
Environmental costs	Soil acidification, harm to soil fauna, loss of soil fertility, pollution of surface and groundwater's, depletion of nonrenewable N and P resources, biodiversity loss, greenhouse gas emissions from NPK fertilisers, acidification of soil, deterioration of freshwater and coastal ecosystems worldwide, and so on.

There is an immediate need to internalise these external costs connected with pesticide use in agriculture, since the author has described the detrimental impacts on health and the environment, as well as the significant financial expenditures linked with them. Chemical crop protection treatments would become unprofitable when these costs are added on top of them. Using genetic engineering techniques is one way ahead for agriculture, as mentioned before. The use of gene editing is becoming increasingly popular among scientists as a means to develop pest- and herbicide-resistant crop varieties that can survive in extreme conditions, yield large quantities of food even in areas with subpar soil and weather, and so on. The utilisation of these and related genetic changes is still controversial due to the lack of confidence around their possible environmental impacts. The results of studies that have sought to determine the impact of genetically modified foods on human health have been contradictory thus far. The development of herbicide resistance in crops has unquestionably resulted in an overuse of these chemicals, which has terrible consequences for human and environmental health.

More than 90% of the soybeans and maize farmed in the US now have herbicide tolerance issues. The genetic engineering of agricultural plants to withstand herbicides has led to weeds developing herbicide resistance. Another factor that adds fuel to the fire is the ethical and financial concerns raised by the cultivation of genetically modified plants. Farmers may be compelled to buy seeds from biotech companies on an ongoing basis if these companies are able to legally patent new transgenic plant varieties. Farmers who were earlier able to provide for themselves are now highly dependent on the seed price and other terms of cooperation set by biotech businesses as a result of the aforementioned processes. The environmental impact of agriculture should be assessed with some components of animal production. There are several drawbacks to the widespread practice of large-scale livestock husbandry that is prevalent today. Inadequate housing, excessive use of high-energy feed concentrate, and the use of synthetic feed additives to accelerate weight gain all contribute to poor animal welfare standards. Massive amounts of garbage that are difficult to control in a limited space also pose a significant hazard to the environment. When animals congregate in close quarters, the likelihood of disease transmission increases. Therefore, a characteristic of intensive animal production is the oversupply of veterinary drugs, particularly antibiotics used for prevention. For decades, these and other risks associated with agricultural intensification were overlooked in favour of short-term economic efficiency and yields. A growing number of individuals believe that farmers should prioritise meeting the needs of their communities rather than attempting to maximise food production while causing unnecessary harm to the environment.

In an effort to include them into, example, input pricing, there has been a recent upsurge in efforts to measure the health and environmental consequences of agricultural production as external costs. Pesticides are estimated to cost the American economy and environment almost $10 billion each year. Another $2.5 billion goes towards the cost of synthetic fertiliser overconsumption, and another $45 billion is due to the effects of soil deterioration. One big reason to be concerned is that modern agriculture uses a lot of energy and relies heavily on outside resources, such water, oil, and gas. According to estimations, intensive farming is believed to consume far more energy than it produces. More so, farming uses a lot of energy and releases greenhouse gases into the atmosphere simultaneously. It is well recognised that agriculture significantly contributes to biodiversity loss, environmental degradation from agrochemicals, and greenhouse gas emissions globally. Soil is undoubtedly one of the most valuable non-renewable resources on Earth. The use of arable land, which accounts for around 12% of the Earth's surface area, is at the root of most of these environmental problems, and each of these impacts is accompanied by significant economic losses. Industrialised agriculture was originally intended to ensure food security for all people on Earth. However, this tendency has backfired, making food even more scarce in many regions, especially in developing countries. A number of regions have

their food sovereignty severely curbed by international trade restrictions and food distribution and production systems, which in turn limits the food alternatives accessible to locals and slows their economic growth. One cannot help but question whether there is a way to enhance the existing system of intensive agriculture after reading about its consequences. Meeting the food demands of an anticipated growing population (with current projections placing it at 9-10 billion by 2050) while simultaneously protecting non-renewable resources and maintaining stable environmental values is the next big concern. Concerns like this prompted studies into alternative agricultural production techniques.

