

## A Review on Potential for Organic Farming in Pakistan

Amir Raza

*Nuclear Institute for Food and Agriculture, Peshawar, Pakistan, amir.boku@gmail.com*

Shahzada Asif Ali

*Nuclear Institute for Food and Agriculture, Peshawar, Pakistan, asif.nifa2418@gmail.com*

Haroon Shahzad

*Nuclear Institute for Food and Agriculture, Peshawar, Pakistan, haroonshahzad.rana@gmail.com*

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## A Review on Potential for Organic Farming in Pakistan

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## A REVIEW ON POTENTIAL FOR ORGANIC FARMING IN PAKISTAN

AMIR RAZA<sup>1</sup>, SHAHZADA ASIF ALI<sup>1</sup>, AND HAROON SHAHZAD<sup>1\*</sup>

<sup>1</sup>*Nuclear Institute for Food and Agriculture, Peshawar, Pakistan*

Corresponding Author's email: haroonshahzad.rana@gmail.com

### ABSTRACT

Intensive use of agrochemicals (fertilizers and pesticides) has enhanced crop productivity in Pakistan. This rise in productivity has been achieved at the cost of degradation of natural resources (land and water), and environmental pollution. The current situation demands a gradual transformation towards eco-friendly farming practices like organic farming to ensure the sustainability of the agriculture sector. This article presents our viewpoint on the potential benefits of organic farming, its role in mitigating the impact of climate change and the potential for adoption and promotion of organic farming in Pakistan. Organic farming seems to offer promising opportunities on account of its documented benefits towards improving soil resilience, sustaining productivity, conservation of bio-diversity and positive impact of organic foods on human health. Adoption of organic farming approaches may help developing countries like Pakistan to realize sustainable development goals. Limited awareness and institutional support are the key factors responsible for the slow adoption of organic farming in Pakistan. There is a dire need for support from the government and policymakers to promote organic farming. The study underlines the dire need for a paradigm shift towards organic agriculture through incentivizing farmers, strengthening research and institutional support, and enhancing market access for organic produce. Organic farming seems to be a viable solution to cope with the challenges of land degradation, loss of biodiversity, and climate change while promoting inclusive and equitable development, paving the way for a resilient and ecologically sound future for the agriculture sector of Pakistan.

**Keywords:** Eco-friendly farming, healthy foods, soil resilience, sustainable agriculture, sustainable development goals.

### INTRODUCTION

The crop yields in Pakistan have tremendously increased over the last few decades, particularly after the introduction of fertilizer-responsive crop varieties and intensive use of chemicals under the conventional systems of crop production. This increase in yield is achieved at the cost of the deterioration of soil health and disturbance of ecological balances (Durham and Mizik, 2021). The spectrum of these disturbances was of extensive volume that gravely deteriorated our entire ecosystem. This deterioration has led the natural biodiversity towards a diminishing side, signs of stagnancy in crop yields, health concerns due to the continual rise in nitrate contents in groundwater and economic losses because of phosphate fertilizers fixation in the lattice (Maji, 2022). This situation of higher production cost with lesser to negative net returns is the major cause that farmers are now losing interest in farming. The unpredictability of climate is further worsening the situation as it poses serious threats to crop production from our soils which have poor resilience capacity (Alotaibi, 2023; Shahzad et al., 2021). This can have extremely serious repercussions for the national food security in future.

