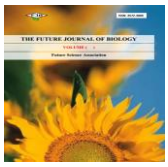

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Organic Farming for Clean and Sustainable Environment

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Abstract: The widespread use of synthetic fertilizers in contemporary agriculture has undoubtedly increased crop productivity, yet has simultaneously led to a variety of agronomic, environmental, and ecosystem health challenges. The ongoing buildup of residues of agrochemicals in food crops, along with structural degradation of the soil, microbiota, and water bodies, attests to the unsustainability of conventional input-centered approaches. This article critically reviews the organic agriculture paradigm as a scientifically validated and eco-sustainable alternative. Special focus is given to the core principles dictating organic production systems, classification and agronomic potentiality of different organic fertilizer materials, and relative environmental footprint versus conventional methods. In addition, the article consolidates existing information pertaining to the development and implementation of organic farming in the Arab world, set in context relative to international trends in order to situate regional achievement and constraints. Specific attention is aimed at the contribution of organic systems to fostering agroecological balance, maximizing biodiversity, and countering anthropogenically driven causes of environmental degradation. The article further reviews shifting attitudes among consumers, highlighting the sociocultural and health-related rationales underpinning the growing demand for organically grown produce. Evidence supports the conclusion that organic agriculture promotes the production of quality food richer in nutrients and free from toxic contaminants, at the same time as advancing environmental stewardship goals. Through the promotion of soil fertility, reducing reliance on extraneous chemical inputs, and fostering ecosystem resilience, organic agriculture is presented as a viable tactic toward long-term sustainability in food production. The results set out herein urge further propagation of organic practice within national and international agriculture development strategies, marrying agronomic outputs to environmental integrity and health imperatives of the people.

Key words: Sustainable, Organic farming, Environment, Biofertilizer, Reduces pollution.

1. Introduction

In recent years, there has been an increase in warnings about the dangers of the widespread use of chemical compounds in agricultural production, both for animals and plants. It has become clear that these compounds can accumulate in the human body, causing toxic effects on living organisms. Compounds such as nitrates, nitrites, and phosphates are particularly concerning due to their accumulation in plants and agricultural media **(Muhammad *et al*., 2016)** .

One of the most significant harms caused by chemical fertilizers to humans and the environment is the risk of cancerous diseases. This risk is linked to the use of nitrogenous fertilizers, as nitrates in the human intestines convert into nitrites, which are cancer-causing substances. Diets high in nitrates have been associated with endogenous nitrate formation, which can lead to various health issues such as hypothyroid conditions, different types of cancers, neural tube defects, and diabetes **(Ahmed *et al*., 2017)**.

Though chemical fertilizers, particularly nitrogenous ones, have been instrumental in enhancing farm production and meeting food security needs – most notably through programs like the Green Revolution – their extensive application is having far-reaching and seldom acknowledged impacts. Studies reveal there is a close correlation between the build-up of nitrate from these fertilizers in crops and groundwater and serious risks to human health. In the human body, nitrates are reduced to nitrites, recognized carcinogens linked with several cancers, neural tube defects, diabetes, and ailments such as methemoglobinemia ("Blue Baby Syndrome") in infants. In addition, the environmental impact is immense, leading to groundwater pollution, eutrophication, greenhouse emissions, and soil deterioration. Notably, the gain from increased production is offset by the heavy disease burden of communicable and non-communicable diseases caused from the use of fertilizers, in addition to concerns of global food inequality in which large percentages of fertilized produce turn into livestock feed **(Khan, Mahapara *et al*., 2022, (Sharma & Singhvi, 2017) and (Kesarwani *et al*., 2024).**

Recent studies have shown the benefits of using organic fertilizers in modern agriculture. The application of humic acids and cultivation at a depth of 15 cm has been found to improve the growth of saffron plants in terms of rooted plants, growth, leaves, plant length, flowers, and wet and dry weight **(Kasouha *et al*., 2014)**. Additionally, the use of organic fertilizers such as humic acid has been shown to increase vegetative growth, improve yield in potato varieties **(Al-zubaidi, 2018)**.

