MedCrave
Step into the World of Research
International Journal of Complementary & Alternative Medicine

Research Article

Open Access
CrossMark

Understanding the concept of organic and inorganic foods

Abstract

The idea of organic farming is acquiring force step by step. The mindfulness towards organic produce merchandise is expanding. So both consumers and farmers are presently continuously moving back to organic farming in India. It is accepted by numerous that organic farming is better. However, the medical advantages of organic food are yet to be demonstrated, buyers will pay a higher expense for something very similar. Numerous farmers in India are shifting to organic farming because of the domestic and worldwide interest in organic food. Further rigid principles for non-organic food in European and US markets have prompted the dismissal of numerous Indian food transfers before. Organic farming, therefore, provides a better alternative to chemical farming. So an endeavor is made in this article to study the concept of organic farming, conventional farming, benefits, and issues of both organic and inorganic foods.

Keywords: agriculture, organic farming, inorganic farming, green revolution, ecosystem, environment, organic, non-organic, manures, compost, fertilizers, pesticides

Volume 14 Issue 5 - 2021

Ningombam Leonardo,[1] Charu Gupta[2]
[1]Amity Institute of Organic Agriculture, India
[2]Amity Institute of Herbal Research & Studies, India

Correspondence: Charu Gupta, Amity Institute of Herbal Research & Studies, Sec-125, Noida-201313, Uttar Pradesh, India, Email cgupta@amity.edu

Received: August 07, 2021 | **Published:** October 11, 2021

Introduction

Organic farming is an integrated production management system based on the basic principle of minimizing the use of external inputs and avoiding the use of synthetic fertilizers and pesticides to ensure the sustainability of agriculture. There are several regions in the country where organic farming is being practiced by farmers and it is becoming increasingly popular throughout the country. Organic farming was practiced in India for thousands of years. India is the second-most populous country in the world. The great Indian civilization thrived on organic farming and India was one of the wealthiest countries in the world, till the British ruled it.

In traditional India, the entire agriculture was practiced using organic techniques, where the manure, pesticides, etc, were obtained from plant and animal products. The cow did not only provide milk but also provided bullocks for farming and dung which was used as manure. With the increasing population, the cultivable land resources are shrinking day by day. To meet the food, fiber, fuel, fodder, and other needs of the growing population, the productivity of agricultural land and soil health needs to be improved.

During the 1950s and 1960s, the ever-increasing population of India and several natural calamities lead to severe food scarcity in India. As a result, the government was forced to import food grains from foreign countries. To increase food security, the government had to drastically increase the production of food in India. The Green Revolution (under the leadership of M. S. Swaminathan) became the government's most important program in the 1960s. A large amount of land was brought under cultivation. Hybrid seeds were introduced. Natural and organic fertilizers were replaced by chemical fertilizers and locally made pesticides were replaced by chemical pesticides. Large chemical factories such as the Rashtriya Chemical Fertilizers were established.

Inorganic farming has made the farmers of today searching for something better, in addition, farmers are pursuing chemical supplements to push crop yield, which is only harming the earth. Farmers and communities faced many socio-economic problems, particularly small farmers who found themselves increasingly marginalized due to a lack of access to external inputs.

International Federation of Organic Agriculture Movements (IFOAM), an international organization established in 1972 for organic farming organizations defines the goal of organic farming as:

"Organic agriculture is a production system that sustains the health of soils, ecosystems, and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation, and science to benefit the shared environment and promote fair relationships and good quality of life for all involved".

Objectives of the study

The study is based on the following specific objectives

a. To know the concepts of organic and inorganic inputs.

b. To study the quality of organic and inorganic food.

Discussion

The word "organic" farming refers to the way farmers grow and process agricultural products. Organic farming practices encourage soil and water conservation and reduce pollution. Farmers growing organic produce do not use conventional or chemical methods to fertilize or control weeds and insects.

The term "conventional" farming refers to a production system that employs a full range of pre and post-plant tillage practices (eg. plow, disk, plant, cultivate), synthetic fertilizers, and pesticides. Therefore, inorganic or conventional farming is characterized by a high degree of crops specialization.

The distinction between organic farming and conventional farming represents the greater part of the debate with claims and counterclaims surrounding organic agriculture and natural food. The comparison looks something like given underneath (Table 1).