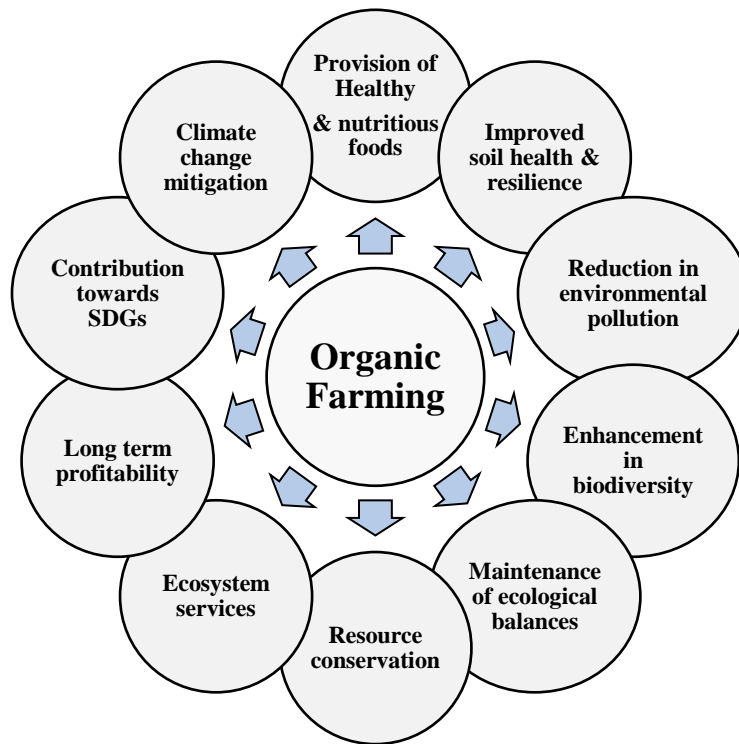
Conventional chemical-based intensive farming systems aim to get higher production, compromising soil health without strategizing a sustainable long-term supply of essential plant nutrients which has become a key challenge under current circumstances (Bernasconi et al., 2021). The usage of effluent water, sewage and sludge, chemical fertilizers, and pesticides in conventional agriculture contributes to soil and water pollution and the gas emissions (CH<sub>4</sub> and N<sub>2</sub>O) from cultivated lands are major contributors towards air pollution (Chataut et al., 2023; Rathod et al., 2025). Therefore, sustainable crop production in the country is needed to overcome soil fertility issues without compromising yields and ecosystem services. The scenario demands exploring feasible options as alternatives to deal with the twin menace of climate change and continually diminishing soil fertility. Organic farming systems based on feeding the soil offer one alternative to conventional farming systems that are based on feeding the crop (Le Campion et al., 2020). “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. It promotes, fair relationship and good quality of life for all who involved” (Saffeullah et al., 2021; Gamage et al., 2023).

Our existing farming practices are leading us towards a massive loss of biodiversity, degradation of land, decline in nature & productivity and a surge in emissions of greenhouse gases (GHG) (Fatima et al., 2020). This demands the protection of the present and future ecological resources that are considered essential for producing food. Following the pandemic (COVID-19), the demand for organic food (safe & nutritious) is also increasing globally (Galanakis, 2020; Mardones et al., 2020; Brata et al., 2022) and the same holds true for Pakistan. It is pertinent to highlight that people are experiencing numerous hazardous health issues due to the consumption of food produced under conventional farming systems. Human and animal health mainly depends on the food they consume. Pesticide residues left in the grains, leafy vegetables or other edible parts enter the body during ingestion and can result in cancer, mental disorders, headache, vomiting, changes in heartbeat rate, muscle weakness, paralysis, respiratory problems, liver & kidney damage, coma and eventually death (Oyugi et al., 2021; Ali et al., 2021a). That is why scientists/nutritionists cite food as health. We must ponder over it, are we consuming safe & healthy foods? The earlier published research work depicts that very few of us might be consuming safe and pesticide-free food as residues of pesticides have been detected in water, cereals, fruits & vegetables, honey and milk (Narenderan et al., 2020; Khazaal et al., 2022). There exists a strong case for promoting organic farming in suitable pockets of the country as a reduction in exports of agricultural commodities from Pakistan is very likely due to the detection of excessive amounts of pesticides. Pakistan may lose many international markets due to failure to comply with the regulations on permissible limits of pesticides in some of its export commodities.