In another study conducted to determine the effects of organic and inorganic fertilization and mulching in lehana growth, using hybrid F1 Atlas 70 seeds from Sacleta, a Japanese company, researchers proved that a combined effect of organic fertilizers and black polyethylene mulching significantly increased lehana production **(Fergana and Tamanna, 2019)**. Additionally, organic fertilizers are applied to fruit orchards by spreading them on the soil surface or placing them in trenches near trees. The study noticed that spreading organic matter around tree trunks and plowing into the soil is the most effective method. The study indicated that fertilization methods and types of fertilizers have a significant impact on the quantity and quality of agricultural crops, including olive trees and the potato crop **(Yusra, 2021)**.

With the growing demand for healthy food and the desire for security free of pesticides and chemical fertilizers, many developed countries are shifting towards organic agriculture. In Iraq, we are also aiming to promote organic agriculture and support the organic farming movement. To further this goal, we conducted theoretical research to understand organic fertilizers, their environmental significance and their role in maintaining biological balance. Our aim is to serve the Iraqi people and their environment by embracing organic practices.

The concept of organic farming and organic fertilizers

Organic agriculture does not have a single, universally accepted definition due to variations in regulatory regimes, scientific perspectives, and socio-environmental contexts. One common description characterizes it as an agricultural paradigm that prioritizes ecosystem management over the use of synthetic external inputs. This approach involves a comprehensive evaluation of potential ecological and socio-economic impacts, focusing on the exclusion of industrial fertilizers, synthetic pesticides, pharmaceutical veterinary agents, genetically modified organisms (GMOs), artificial additives, and ionizing radiation. Instead of relying on these external inputs, organic agriculture incorporates unique agronomic practices tailored to specific locations, aiming to improve soil biotic activity, nutrient cycling, and plant resistance to various stresses. The ultimate goal of this approach is to maintain and enhance soil fertility while implementing preventive measures to minimize pest and disease pressures, creating a self-sustaining and ecologically balanced production system **(Varma *et al*., 2024); (Akanmu *et al*., 2023); (Mohan *et al*., 2024) and (Suleiman and Abdel-Gawad, 2018)**.

Organic farming is a method of land management in agriculture that strictly regulates the use of chemical fertilizers and pesticides. The main objectives of organic production include producing crops free from residues of synthetic chemicals, adopting environmentally friendly farming practices that exclude synthetic fertilizers, and implementing production methods that promote the renewal and maintenance of soil fertility **(Kulthum & Hani, 2021)**. Organic fertilizers are made up of soil-amending materials containing organic matter such as partially decomposed or fully decomposed plant residues, animal matter, and various biological waste products. This type of soil structure supports microbial populations and has a high decomposition rate, allowing plant roots and leaves to decompose and contribute to the soil's humus content. The resulting soil humus is long-lasting and enhances soil quality and overall farm sustainability **(Yusra, 2021)**.

Principles of organic farming

To realize and appreciate organic agriculture, the International Federation of Organic Agricultural Movements (IFOAM) has outlined four fundamental principles to guide organic farming. These principles serve as a framework to maximize environmental interactions and support sustainable and secure agriculture. The principles are as follows: a) The Precautionary Principle: Organic agriculture requires a forward-looking and ethical approach, focusing on ecosystem integrity, as well as the health and welfare of present and future generations. Preventive action must be a priority in farm management to reduce risks to human and environmental health. b) The Principle of Equity: Organic agriculture practices must ensure a fair distribution of natural resources, providing equal access to water, land, and environmental services. This principle emphasizes the importance of justice in environmental stewardship and social responsibility. c) The Principle of Ecological Balance: Organic farming should be designed to support natural biological processes and ecosystem functions, aligning farm activities with nature's rhythms to promote biodiversity, soil fertility, and minimize environmental disruption and d) The Holistic Health Principle: Organic farming should sustain and enhance every interdependent component in the agroecosystem, including soil microbiota, plant health, animal health, and human health. By considering these elements as a system, organic agriculture promotes long-term ecosystem resilience and sustainability **(Kulthum and Hani, 2021 and Zannatul *et al*., 2020)**.

The reality of organic agriculture in the world and Arab countries

Organic agriculture in most countries in the Arab world is still in its early stages. Despite significant growth in organic agriculture in some countries worldwide, there has been remarkable development in certain Arab countries such as the Hashemite Kingdom of Jordan and the Lebanese Republic.