Table 1 The comparison looks something like given underneath

Parameter	Organic	Conventional
Size	Smaller, Marginal , dependent operations	Large scale, economically tied to major food corporation
Method	No use of purchased fertilizer and other inputs e.g. Pesticides, weedicides, etc. less mechanization of the growing and harvesting process. Use of organic inputs like green manure, vermicompost, biofertilizers, etc.	Heavy use of chemicals e.g. Fertilization, use of pesticides, etc. mechanized production using special equipment and facilities.
Technology	Nature-based, environment-friendly, and sustainable.	Synthetic, harmful to the environment, and nutrient depleting.
Products	Good in taste, flavor, nutrition, and free from chemicals.	Less taste, less nutritious may contain toxic residues of chemicals.
Market	Local, direct to consumer, on-farm stands and farmers markets and through special wholesalers and retailers.	Wholesale with products distribution across large areas (average supermarket produce travels 100 to 1000 Km) and sold through high- volume.

Principles of organic farming

The principles of organic farming are as follows:

i. To work within a closed system and draw upon local resources as much as possible.

ii. To maintain the long-term fertility of soils.

iii. To avoid all forms of pollution that may result from agricultural techniques.

iv. To produce food in sufficient quantity with high nutritional quality.

v. To minimize the use of fossil energy in agricultural practices.

vi. To make it possible for agricultural producers to earn a living through their work and develop their potentialities as a human being.

Types of organic fertilizers

Dry organic fertilizers: Dry organic fertilizers can consist of a single material, such as rock phosphate or kelp (a type of nutrient-rich seaweed) or they can be a blend of many ingredients. Almost all organic fertilizers provide a broad array of nutrients, but blends are specially formulated to provide balanced amounts of nitrogen, potassium, and phosphorus, as well as micronutrients. The most common way to apply dry fertilizer is to broadcast it and then, hoe or rake it into the top 4 to 6 inches of the soil.

Liquid organic fertilizers: Plants can absorb liquid fertilizers through both their roots and leaf pores. Foliar feeding (through leaves) can supply nutrients when they are lacking or unavailable in the soil, or when roots are stressed. It is especially effective for giving fast-growing plants like vegetables an extra boost during the growing season. Some foliar fertilizers, such as liquid seaweed like kelp, are rich in micronutrients and growth hormones. These foliar sprays also appear to act as catalysts, increasing nutrient uptake by plants. Compost tea and seaweed extract are two common examples of organic foliar fertilizers.

GROWTH ENHANCERS: Growth enhancers are materials that help absorb nutrients more effectively from the soil. The most common growth enhancer is kelp, which has been used by farmers for centuries. Kelp is sold as a dried mal or as an extract of the meal in liquid or powdered form. It is safe and provides some 60 trace elements that plants need in very small quantities. It also contains growth-promoting hormones and enzymes.

Types of inorganic fertilizers

Nitrogen fertilizers

Inorganic nitrogen fertilizers come in many different forms, such as ammonium nitrate, potassium nitrate, calcium nitrate, and urea. These fertilizers contain high levels of nitrogen, one of the most vital nutrients for plant growth. However, these inorganic fertilizers tend to increase the pH of the soil upon application, increasing the chances of burn and damage to seedlings. Others pull moisture from the air, making them difficult to apply and store.

Potassium fertilizers

Inorganic potassium fertilizers include potassium sulfate and potassium nitrate, as well as muriate of potash, also known as potassium chloride. Muriate of potash is the most commonly used potassium fertilizer. In some cases, plants may be sensitive to chloride. If a plant is sensitive to chloride, potassium sulfate, also known as sulfate of potash, is a better choice, as it does not contain chloride. Potassium nitrate is easy to apply, because it does not pull moisture from the air, but it does slightly increase the pH of the soil upon application.

Phosphorus fertilizers

Inorganic phosphorus fertilizers such as rock phosphate remain in the soil years after the initial application. Rock phosphate works only in acidic soils, as the nutrients do not break down for plants in neutral or alkaline soils. Superphosphates are other forms of phosphorus fertilizer. These do not affect the pH of the soil upon application, while ammonium phosphate comes in water-soluble, granular forms.