### ***Benefits of Organic Farming***

People are gradually opting for organic foods for good health due to their natural taste, good flavour, high nutritive value and most importantly residue-free. It has been revealed through long-term field experiments that yield of organic farms is at par with conventional farms. Organic farming has the additional advantages of improved soil resilience, fertility, biodiversity and sustainable production without fertilizer supplementation through chemicals (Kareem et al., 2022; Aulakh et al., 2022). Organic farming enhances biodiversity cost-effectively in high-productive regions (Sidemo-Holm et al., 2024). Ecosystem services provided by enhanced farmland biodiversity under organic farming include pollination of crops, pest control by natural enemies, and healthy soil providing

efficient nutrient cycling (Karlsson, 2024). The volume of organic farming is growing globally on account of its documented benefits of the provision of safe foods for human health, maintenance of ecological balance, resource conservation, long-term profitability, better performance under drought, ecosystem services, enhancement in biodiversity, improved soil resilience and reduction in environmental pollution (Verma et al., 2020; Soni et al., 2022; Kharel and Sahoo, 2023). Earlier research reported that health-conscious consumers usually prefer organic foods because they are free from pesticides and chemicals used in food production and genetically modified foods. Organic foods are more nutritious, eco-friendly, natural, healthy, safe, tasty, clean and of high-quality (Brantsæter et al., 2017; Aschemann-Witzel et al., 2019; Busch et al., 2024). Organic farming currently occupies 70 million hectares globally compared to only 69850 hectares in Pakistan (Willer et al., 2024). A summary of the benefits derived from practising organic farming is presented in Figure 1.



**Figure 1: Benefits of organic farming**

Organic farming may help the nations to achieve sustainable development goals (SDGs) as the United Nations (UN) and other foreign donors compel the developing countries to ensure compliance and achievement of SDGs to secure peculiar funding and leverage under several relevant international deals. Organic farming has a pertinent contribution to SDG 1 (no poverty) as it provides sustainable production by involving low direct cash involvement in the procurement of expensive chemical fertilizers and pesticides, thereby, improving the income of poor and marginal farmers and fetching higher premium prices of organic produce. Organic farming contributes to SDG 2 (zero hunger) as it promotes diversified cropping systems that have a relatively lower risk of failure than conventional systems and also organic farming provides safe and nutritious foods. The contribution of organic farming to SDG 3 (good health and well-being) comes from improved health by non-exposure to chemicals and the promotion of healthy lifestyles. SDG 13 (climate action) is met through climate change mitigation potential of organic farming practices and increased resilience of organic farms to extreme weather patterns and events. Organic farming is more relevant to SDG 14 (life below water) as synthetic chemicals are not used on organic farms,

and agriculture's negative externalities in water bodies are minimized. Organic farming also contributes to SDG 15 (life on land) as organic practices promote soil health to produce healthy food (Lal et al., 2021; Bouma et al., 2021).

### ***Organic Farming for Mitigating Climate Change***

Organic farming focuses on sustainable agricultural practices that boost carbon sequestration resulting in reduced GHG emissions to mitigate climate change impacts (Holka et al., 2022; Arunrat et al., 2021). There are several management strategies through which organic farming contributes to mitigating climate change (Clark, 2020). Cover cropping, crop rotation, and reduced tillage are the ways to build soil organic matter through carbon sequestration helping to offset emissions (Mandal et al., 2022). Mulching and agroforestry practices, promote water conservation by improving soil structure and water retention capacity (Kaushal et al., 2021; Kun et al., 2023). Agro-ecological approaches enhance agro-ecosystem resilience to synergize ecological processes and agricultural productivity (Boeraeve et al., 2020). Avoiding or minimizing the use of synthetic fertilizers and pesticides produced through energy-intensive processes decreases the carbon footprint associated with their production and application. It supports greater biodiversity compared to conventional methods and the diverse ecosystems are more resilient to climate change impacts. Manual weeding, crop rotation, and renewable energy usage reduce energy consumption (Kargwal et al., 2022). It also contributes to climate change mitigation by fostering sustainable economic development in rural areas by promoting local food systems and reducing dependency on external inputs. It is important to understand that organic farming can play a pivotal role in climate change mitigation and should be part of broader efforts to transition towards more sustainable and resilient food systems rather than assuming it is a silver bullet to fix the existing issues of conventional chemical-intensive farming systems. The high diversity together with the lower input costs of organic agriculture is a key to reducing production risks associated with extreme weather events (Anderson et al., 2020; Komarek et al., 2020; Elahi et al., 2022). A comparison of features of both farming systems is presented in Table 1.