Fig. (1). IFOAM's Principles for Organic Agriculture Farming (Manida and Nedumaran, 2021)

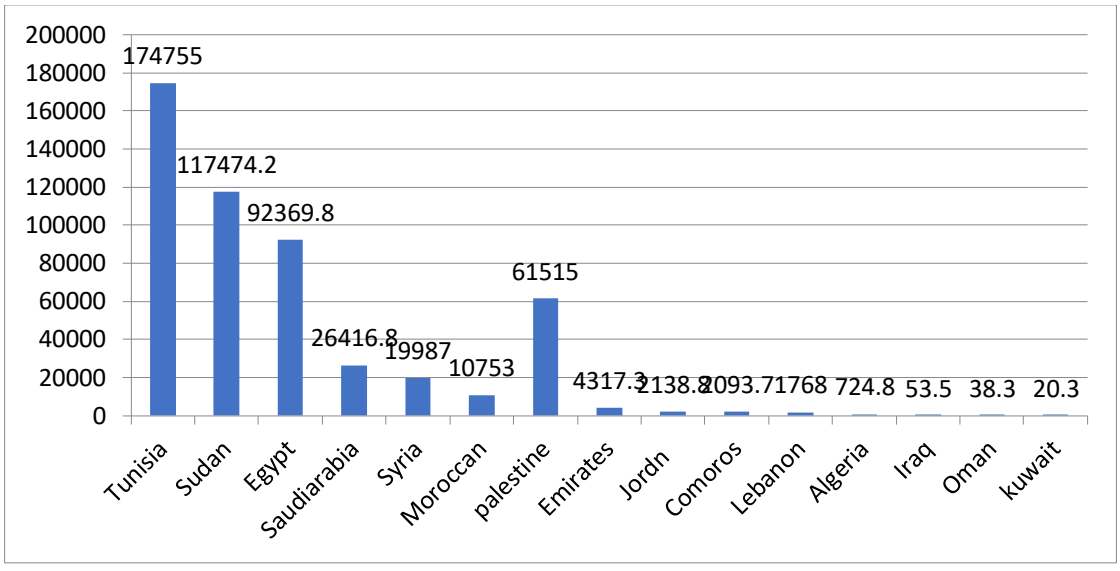

Fig. (2). Shows the organic agricultural area in Arab countries from 2012 to 2017, measured in thousand hectares (Kulthum and Hani, 2021). It specifically emphasizes Iraq's participation in organic agriculture, with an area of 53.5 thousand hectares. Our objective is to increase this area by educating and training Iraqi farmers in the practices of organic agriculture, implementing laws and regulations for organic production, and promoting a clean and sustainable environment.

The goals of organic farming

Organic agriculture has several important goals, including: Producing food that is free of chemicals, developing and implementing modern environmental methods as alternatives to chemical fertilizers and applying production techniques that help restore and preserve soil fertility **(Al-Zahir 2015 and Varma *et al*., 2024)**

Benefits of organic farming

Benefits of organic farming include increasing crop yield and enhancing soil quality in the long term, ensuring the availability of healthy food free from chemical additives, decreasing environmental pollution, being more cost-effective, preserving animal health, thereby reducing health risks to humans, improving soil biodiversity, enhancing the soil's ability to retain irrigation water, creating job opportunities for farmers, and decreasing reliance on non-renewable energy sources and synthetic materials. Ultimately, organic farming can help mitigate global warming (**Majhi, 2024), (Tiwari, 2023) and (Grady, 2015)**.

Organic logo

The local or national organic logo of your country is used for marketing purposes and to differentiate certified organic products from traditional ones. Specific standards regarding size, colors, shape, and other technical specifications are considered. **Al-Dakhiri (2020)** provides examples showcasing the local or national logos of some Arab countries.

Fig. (3). Different organic logos

Sources of organic fertilizers

Enhancing farm production and ensuring long-term sustainability fundamentally rely on effective management of water and soil resources, as well as the planned utilization of organic residues. Organic matter plays a crucial role in improving soil structure, chemical properties, and biological processes, ultimately impacting crop performance. Regular application of organic inputs not only boosts soil fertility but also increases resistance to environmental stresses, thus contributing to long-term farm

productivity. To fully maximize the benefits of organic waste, it is crucial to understand the sources of this waste and their specific characteristics. These organic wastes can be broadly categorized into three main groups:

1-Residues of agricultural crops

Several agronomic crops such as Gossypium spp. (cotton), Zea mays (maize), Sorghum bicolor (sorghum), Glycine max (soybean), Oryza sativa (rice), Saccharum officinarum (sugarcane), Beta vulgaris (sugar beet), Linum usitatissimum (flax), Hordeum vulgare (barley), Helianthus annuus (sunflower), Sesamum indicum (sesame), Lupinus spp. (lupine), Vicia faba (fava bean), Lens culinaris (lentil), Cicer arietinum (chickpea), and Trigonella foenum-graecum (fenugreek) have value beyond direct production. Residual biomass from vegetable cultivation, processing by-products, and surplus materials generated during the industrial transformation of single commodities offer vast opportunities for reutilization. Additionally, orchard management and planned pruning of fruit-bearing trees and Arecaceae (palms) species serve as a vital source for further utilization **(Jena, 2022)**.

2- Animal Wastes

Animal waste refers to the dung and urine of cows mixed with soil used as bedding for the animals. In addition to cows, sheep, goats, camels and other farm animals are also a source of organic waste **(Singh and Rashid. 2017)**.

3-Residues of agricultural processing

It includes the remnants of organic industries and foodstuffs, such as the remnants of sugar cane and beet factories, starch and glucose industries, wheat mills, rice whitening, and the oil industry with resulting residues like cotton seed, sunflower corn, soybeans, and residuals used in animal feed.

Other wastes come from the food industry, produced during the preparation of juices, soft drinks, canning and freezing vegetables and fruits. On average, waste amounts to about 25% for vegetables and 40% for fruits. The food industry generates an estimated 4.7 million tons of waste annually, consisting of peels, seeds and dregs. This waste has high moisture content and can be used as animal feed directly or after drying. It can also be composted under aerobic conditions to create compost. Additionally, organic wastes include slaughterhouse byproducts like blood and bones, poultry wastes, mixed residues and feathers, and waste from fish processing and cleaning factories.

Types of organic fertilizers

Organic fertilizers are derived from various sources, including plant residues, animal by-products, and industrial wastes. They can be in solid or liquid form, fresh or decomposed. The application of organic fertilizers varies depending on the type of plant, with the rate and method of application determined by factors such as crop type, soil type, environmental conditions, and the solid-to-liquid ratio in the fertilizer mix.

Liquid organic fertilizers, which contain bioactive compounds like humic and fulvic acids, amino acids, and other organic matter, have become increasingly popular. These fertilizers are praised for being cost-effective, easy to apply, and environmentally friendly. They are known to improve soil physical, chemical, and biological properties, ultimately enhancing plant growth and production. The application rate of organic fertilizers depends on soil texture and fertility, plant type and variety, plant growth stage, and environmental conditions.

1-Plant organic fertilizers

Industrial plant byproducts such as sesame, cotton, and castor seed meal contain nitrogen in concentrations ranging from 5.6% to 7%. A prime example of their utilization is compost, a biodegradable organic fertilizer consisting of plant-derived residues, primarily hay (a carbon source), and organic waste from domestic and animal sources. This waste includes citrus peels, eggshells, rejected leafy green vegetables, banana peels, and potato peels, which are crushed or cut into smaller forms to accelerate decomposition and systematically stacked. Livestock dung from cattle, goats, or rabbits, mixed with water, is added to the mix and placed in a controlled environment for a minimum of

three weeks to allow microbial activity to create compost as a rich organic fertilizer **(H *et al*., 2019), (Santos *et al*., 2018) and (Feitosa *et al*., 2022)**.

Compost shares all the characteristics of peat moss, except that it may be contaminated, especially when derived from animal sources. It may also have an unpleasant smell, but it is richer in plant nutrients compared to peat moss. The nutrient content of compost depends on its components, with plant-based compost being cleaner and more expensive **(Bhunia *et al*., 2021) and (Isaka *et al*., 2021)**.

Fig. (4). shows organic household waste

2- Animal organic fertilizers

Animal waste such as dried blood, horse, cattle, sheep and bird waste, contains nitrogen levels ranging from 5-14%. Straw and other bedding materials are examples of this:

1 - Municipal fertilizer

The municipal fertilizer sourced from animals does not need a specific definition. It is heavily contaminated with unwanted microbes and weeds and may contain parasites like worms and insects. Therefore, it is not used in its pure state as shown in Fig. 5.