Benefits of organic fertilizers

- Plant growth: Organic fertilizer provides nutrients necessary for plant growth, with the benefit of being slower-acting and gentler than chemical fertilizers so that we are less likely to overfeed and chemically burn the plants.
- Soil improvement: Organic fertilizer help improve soil structure and nutrient content over time. While chemical fertilizers simply add water-soluble chemicals which are either absorbed by the plant roots or leached away, potentially polluting water resources. Organic fertilizer adds organic matter that helps the soil retain moisture and nutrients.
- Slow-release of nutrients: Organic fertilizers do not contain nutrients in an easily usable form. Therefore, there is a low chance for “plant burn” when organic fertilizers are used.

Citation: Leonardo N, Gupta C. Understanding the concept of organic and inorganic foods. *Int J Complement Alt Med.* 2021;14(5):200–204.
DOI: 10.15406/ijcam.2021.14.00561

- Environment friendly: Synthetic fertilizers also tend to release any chemicals into the soil that contain nutrients helpful to the soil but may also contain elements that are not easily biodegradable. These may go to contaminate our land and water bodies. On the other hand, by definition, organic fertilizers almost always have only biodegradable contents.
- Cheap and cost-effective: Organic fertilizers can be produced at home or on farms by using a mix of cow, sheep, chicken, and horse manure along with waste like leaves and dead plants. This is a great way of getting rid of waste from the garden or farm and certainly a cheaper alternative to purchasing chemical fertilizers.
- Safety: Unlike chemical fertilizers, the farmers have low to no risk while applying organic fertilizers.
- Organic fertilizers are not only the source of organic matter and nutrients but also boost the microbial population, physical, biological, and chemical properties of the soil (Albaich et al. 2000).
- Organic fertilizers like compost and vermicompost are soil conditioners, which provide nutrients and organic matter within the soil and also ameliorate the water holding capacity, firmness, and structure of the soil.

Drawbacks of chemical fertilizers

- Chemical fertilizers affect micro-organisms living in the soil. The acidity of chemical fertilizers also adversely affects the soil's pH and makes it acidic, thereby changing the kinds of microorganisms that can live in the soil. Prolonged use of chemical fertilizers can cause an increase in pests and kills the beneficial microbes present in the soil.
- Chemical fertilizers are highly soluble in water, hence, they leach away into groundwater without fully benefiting the plants. Thus fewer nutrients are available for the plant. The leaching away of chemical fertilizers pollutes the water. These chemicals also seep into the sub-soil where they interact with clay, forming impermeable layers called hardpan resulting in compaction of the soil.
- Chemical fertilizers can also encourage plant disease. Fast-releasing chemical fertilizers have a high nitrogen content compared to slow-releasing organic fertilizers. When there is an overabundance of Nitrogen with phosphate, plants are more susceptible to mosaic infections. Excessive use of these fertilizers tends to destroy the beneficial microbes present in the soil.
- While these fertilizers help plants to grow and thrive, it doesn't do much for the soils. When chemical fertilizers are used for a prolonged duration, the soil gets damaged as the trace nutrients are not replenished in the soil.
- Excessive nitrogen used in crop fertilization can contribute to the release of greenhouse gases such as carbon dioxide and nitrous oxide into the atmosphere. This effect is caused by using a greater amount of chemical fertilizer that the plants can readily absorb.
- There is an increasing concern that continuous use of chemical fertilizers on soil depletes the soil of their essential nutrients which as a result, the food produced in these soils has less vitamin and mineral content.
- Based on experimental and sometimes clinical evidence, a number of pesticides in common use in many parts of the world are known human nephrotoxins, albeit causes of acute kidney injury. A major food safety incident in 2009 exemplified the potential scope of the adverse renal consequences that can occur following population-wide exposure to organic contaminants. The liver has long been considered the major target organ for most of the chemicals implicated in eliciting toxic effects following environmental exposure. Nevertheless, emerging data suggest that the kidney is also an important site of injury after chemical exposure, although substantial gaps remain regarding the effects of environmental chemicals on specific aspects of kidney function.

Identifying foods grown organically

There are organic certification programs that require all organic foods to meet strict standards. Any product labelled organic must be certified as meeting the standards. Different labels can be used to claim a food is organic. "100% Organic" claims the food is made entirely from organic ingredients. "Organic" claims the food is at least 95% organic material. "Made with Organic Ingredients" claims at least 70% organic ingredients and can display three organic ingredients on the food label. "Non-Organic" is used when less than 70% of the ingredients are organic. Non-organic is when synthetic chemicals are used on the crop or product to boost its growth. Foods classed as non-organic include pre-coked/ready-to-cook meals, processed foods, commercial food, baked goods, and frozen foods.