### ***Current Status and Potential of Organic Farming in Pakistan***

The volume of organic imports from Pakistan to the European Union increased from 27091 metric tons (MT) in 2018 to 49959 MT in 2023 (Castillo-Díaz et al., 2023). The share of Pakistan in total imports is only 1.1 % while organic farmland is 0.2 % and the reported number of organic producers is 934 (Shaikh Tanveer et al., 2021; Willer et al., 2024). Pakistan is in the development/drafting phase of one operational regulation for policies, standards and regulations for organic farming. The national organic farming policy is at the stage of approval.

Khyber Pakhtunkhwa's climate change policy includes organic farming as one measure to improve productivity (Fahad et al., 2020; Ali et al., 2021b). Organic farming is more suitable for small farms. Farm sizes (81 % smaller than 5 ha) in Khyber Pakhtunkhwa are among the smallest in Pakistan and a single hectare of farmland supports an average of 18 people (Ali et al., 2020; Khan et al., 2021; Raza and Ullah, 2022). Most of the nuts and deciduous fruits (walnuts, pecans, pine nuts, almonds, pistachio, mulberry, apricot, fig, wild cumin etc.) are grown in the organic environment of mountainous regions, where fertilizers and pesticides are hardly used. Production of organic peaches in Swat & Cherries in Chitral is a regular activity. The interventions required are training of local farmers for processing, value addition and tagging of these fruits as organically grown products to get a premium price through exports and to incentivize the corporate sector for investment. Quality control systems can be developed for maintaining residue-free soil and marketable products. The

private sector has already identified virgin lands in the pockets of Khyber Pakhtunkhwa & Balochistan and 40,000 acres of organic cotton were certified in 2022. Southern districts of Khyber Pakhtunkhwa i.e., Tank and DI Khan have almost 64,000 hectares of land under the command area of Gomal Zam Dam are suitable for organic cotton production.

**Table 1: Comparison of organic farming with conventional farming**

| Practice/Intervention                    | Organic Farming | Conventional Farming |
|--|-----------------|----------------------|
| Fertilizer Use Efficiency                | High            | Low                  |
| Sustainable Soil Fertility Management    | Moderate        | Low                  |
| Nutrient Retention Capacity              | High            | Low                  |
| Nitrous Oxide Emissions                  | Low             | High                 |
| Rates of External Fertilizer Application | Low             | High                 |
| Soil Resilience Capacity                 | High            | Low                  |
| Soil Strength                            | Low             | High                 |
| Soil Bulk Density                        | Low             | High                 |
| Soil Total Porosity                      | High            | Low                  |
| Aggregate Stability                      | High            | Low                  |
| Infiltration Capacity                    | High            | Low                  |
| Hydraulic Conduction                     | High            | Low                  |
| Soil Erosion                             | Low             | High                 |
| The Build-up of Soil Organic Matter      | High            | Low                  |
| Carbon Sequestration Potential           | High            | Low                  |
| Water Capture Capacity                   | High            | Low                  |
| Microbial Biodiversity                   | High            | Low                  |

