

Proceeding Paper

Organic Farming as a Safe Alternative to Toxic Synthetic Chemicals Usage in Tropical Crop Production [†]

Chinedu Felix Amuji

Department of Crop Science, Faculty of Agriculture, University of Nigeria, Nsukka 410001, Nigeria; felix.amuji@unn.edu.ng

[†] Presented at the 1st International Online Conference on Agriculture—Advances in Agricultural Science and Technology, 10–25 February 2022; Available online: <https://iocag2022.sciforum.net/>.

Abstract: Organic farming ensures that crops are produced in a natural bio diversified state without loss of any productivity. Synthetic chemical usage in the tropics increases the levels of the environmental and health risks associated with agriculture. Every piece of synthetic material used each day by man to ‘improve’ agricultural productivity is either ‘polluting’ or ‘poisoning’ the environment. Through these damages to the natural environs by man, more deaths because of serious illness has been recorded. In this work, facts are presented and discussed on how intensive crop production causes problems and ways of ensuring less use of these toxic synthetic chemicals in crop production, especially in the tropical regions of the world. Furthermore, major benefits of organic farming in crop production as well as how organic farming ensures genetic diversity preservation are discussed. This review reveals how organic farming can reduce adverse environmental impact associated with conventional methods of synthetic chemical usage tradition. The work concludes that practising organic farming in the tropics would be very beneficial especially for future generations.

Keywords: chemicals; crop production; organic farming; tropics



Citation: Amuji, C.F. Organic Farming as a Safe Alternative to Toxic Synthetic Chemicals Usage in Tropical Crop Production. *Chem. Proc.* **2022**, *10*, 52. <https://doi.org/10.3390/IOACAG2022-12190>

Academic Editor: Bin Gao

Published: 10 February 2022

Publisher’s Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2022 by the author. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

We live in an environment that is altered in every way by human activities. Every piece of material used each day is either been ‘polluted’ or ‘poisoned’ by humans trying to “improve” the normal lifestyle. Therefore, it is important that we educate ourselves and take interest in what is happening to the earth in order to preserve it.

The definition of organic farming involves the ecological production and management approach that supports and improves biodiversity. It basically minimises the use of inputs and maximises management procedures that ensure ecological coherence [1]. However, Hynes [2] defined organic farming as a system of agriculture that excludes the use of synthetic pesticides, growth hormones, antibiotics, genetically modified seeds and animal breeds, and irradiation. Studies on organic farming have showed that the inherent benefits include a decrease in soil erosion, less use of fossil fuel, a lesser amount of nitrate leaching, an increase in the carbon sequestration, and little to no use of synthetic chemicals [2–5].

In the tropical regions of the world, many farmers that normally use the traditional methods which are comparable to organic farming are now converting to modern methods that involve the use of synthetic chemicals for economic reasons. Therefore, the objective of this review paper is to highlight the major perceived benefits of organic farming on food productivity especially in the tropical region of the world.

2. Modern, Intensive Crop Production Causes Many Problems

2.1. Nitrate Pollution

The use of nitrogenous fertilizers, such as urea and ammonium sulphate in the tropical crop production, increases the acidity of the soil [6]. This leads to a high nitrate concentration in the environment. Studies have shown that consumption of these high doses of

nitrates can cause dizziness, vomiting, abdominal cramps, and psychological problems or even be cancerous [7].

2.2. Accumulation of Heavy Metals

The addition of fertilizers containing heavy metals even as impurities, for example, rock phosphate which has a significant amount of lead and cadmium, can cause health hazards [8].

2.3. Pesticide Pollution

Synthetic chemical pesticide usage on crops can cause harm to man or animals that consume them as food or feed [9]. Moreover, some of the pesticides such as the chlorinated ones are non-biodegradable. Hence, they pollute the environment and are very harmful to living organisms including man [7].

3. Ways of Ensuring Less Use of Toxic Chemicals in Crop Production through Organic Farming

3.1. Choice of Crops

Each specific crop variety has its own environmental requirements. These environmental factors affect the crop's growth and yield. When climate situations are not right, the crop's produce low yields and may be more susceptible to pests and diseases. Organic farming encourages the growth of crop varieties suited to the local conditions.

3.2. Crop Rotation

This practice involves the movement and changing of crops to a different land area each growing season. No crop should be grown on the same site year after year.

3.3. Composting

This is the process of applying plant and animal residues, such as leaves, fruit skins, and animal dung, that have rotted over time by the action of bacteria and other similar organisms, to the crops.

3.4. Mulching

The technique of covering the ground where the crops are grown with materials, such as compost, manure, straw, dry grass, leaves, or crop residues, has the effect of improving crop growth through: decreasing water loss due to evaporation, preventing soil erosion, and adding crop-required nutrients to the soil.

3.5. Weed Control

Organic farming avoids the use of herbicides, which leave harmful residues in the environment. Therefore, natural forms of weed control are used.

3.6. Natural Pest and Disease Control

Pests and diseases are part of nature. In organic farming, the aim is not to eradicate them altogether but to maintain an acceptable level.

4. Major Benefits of Organic Farming in Crop Production

Some studies have shown that despite the continuous increase in synthetic chemical usage in crop production, losses due to pest damage have continued to multiply; therefore, natural control methods are still a viable option [10].

4.1. Safety for People

Synthetic chemicals can easily find their way into food chains and water sources, thereby creating health hazards [11]. In the tropical regions, it is even more severe as most deaths because of the chemical usage are from banned ones in Europe and North

America [10]. The use of pesticides is restricted in organic farming to avoid causing harm to non-target organisms including humans [12].