Quality of organic and inorganic food

The good taste and nutritional value of organic food also attract consumers. Inorganic agriculture uses a wide range of synthetic chemicals that inevitably leave residue in the produce. According to Plimmer,[1] there are more than 130 different classes of pesticides containing some 800 entries. According to Kuchler et al.[2] pesticides residues enter the food chain via four main routes; on-farm pesticide use, post-harvest pesticides use, pesticide use on imported food, and cancelled pesticides that persist in the environment. According to WHO estimates approximately one million people are taken ill every year with pesticides poisoning and up to 20,000 of them die in agony and a variety of reproductive health impacts on women. According to Ransom, 2002, increased incidence of miscarriage, birth malfunctions, stillbirths, and delayed pregnancy have been documented among women agricultural workers and wives of men employed in pesticide mixing and spraying. This is mainly due to overuse or misuse of chemicals, particularly synthetic insecticides, fungicides, herbicides, fertilizers, plant growth regulators, etc; that resulted in undesirable side effects not only in the agro-ecosystems but also on human health and life systems of beneficial fauna and microorganisms.

The toxic residues poison the body slowly causing intensive damage to the human body. Food products containing toxic pesticides residues cause heart disease, brain, kidney, and liver damage and even cancer, limb deformities, and poor eyesight. Hence, the extensive use of chemicals and antibiotics in inorganic food production technology has compelled health-conscious people to explore and support organic farming.

In 2012, Smith-Spangler et al.[3] reported similar findings after a further systemic review and meta-analysis, with phosphorus and total polyphenol content higher in organic produce, but no difference in other nutrients between organic and conventional production. Particularly, there were no significant differences in vitamin C,

Citation: Leonardo N, Gupta C. Understanding the concept of organic and inorganic foods. *Int J Complement Alt Med.* 2021;14(5):200–204.
DOI: 10.15406/ijcam.2021.14.00561

B-carotene, a-tocopherol, calcium, magnesium, or iron. Conversely, Brandt et al. conducted a systematic review of papers reporting on the vitamin and phenolic compounds in fruits and vegetables, comparing organic to conventional production. They found that the content of vitamin C, and 'secondary plant metabolites' were significantly greater in organic foods, while there was no difference in carotenes, tocopherols, or anthocyanin (a subclass of flavonoids). Specifically, antioxidant 'secondary plant metabolites' were found to be 12% higher in organically grown fruit and vegetables.

Pragya Agarawal et al., the quality attributes and tangible quality in fresh green peas grown organically, inorganic and integrated methods of cultivation at Govind Ballabh Pant University of Agriculture and Technology, Pantnagar. The study found that no significant difference was observed in terms of pod length but a significant difference was observed in the number of seeds per pod that was higher in pea grown by the integrated method of cultivation. The organically grown peas scored higher total sugar, sweetness, colour, flavour, and taste, other than as far as minerals, organically grown peas had higher copper and zinc levels analyzed to conventionally grown peas and peas grown by integrated cultivation method.

According to Alfvén et al.[4] Kummeling et al.[5] several studies have examined the possible human health effects of organic diets through observational data from consumers beyond the chemical composition of foods. A few studies suggest that the consumption of organic foods can be associated with a lower risk of allergies and eczema in infants.

According to Baranski et al.[6] Huber et al. 2011, in terms of other unhealthy components, some reviews conclude that organic foods contain lower concentrations of nitrate and cadmium. According to Mditshwa et al.,[7] no significant difference was found in terms of fungal or bacterial contamination in most studies, although some suggest higher microbial concentrations in certain organic products such as fruits.[8-16]

Certain differences in the composition of organic and conventional foods may not be surprising, as farming practices can affect plant chemistry. Lower cadmium and nitrate levels in organic plants are linked to synthetic fertilizers not being allowed in organic farming. Nitrogen fertilization promotes vegetative growth (associated with the formation of proteins and carbohydrates) while limiting generative growth (associated with the formation of secondary metabolites). Regarding animal products, higher levels of omega-3 fatty acids are potentially linked to outdoor grazing and larger biodiversity in pastures on organic farms.