Organic farming as an alternative

The hunt for new environmentally friendly farming methods is being propelled by rising environmental consciousness about the harm that intensive farming causes. Among these options, organic farming is rapidly growing in favour throughout the globe. Organic farming as we know it now has its origins in the 1920s, when various forms developed in different countries. Following its repeal of Regulation No. 2092/91 and its entry into effect on 1 January 2009 (dated 28 June 2007), Council Regulation (EC) No. 834/2007 detailed the present organic farming principles in the EU. The particular requirements for its implementation are laid down in Commission Regulation 889/2008 on 5 September 2008. "Production includes an overall system of farm management and food production that combines best environmental practices, a high level of biodiversity, the preservation of natural resources, the application of high animal welfare standards and a production method in line with the preference of certain consumers for products produced using natural substances and processes," according to the current Regulation (EC) 834/2007 of the Council. Organically grown plants do not get chemical protection treatments such as herbicides, fungicides, insecticides, or synthetic growth regulators, as this is what this actually means. Rather, synthetic NPK fertilisers that are readily soluble are used for their cultivation. Soil fertility is greatly enhanced by organic farmers' use of green manure, varied crop rotation, and natural organic fertilisers. To prevent weeds and pests, people use mechanical and biological management methods. Because organic farms have a diverse landscape that includes woodlots, field margins, and ponds, they are able to withstand pest and plant invasions. This variety also helps to maintain the natural equilibrium of agricultural ecosystems. The practice of organic animal husbandry prioritises the health and happiness of animals by providing them with natural habitats, such as grass or open air, as well as high-quality food produced from organic components. A key component of breed selection is an animal's ability to adapt to a particular environment or climate. In organic farming and animal husbandry, the use of genetically modified organisms is absolutely forbidden. Certified organic farms are subjected to thorough inspections by credible certification authorities, and their products are branded accurately, so that consumers may be sure of the origin and production methods of organic foods. For these and other reasons, more and more farmers and consumers throughout the world are turning to organic agricultural products. Almost 2.3 million farmers in 172 of the 227 nations already engage in organic farming, a trend that is only expected to grow in popularity. Roughly 340,000 farmers throughout all 47 European nations are part of this. Organic farming encompasses more than 43.5 million hectares, which accounts for 27% of the global agriculture. Sales in the organic food industry now exceed 80 billion USD per year, making it one of the fastest growing industries overall. The organic farming industry has expanded at a rate of nearly four times since 1999. It may only make up 1% of farmland worldwide, but in certain EU countries—like Lichtenstein (30.9%), Austria (19.4%), Sweden (16.4%), Estonia (16.2%), Switzerland (12.7%), Latvia (11.2%), the Czech Republic (11.1%), and Italy (10.8%)—it makes up nearly 6% of farmland. Organic farming only occupies 4.3 percent of Poland's total arable land. When it comes to organic agricultural methods, there are two primary schools of thinking. One school of thought tries to

become self-sufficient by closing nutrient cycles inside the farm. The other school of thought is quite strict about following the requirements laid out by current inspection and certification systems.

Many farmers find that organic farming certificates help them financially, especially those whose produce goes beyond just the local market. Higher workloads and more costly inputs are compensated for by the higher price that these qualifications ensure. Many farmers in both developed and developing countries practise organic farming without obtaining official certification. The certification process is lengthy and intricate, which is why this is the case. However, they persist in cultivating their crops in line with the tenets of organic and ecological farming. These include, among other things: safeguarding biodiversity, promoting resilient food systems that can adapt to climate change, ensuring soil health and cleaner water, and food sovereignty (the independence of food chains from multinational corporations).

The environmental and social benefits of organic farming

According to the research that has been conducted, the use of organic farming techniques results in the enhancement of soil fertility and structure, the reduction of erosion and degradation, the preservation of biodiversity, and a greater degree of independence from external production inputs (i.e., sources of energy that do not replenish themselves). Each and every one of these characteristics of organic farming is beneficial to the development of sustainable practices and essential to the preservation of the natural resources of our planet. In general, organic farming techniques are better for the environment than conventional farming practices, according to recent meta-analyses and extensive reviews of the relevant research. According to the findings of a number of studies, the implementation of production methods that correspond to the principles of organic farming results in improvements in soil carbon, soil quality, and erosion prevention. As a further point of interest, as compared to conventional farms, organic farms exhibit a far greater variety of landscapes, animals (including pollinators, soil fauna, and birds), and soil bacteria. According to the findings of a study that collated data from eight different European countries, the usual application of pesticides and fungicides in agricultural settings leads to a reduction in the biodiversity of agricultural regions. Additionally, the use of pesticides makes biological approaches to pest management less effective than they would otherwise be. A further benefit of organic farming is that it does not contribute to the pollution of surface and subsurface water sources with dangerous chemicals. This is because organic farming does not permit the use of synthetic pesticides. The amount of nitrogen and phosphorus leaching as well as greenhouse gas emissions that are produced by organic farming are significantly lower per unit of land compared to those that are produced by conventional agriculture. This difference is scientifically supported. The effect that is described is less apparent or even opposite, per unit of output, in organic farming. This is because the yields in both systems are far larger than in conventional farming. In spite of this, it is important to point out that crop yields in organic farming are frequently equivalent to those in conventional agriculture, and in certain circumstances, such as drought, they are even greater. When compared to conventional farming practices, organic farming techniques often require less energy per acre and result in the production of a greater quantity of food. Organic farming is associated with reduced emissions of greenhouse gases (GHG) and improved soil carbon storage. This is because organic farming requires less energy to produce and has a higher organic matter content in soils that are the result of ecological farming. As a consequence of this, it has the potential to be regarded as a sensible alternative to intensive agricultural techniques in the context of the battle against climate change. Comparative analysis of organic farming versus conventional farming, focusing on the most important characteristics, objectives, and effects of each. There is a possibility that the environmental and ecological benefits of transitioning from industrial intensive farming to organic farming may be assessed in terms of money. This is something that