Fig. (5). Cow dung is an abundant source of organic matter Rayan and Muhammad (2010)

2- Bird feathers

Bird feathers are a valuable source of nitrogen that can be combined with slow-decomposing materials like sawdust to enhance the speed and efficiency of decomposition **(Gao *et al*., 2014 and Yusra, 2021).**

3- Green fertilizers

Green fertilizers are plants belonging to the legume family, such as alfalfa, and the cruciferous or falciform families. They improve the natural properties of the soil and are used in sandy, light and yellow soils. They are an important source of nutrients like nitrogen and create a suitable medium for the growth and activity of beneficial organisms in the soil. This type of fertilizer is often used without fermentation, increasing CO_2 levels in the soil to facilitate nutrient absorption. This system relies on crops that enrich the soil with various nutrients, especially nitrogen, known as green manure **(Mahey *et al*., 2024)**.

4- Biofertilizers

Biofertilizers are formulations containing microbes that help plants absorb nutrients from natural sources and reduce the need for synthetic chemical fertilizers. These fertilizers release nutrients continuously, promoting plant growth. Biofertilizers are created by isolating, purifying, and characterizing various microorganisms like bacteria, fungi, and algae **(Santhoshkumar *et al*., 2017 and Soni *et al*., 2022)**.

They can be applied by mixing with seeds before planting, immersing seedling roots, or adding directly to the soil near growing plants. Biofertilizers can reduce chemical fertilizer use by at least 25% and decrease environmental pollution. Microbial inoculation with seeds and bacteria helps maintain soil health, while biofertilizers compensate for nutrient deficiencies and support sustainable agriculture. Mycorrhizal fungi also enhance the release of growth regulators like auxins, gibberellins, and cytokinins, stimulating root hair growth **(Tarabulsi *et al*., 2024)**.

Types of biofertilizers

1- Nitrogen fixers

Nitrogen-fixing biofertilizers vary depending on the crop being cultivated. Rhizobial inoculants are primarily used on leguminous crops, while Azotobacter and Azospirillum are preferred for non-leguminous crops. Acetobacter is commonly used in sugarcane production, and blue-green algae and Azolla are used in lowland rice production **(Daniel *et al*., 2022)**.

2- Microorganisms

Microorganisms help facilitate soil phosphate for plants **(Yusra, 2021)**.

3- Seaweed extract

Sea weed extracts, natural organic degradable substances, are derived from sea algae **(Singh *et al*., 2025)**. There are more than 20,000 species of marine plants worldwide. Some products obtained from seaweeds include Agar, Alginic acid, Carrageenan (extracted from red seaweeds like Gigartinaceae, Soliriaceae, and Hypneaceae), mannitol (from brown algae), Liquid Seaweed Fertilizer (LSF), and animal feed. These compounds may enhance plant immunity and protect it from various environmental and biological stresses **(Mughunth *et al*., 2024)**.

4- Organic liquid fertilizers

Organic liquid fertilizers contain a wide range of biologically derived compounds such as fulvic and humic acids, amino acids, and numerous other organic compounds. They have been widely accepted for their efficiency in enhancing soil fertility and crop production **(Alalaf 2023)**.

The effect of organic fertilizers on the environment and living organisms

Organic fertilization is a key strategy developed by experts to improve soil fertility and nutritional status while reducing environmental pollution caused by heavy use of mineral fertilizers. Providing a balanced amount of nutrients is crucial for sustaining optimal plant growth and meeting production demands at different growth stages. Extensive research has been conducted on organic fertilizers as a way to promote ecological sustainability, enhance biodiversity, and preserve food chain integrity.

Effect on the plant

One study conducted at the Agricultural Scientific Research Center in Homs Governorate aimed to determine the optimal planting depth and different organic acids for enhancing the growth and productivity of saffron plants. Four treatments were used, including amino acids, humic acids, a mixture of both, and a control treatment. Additionally, three planting depths of 10,15 and 20 cm were tested. The results showed that treating the soil with organic acids and planting at a depth of 15 cm led to improved vegetative growth of the saffron plant including increased percentage of rooted plants, number of growths, number of leaves, length of the plant, number of flowers, and wet and dry weight of the stigmas **(Kasouha *et al.*, 2014)**.

Another study focused on the role of organic farming in the growth and development of cucumber plants. Organic matter was used in the protected cultivation system at the Agricultural Research Station of the Ministry of Science and Technology in Baghdad. Corn grains (Corn Cob) were mixed at varying percentages of 0, 1, 2, 5, 10, and 20% with 30 cm of soil based on weight and sector design.