Conclusion

Modern agricultural practices have emphasized the widespread utilization of fertilizer and this methodology has expanded grain yields in many countries in the last three decades. However, long-term utilization of chemical fertilizers also led to a decrease in crop yield and soil fertility in the intensive cropping system. There is evidence that over-fertilization has expanded the concentration of many plant supplements in both surface and groundwater which has created a potential health hazard. Most agricultural soils in India have low native soil fertility. Successful and sustained crop production on these soils requires regular nutrient inputs through chemical fertilizers or organic manure to replenish soil nutrient reserves depleted by crop removal and other losses. Utilization of chemical fertilizers for better production is easy and is rapidly available or absorbed by the plants but in the long run, it only depletes or deteriorate the soil health while on the other hand use of organic fertilizers may be slow and time-taking at first but with the gradual use of such fertilizers will not only provide soils with the nutrients it requires but will also prove to be beneficial for the environment as a whole. Besides organic fertilizers are not only environmentally friendly they are financially friendly also. Therefore, more emphasis should be given to the utilization of natural, organic fertilizers particularly in a country like India, where half of the population is dependent on agriculture for their livelihood and good health.

Acknowledgments

None.

Conflicts of interest

The authors have no conflict of interests related to this publication and have not received any grants.

Funding

None.

References

1. Plimmer JR, Krieger R. Handbook of Pesticide Toxicology. 2nd edn. USA, San Diego: Academic Press; 2001. pp.95-107.
2. Kuchler F, Chandran R, Ralston K. The linkage between pesticide use and pesticide residues. *American Journal of Alternative Agriculture*. 1996;11(4):161-167.
3. Smith-Spangler C, Brandeau ML, Hunter GE, et al. Are organic foods safer or healthier than conventional alternatives? A systematic review. *Annals of Internal Medicine.* 2012;157(5):348-366.
4. Alfvén T, Braun Fahrländer C, Brunekreef BV, et al. Allergic diseases and atopic sensitization in children related to farming and anthroposophic lifestyle-the PARSIFAL study. *Allergy*. 2006;61(4):414-421.
5. Kummeling I, Thijs C, Huber M, et al. Consumption of organic foods and risk of atopic disease during the first 2 years of life in the Netherlands," British Journal of Nutrition. Cambridge University *Press*. 2008;99(3):598–605.
6. Barański M, Srednicka-Tober D, Volakakis N, et al. Higher antioxidant and lower cadmium concentrations and lower incidence of pesticide residues in organically grown crops" a systematic literature review and meta-analyses. *Br J Nutr*. 2014;112(5):794-811.
7. Mditshwa A, Magwaza LS,Tesfay SZ,et al. Postharvest quality and composition of organically and conventionally produced fruits," A review. Scientia Horticulturae. 2017;216:148-159.
8. Flanagan A. Organic vs. Non-Organic Food: Is There a Difference. Blog in Sigma Statements. 2021.
9. Albiach R, Canet R, Pomares F, et al. Microbial biomass content and enzymatic activities after the application of organic amendments to a horticultural soil. *Bioresource Technology*. 2000;75(1):43-48.
10. Gawali AS, Meshram N. Advances in Agricultural Research and Innovations: Organic Farming – A Rising Concept. *Agricultural Horticultural Forestry Agroforestry Res*. 2019;25-31.
11. Charles S. A Comparative Study on Organic Farming and Inorganic Farming in Tirunelveli District. *WWJMRD*. 2018;4(6):28-30.
12. BrandtK, LeifertC, Sanderson R, et al. Agroecosystem Management and Nutritional Quality of Plant Foods: The Case of Organic Fruits and Vegetables. *Critical Reviews in Plant Sciences*. 2011;30:1-2.
13. Meemken EM, Qaim M. Organic agriculture, food security, and the environment. *Annual Review of Resource Economics*. 2018;10:39-63.
14. http://www.earthsummit2002.org/wcaucus/Caucus_Position_Papers/agriculture/pestices1.html

15. Agrawa lP, Bhattacharya L, Kulshrestha K, et al.Effect of Organic, Inorganic and Integrated Methods of Cultivation on Quality of Fresh Green Peas. *Journal of Eco-friendly Agriculture*. 2007;2(1):20-22.

16. Thippeswamy E. Comparative analysis of organic and inorganic food". *J Agric Vet Sci*. 2013;4(6):53-57.

Citation: Leonardo N, Gupta C. Understanding the concept of organic and inorganic foods. *Int J Complement Alt Med.* 2021;14(5):200–204.
DOI: 10.15406/ijcam.2021.14.00561