4.2. Cost

In organic farming, all products used are mostly materials which are already in the home, around the farm, or can easily be made. It does not involve much buying of materials from the outside.

4.3. Safety for the Environment

Most synthetic chemicals normally used in conventional crop production in the tropical regions are not biodegradable and are harmful to the environment [13]. In other words, these non-natural synthetic chemicals can stay in the environment for many years causing numerous problems to the ecosystem.

5. How Organic Farming Ensures Genetic Diversity/Preservation

Organic farming encourages the cultivation local traditional crops by the farmers. These traditional crops contain more genetic diversity than the modern conventionally bred crops [14]. The ability of the crops to differ genetically gives them the ability to resist diseases [15].

Organic farming also allows for a number of different crops to be grown together; this helps in protection against diseases and pests and can also serve as insurance for crop failures [16].

6. Conclusions

A sure way to ensure safer environment is through organic farming. The most important benefit of organic farming process is the health of the consumers. In addition, organic food is free from genetically modified organisms (GMOs), hormones, and antibiotics and has little or no chemical residue [2]. It is important to also note that organic farming helps preserve aquatic life and clean water by minimizing the flow of toxic pesticides into streams, rivers, and lakes. The work concludes that practising organic farming in the tropics will be very beneficial especially for future generations.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/IOCAG2022-12190/s1>.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The author declare no conflict of interest.

References

1. National Organic Standards Board (NOSB). Organic Farming Definition at Its April Meeting in Orlando, Florida. Organic Trade Association. 1995. Available online: www.northcoast.com/-startrak/ota/legislat.htm (accessed on 14 June 2022).
2. Hynes, E. "Organic Farming" Microsoft® Encarta® 2009 [DVD]; Microsoft Corporation: Redmond, WA, USA, 2008.
3. Lockeretz, W.; Shearer, G.; Kohl, D.H. Organic farming in the Corn Belt. *Science* **1981**, *211*, 540–547. [CrossRef] [PubMed]
4. Drinkwater, L.E.; Wagoner, P.; Sarrantonio, M. Legume-based cropping systems have reduced carbon and nitrogen losses. *Nature* **1998**, *396*, 262–264. [CrossRef]
5. Le Campion, A.; Oury, F.X.; Heumez, E.; Rolland, B. Conventional versus organic farming systems: Dissecting comparisons to improve cereal organic breeding strategies. *Org. Agric.* **2020**, *10*, 63–74. [CrossRef]
6. Fageria, N.K.; Dos Santos, A.B.; Moraes, M.F. Influence of urea and ammonium sulfate on soil acidity indices in lowland rice production. *Commun. Soil Sci. Plant Anal.* **2010**, *41*, 1565–1575. [CrossRef]
7. Ananata, G. *A Review on Organic Farming for Sustainable Agriculture*; Department of Agriculture Extension and Rural Sociology, Institute of Agriculture and Animal Science Rampur: Chitwan, Nepal, 2002.

8. Kostial, K. Cadmium. In *Trace Elements in Human and Animal Nutrition*; Mertz, W., Ed.; Academic Press: London, UK, 1986; pp. 319–325.
9. Nicolopoulou-Stamati, P.; Maipas, S.; Kotampasi, C.; Stamatis, P.; Hens, L. Chemical pesticides and human health: The urgent need for a new concept in agriculture. *Front. Public Health* **2016**, *4*, 148. [[CrossRef](#)] [[PubMed](#)]
10. Henry Doubleday Research Association (HDRA)—The Organic Organisation. *The Organic Farming*. Ryton Organic Gardens, Coventry, United Kingdom. 1998. Available online: www.hdra.org.uk (accessed on 14 June 2022).
11. Aktar, M.W.; Sengupta, D.; Chowdhury, A. Impact of pesticides use in agriculture: Their benefits and hazards. *Interdiscip. Toxicol.* **2009**, *2*, 1. [[CrossRef](#)] [[PubMed](#)]
12. Mie, A.; Andersen, H.R.; Gunnarsson, S.; Kahl, J.; Kesse-Guyot, E.; Rembiałkowska, E.; Quaglio, G.; Grandjean, P. Human health implications of organic food and organic agriculture: A comprehensive review. *Environ. Health* **2017**, *16*, 111. [[CrossRef](#)] [[PubMed](#)]
13. Jacobson, M. *Insecticides from Plants. A Review of the Literature Agricultural Handbook 461*; US Department of Agriculture: Washington, DC, USA, 1975; Volume 138, pp. 1957–1971.
14. Murphy, K.; Lammer, D.; Lyon, S.; Carter, B.; Jones, S.S. Breeding for organic and low-input farming systems: An evolutionary-participatory breeding method for inbred cereal grains. *Renew. Agric. Food Syst.* **2005**, *20*, 48–55. [[CrossRef](#)]
15. Govindaraj, M.; Vetriventhan, M.; Srinivasan, M. Importance of genetic diversity assessment in crop plants and its recent advances: An overview of its analytical perspectives. *Genet. Res. Int.* **2015**, *2015*, 431487. [[CrossRef](#)] [[PubMed](#)]
16. Kollas, C.; Kersebaum, K.C.; Nendel, C.; Manevski, K.; Müller, C.; Palosuo, T.; Armas-Herrera, C.M.; Beaudoin, N.; Bindi, M.; Charfeddine, M.; et al. Crop rotation modelling—A European model intercomparison. *Eur. J. Agron.* **2015**, *70*, 98–111. [[CrossRef](#)]