The results of the completely randomized study indicated that the 20% organic matter level significantly increased the relative total yield by more than three times compared to the relative early yield. A decrease in nitrate, ammonium, and free phosphate levels in cucumber fruits was recorded, along with lower concentrations of potassium, copper, zinc, and manganese in the fruits after 175 days of cultivation. Levels below 20% of organic matter showed similar trends **(Muhammad *et al.*, 2016)**.

Another study was conducted at Iraq Technical College, Al-Musabab, Babylon, to examine the impact of humic acid on the growth and yield of three potato cultivars (Elmumdo, Rodolph, Rivera). Potato tubers were planted in 40 cm diameter bags filled with sand and NPK compound fertilizer. Humic acid was applied at concentrations of 0, 1.5, 2, and 2.5 ml/L, sprayed twice: first after 30 days and then after 35 days. The study revealed that humic acid at a concentration of 2 ml/L, sprayed at the second application after 35 days of planting, significantly improved the quality and yield of potato varieties (AL-zubaidi, 2018). Researchers explored the effect of organic fertilization with humic acid and plant growth regulator naphthalene acetic acid (NAA) on various growth traits in Baashiqi variety olive seedlings (*Olea europaea* L.). The experiment was performed in a randomized complete block design with two principal factors: organic fertilization with humic acid, with a weight proportion of 3% fulvic acid and 97% organic matter, applied in three concentrations (0, 1000, and 2000).

The study confirmed a significant increase in vegetative and root growth when fertilized with humic acid, especially at a concentration of 100 mg/liter. Additionally, substantial growth stimulation was observed following application of naphthalene acetic acid, with the greatest increase seen at a concentration of 1000 mg/L **(Hussein *et al.*, 2018)**.

In a recent research, Wen *et al.* (2024) explored how organic, chemical, and integrated fertilizers influenced microbial communities in highly acidic greenhouse soils where tomatoes are grown. Experimental analysis demonstrated how organic compost alone significantly enhanced microbial diversity as well as microbial stability through an increase in beneficial bacterial as well as fungal taxa abundance. Organic treatment also enhanced microbial network complexity and connectivity, leading to higher soil health, resilience under acidic conditions. These findings highlight organic fertilizer's potential for soil restorations as well as sustainable farming under unfavorable environments **(Zhou, Shishang, *et al*, 2024)**. In another study, Ajeel (2018) investigated the effects of various concentrations of liquid organic fertilizers and chemical fertilizer NPK on vegetative growth, flowering characteristics, and bulb production in the Tulip Upstar variety. The study was conducted in a wire house at the College of Agriculture and Forestry, University of Mosul. The experiment included three levels of organic and chemical fertilizers (0, 1, 2 ml/L). The study found significant improvements in flowering and bulb yield characteristics after treatment with a concentration of 2 ml/Lof Foli Artal fertilizer **(Ajeel, 2018)**.

An experiment was conducted at the horticultural station of the University of Bangladesh during the 2016/2017 season to study the effects of organic fertilizer, inorganic fertilizer, and mulching on the growth and yield of lahana. The study utilized seeds of the F_1 hybrid Atlas 70 from the Japanese company Sakata. The experiment involved the use of a mixture of organic and inorganic fertilizer as the first factor and mulching as the second factor, with four treatments (comparison, mulching with rose

hips, mulching with rice straw, mulching with black polyethylene). The growth and yield of the Lahana plant were observed **(Farjana, 2019)**.

According to another source, an olive grove requires 3 to 5 tons of fermented organic fertilizer, 10 kg of phosphorus and 15 kg of potassium per hectare. Additionally, a potato crop also needs 30 to 40 tons of animal organic fertilizer per hectare. These are essential factors for increasing the yield and quality of potato production **(Yusra 2021)**. Organic fertilization and melatonin also improve the growth of lettuce plants in water-deficient conditions **(Helmy *et al*., 2024)**.

The effect of organic fertilizers on the soil and its microorganisms

In a field experiment in the Dujaila region of Wasit Governorate, Iraq, the role of organic waste in reducing the effects of irrigation water salinity on the growth of maize (*Zea mays* L.) cultivar Rabia was demonstrated. The results showed that adding organic waste at levels of 20 or 40 tons per hectare reduced the negative impact of tap water, improved soil properties and increased plant growth and yield to levels equal to or better than when using river water without organic waste. This was especially clear when using fermented poultry offal and fermented beef offal **(Abdul Karim and Hussein, 2017)**.