should be taken into consideration. Due to the fact that global economic balance sheets often neglect the external (i.e., environmental) costs and benefits (such as ecosystem services) involved with farming, the potential of organic agriculture is hindered.

Limitations for the development of the organic sector

Due to the fact that the organic business is still relatively new, it does not receive adequate support in many nations, including Poland. The internal market in this sector is marked by a poor organisation, which is typified by the absence of a manufacturing, processing, and distribution chain that operates appropriately. This sector will be discussed more in the following paragraphs. There are a number of possible sources of additional constraints, including the legislative and administrative obstacles that are linked with organic certification, the relatively low income of customers, and the underinvestment of initiatives that are aimed towards the development of ecological consciousness among consumers. Consequently, as a consequence of all of this, the products that come from organic farms are usually advertised on the market as conventional things, and they are not sold at a premium price. On top of that, a tiny number of clients who are interested in organic foods acquire niche items at high prices, which results in the generation of income for distributors and wholesalers rather than for farmers. It is abundantly obvious that the circumstance that was stated before is a considerable obstacle to the expansion of the organic business.

Soil Quality

For further information, see Principles and Practices of Soil Resource Conservation. Agricultural land consumption and the intensification of farming techniques pose serious threats to soil degradation globally. Agricultural management influences soil microbial communities, erosion, nutrients, and physical properties, all of which can have far-reaching consequences for human society. Organic farmers control the amount of organic matter and carbon in the soil by using organic fertilisers (such compost, manure, or slurry), mulches made of crop wastes, and crop rotations that incorporate legumes that fix nitrogen (N) into the soil. This stands in stark contrast to the intensive, nonorganic farming practices that rely on mineral fertilisers. Soil carbon stocks and organic matter are both higher in organically farmed soils than in non-organically farmed ones. A large amount of evidence supports this. Organically managed fields often get higher rates of carbon input from the environment, and diverse crop rotations are more common in organic farming than in conventional farming, both of which contribute to these results. Marriott and Wander (2006) state that soil carbon content can be significantly higher in soils that are organically maintained. It makes no difference whether manure is applied to organic fields or not, or whether manure is applied to both types of fields over long periods of time. Nitrogen content and microbiological traits (biomass and activity) are both improved by organic farming as compared to conventional farming. Conversely, the availability of phosphorus (P) and potassium (K) is less consistently affected by organic farming. Soils used for farming must have certain physical properties, the most important of which are aggregate stability, water-holding capacity, and bulk density. Soil structure and nutrient leaching are both aided by these features; for further details, refer to the "Ground and Surface Water" section. For example, because earthworm activity is normally higher on organic farms, soil physical quality is generally higher as well. This is one reason why organic farming practices tend to reduce soil erosion compared to conventional farming methods. The risk of excessive soil erosion in organic agriculture due to lower crop plant densities may be exacerbated by a rise in arable weeds and their competition with crop plants. This is because organic farming practices involve fewer plants per acre.

Conclusion:

In conclusion, organic farming is foundational to promoting sustainable agriculture and preserving our natural resources for the advantage of subsequent generations. Adopting organic principles and practices allows us to create food systems that are robust, egalitarian, inclusive, and environmentally responsible. Organic farming offers a more responsible and sustainable way ahead at a time when we are trying to find answers to the pressing issues of food poverty, climate change, and biodiversity loss. The organic farming technique prioritises the protection of natural resources and the environment, making it a sustainable approach to agricultural production. Through the use of techniques like crop rotation, organic fertilisation, and habitat protection, organic farming has the potential to improve water quality, soil health, and biodiversity preservation. Organic farming has many advantages, but it also comes with certain drawbacks, such as lower yields, greater production costs, and limited scalability in some situations. These difficulties are not insignificant. Although organic farming does have its share of challenges, the data shows that the environmental advantages much outweigh these issues. Organic farming practices help mitigate the environmental damage caused by conventional farming by increasing biodiversity, decreasing chemical inputs, and promoting healthier soil ecosystems. In addition to meeting customer demand for sustainably grown food, organic farming also offers farmers in some niche markets a chance to make a living.

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