One study compared the long-term effects of organic and chemical fertilizers on tea leaves and soil parameters in tea plantations. The study indicated a decrease in concentrations of lead, cadmium, and copper in the root region when organic fertilizers were applied, along with a decrease in these heavy metal concentrations and acidity in tea leaves. Organic fertilizers also increased amino acid concentration in tea, increased soil pH, and increased numbers of beneficial bacteria such as Acidobacteria and Nitrospirales in the rhizosphere. The researchers concluded that organic fertilizers enhance microbiome structure and recruit useful bacteria in the root region, thus enhancing tea quality and reducing heavy metal concentrations in tea leaves and soil **(Lin *et al*., 2019 and Ye *et al*., 2020)**.

Organic fertilizers exert a significant impact on microbial processes, which result in N_2O emissions, enhance soil carbon sequestration, and contribute to reducing climate change. Utilization of organic fertilizers provides a sustainable approach to recycling nutrients to promote long-term ecosystem balance **(Lazcano *et al*., 2021)**.

Another source mentioned that compost has environmental benefits, including: a) Identifying and reducing soil erosion, b) Stabilizing minerals to prevent their transfer to springs and protect plants from absorbing them, c) Allowing for rapid fermentation through the treatment of organic materials to avoid the formation of methane gas and its leakage into the soil, and d) Assisting in the decomposition of chemicals such as pesticides (insecticides, fungicides, and herbicides) and oil derivatives **(Yusra, 2021 and Sadiq and Akoul, 2013)**.

Organic fertilizers, organic food and human beings

Organic food is produced using natural methods without the use of pesticides, chemical fertilizers, hormones, or other manufactured materials. The term "organic" has become a trademark protected by international laws, indicating that the product has been carefully examined from the farm to the store by an independent monitoring body.

Why do we choose organic products?

Organic food is considered the best option for humans due to its inclusion of organic vegetables and fruits. Numerous studies have demonstrated that organic food contains higher levels of vitamins, nutrients, and antioxidants that can help prevent cancer compared to non-organic food. Additionally, organic products are known for their delicious flavor.

One of the key benefits of organic food is that it is produced without the use of chemicals, making it a healthier option for both humans and animals. Animals that are fed organic food also experience additional advantages, such as the absence of pesticide residues in their bodies.

It is worth noting that organic fruits and vegetables are free from pesticide residues. Leafy vegetables like lettuce and spinach are more susceptible to nitrate accumulation. However, studies have shown that organically produced vegetables have a lower percentage of nitrates compared to

conventionally grown vegetables. Additionally, organic food is rich in polyphenols, which are active plant compounds that promote health and reduce the risk of chronic diseases such as heart disease, vascular diseases, inflammation, and neurological disorders **(Samukelisiwe *et al*., 2020; Nardini, 2022 and Guangxin Feng *et al*., 2022)**.

Success stories of organic agriculture in the Arab world: Hashemite Kingdom of Jordan

Success stories of organic agriculture in the Arab world include the Hashemite Kingdom of Jordan. Al-Majdil Pharmaceuticals Company (MNPC) was established in 2014 in Jerash Governorate, Jordan. They specialize in organic products (https://youtu.be/R-UFkpsbG-s). Another success story is Al-Sama'in Press, founded in 2001 in Al-Karak Governorate, Jordan. They export organic oil to America and Britain (https://youtu.be/eEofxmhQ). In Yanbot, Tunisia, there is a restaurant and a natural fruit and vegetable market (https://youtu.be/eEofxmhQ4Ec).

In the Republic of Tunisia, there are several successful ventures:

1 -Jawaher Al-Waha Complex for Organic Agriculture

2 -The “Nawaka Bio” project in biological agriculture in the wilaya of Monastir

3 -A supermarket selling organic products called Elixir Bio

4 -The town of Beausfar

In the Lebanese Republic, success stories include:

1 -Adonis Valley Company

2 -Al-Solh Company for Organic Agriculture

3 -Biomass Company, which works in the field of organic agriculture

In the Arab Republic of Egypt, there are also successful initiatives:

1 -Sekem research

2 -The Organic Agriculture Program at the Faculty of Agriculture, Ain Shams University (https://www.facebook.com/113591133426361/) **(Al-Dakhiri, 2020).**

3 -Pictures showcasing organic products in the Arab world

These success stories highlight the growing trend and importance of organic agriculture in the Arab world.

Fig. (6). The products of the Naqawa Bio project in biological agriculture in the wilaya of Monastir

Fig. (7). The organic tomato paste product from the "Elixir Bio" supermarket selling organic products

The role of organic agriculture in achieving sustainable development in the Arab world

The 2030 Sustainable Development Plan emphasizes several key points in the agricultural sector, including environmental protection, organic agriculture, rural development, and the preservation and enhancement of agricultural resources. In terms of sustainable agricultural development, the plan aims to increase plant and animal production to achieve the highest level of self-sufficiency possible in agricultural products (both plant and animal) in order to ensure sustainable food security in Arab countries, as well as provide water and alleviate poverty.

Organic agriculture plays a central role in contributing to sustainable agricultural development through the following:

1. Continuously improving the productive capacity of the natural resource base
2. Driving economic development forward
3. Supporting rural development
4. Creating job opportunities
5. Ensuring food security
6. Promoting eco-tourism
7. Expanding into rural areas **(Kulthum and Hani, 2021)**.

2. Conclusions

Organic agriculture enhances nutrients and improves the quality of products, increasing their nutritional value compared to conventional agriculture. It is also environmentally friendly, as it avoids the use of chemical fertilizers, pesticides, and genetically modified organisms .This practice ensures that organic products are free from residual pesticides and heavy metals .

Organic farming is cost-effective and relies on the expertise of farmers. It plays a crucial role in environmental sustainability by preserving natural resources, maintaining biodiversity, and ensuring soil fertility and sustainability. Additionally, organic farming contributes to waste recycling by utilizing organic residues such as food waste and animal remains.

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الزراعة العضوية من أجل بيئة نظيفة ومستدامة

استخدام الأسمدة الاصطناعية على نطاق واسع في الزراعة المعاصرة قد أدى بالفعل إلى زيادة إنتاجية المحاصيل، لكنه تسبب في الوقت نفسه في عدد من التحديات الزراعية والبيئية والصحية للنُظم البيئية. فالتراكم المستمر لبقايا الكيماويات الزراعية في المحاصيل، إلى جانب التدهور البنيوي في التربة والكائنات الحية الدقيقة ومصادر المياه، يعكس عدم استدامة النهج التقليدي القائم على كثافة المُدخلات. تستعرض هذه المقالة نقديًا نموذج الزراعة العضوية كبديل مستند إلى العلم ومستدام بيئيًا. وتركز بشكل خاص على المبادئ الأساسية التي تُنظم أنظمة الإنتاج العضوي، وتصنيف المواد العضوية المُستخدمة كأسمدة، وإمكانياتها الزراعية، مقارنةً بالأثر البيئي للطرق التقليدية. كما تُجمع المقالة معلومات حالية حول تطور الزراعة العضوية في العالم العربي، وتُقارنها بالاتجاهات العالمية لوضع الإنجازات والتحديات الإقليمية في سياقها الصحيح.

كما تُسلّط الضوء على مساهمة الأنظمة العضوية في تعزيز التوازن البيئي الزراعي، وزيادة التنوع الحيوي، ومواجهة الأسباب البشرية لتدهور البيئة. وتستعرض المقالة أيضًا التغير في توجهات المستهلكين، وتوضح الأسباب الصحية والثقافية التي تدعم الطلب المتزايد على المنتجات العضوية. وتخلص الأدلة إلى أن الزراعة العضوية تُعزز إنتاج غذاء أكثر جودة وغنيّ بالمغذيات وخالٍ من الملوثات السامة، في الوقت نفسه الذي تخدم فيه أهداف الحفاظ على البيئة. ومن خلال تعزيز خصوبة التربة، والحد من الاعتماد على المُدخلات الكيميائية الخارجية، وزيادة مرونة النظم البيئية، تُقدَّم الزراعة العضوية كخيار عملي لتحقيق استدامة طويلة الأمد في إنتاج الغذاء. وتدعو النتائج إلى تعميم الممارسات العضوية ضمن استراتيجيات التنمية الزراعية الوطنية والدولية، بما يربط بين العوائد الزراعية وسلامة البيئة وصحة الإنسان.