Sapphire Group signed a 5-year agreement in March 2022 with the worldwide Fund for Nature (WWF) to improve organic cotton production. An American company intends to import 50,000 bales of organic cotton from Pakistan. Experts have identified Balochistan province as the potential area for growing organic cotton as the area is free of pest pressure and farmers are using very few pesticides compared to other parts of the country. 34,000 bales of cotton exported to DENIM, France. IKEA & other multi-national brands are also interested in organic cotton of Pakistan. These brands made contracts growing of organic cotton in Pakistan by involving WWF. If proper planning and foresighted measures are timely taken, Pakistan has one of the greatest potentials among the developing countries. Millions of acres of highly fertile and productive-virgin lands under the command of five mega dams Akhori, Bhasha-Diamer, Kalabagh, Kuramtangi and Munda can be the potential areas for delineation as ‘organic farming’ areas. The ‘organic farming’ will have a direct impact on alleviating poverty by providing large-scale employment to unskilled & semi-skilled labour. The higher cost of chemical-based crop production is turning farming

unsustainable and thereby creating opportunities for small farmers to practice organic farming (Walia et al., 2022; Khan et al., 2022; Singh et al., 2024).

The above figures and facts elaborate on the significance of organic farming, therefore, the researchers of the Nuclear Institute for Food and Agriculture, Peshawar have contributed to organic farming by doing research work on the aspects of designing protocols and preparing compost and compost tea (fertilizer products for organic farming systems) from agro-wastes. Long-term field experiments had been established at the experimental farm of the institute to monitor the impact of conversion to organic farming. The trials are studying yield responses of wheat and potato besides monitoring changes in soil fertility under organic and conventional systems of production for the last five years. Preliminary findings depicted that it was possible to maintain yield and improve soil fertility under organic systems of production. The findings of these research activities have been disseminated regularly to the end users, researchers and students by conducting annual training events at the institute and by publishing the materials in peer-reviewed journals and local farming-oriented magazines.

## **CONCLUSION AND WAY FORWARD**

Despite knowing the detrimental effects of chemicals and the decrease in returns from conventional farming practices, solutions are sought from within the box. It is a myth that returns from organic farming are low, although this is not the case as it has been revealed through long-term research. Organic farming finds low priority in funding for research. It is assumed that organic farming is for richer countries, although this is not the case. The developed countries have defined specified programs for organic farming i.e., the EU and Germany's organic farming policy, the US organic initiative, Denmark's organic action plan, Japan's organic farming promotion, Australia's organic certification and market support and India's national program for organic production, to promote organic farming in their countries and support the farming communes. After studying these initiatives of the developed countries we need to define zones and pockets for organic farming, provide institutional support for organic farming, improve supplies of organic input and develop organic food markets. It is the need of the hour to invest in research to address challenges specific to organic farming in Pakistan, such as pest control and soil fertility management and to develop a regulatory framework similar to the EU's that clearly defines organic practices, labelling, and certification processes. Therefore it is needed to increase incentives to farmers for the promotion of organic farming, develop and implement policies to promote organic farming, increase the number of organic certifying bodies at the national level, improve processing & storage facilities for organic fruits and increase the involvement of private sector besides simultaneously provide information on organic production, certification and marketing to the organic producers.

We shall emphasize strengthening provincial & national research programs on organic farming and try to establish organic farming research & certifying institutes at the provincial level. Research-based technological solutions to the issues related to organic farming systems shall be a continuous process and the government shall establish a platform for the projection of organic farming practices in the context of changing climate. Drafting of provincial & national level organic farming policies shall be expedited while ensuring that these policies are implemented in letter and spirit. The government shall assign high priority towards the development of organic agriculture for creating employment & reducing poverty. We must target the international market for the export of organic products by capacity building and strengthening the certification system and strict surveillance by the International Organic Certifying Agency.



A scheme for the provision of incentives to farmers during the initial years of their conversion to the organic mode of production shall be introduced as it has been already successfully implemented in many countries across the globe. Funds shall also be allocated for the up gradation of existing storage & processing facilities for organic fruits & vegetables. Social & electronic media platforms shall be used to raise awareness of the benefits of organic farming. All relevant stakeholders must think out of the box with a strong will to promote organic farming as it is the sustainable way of farming that nurtures nature and saves our land resources for generations to come. We must think positively and partial conversion to organic farming shall be practiced particularly for horticultural crops.

#### **AUTHORS CONTRIBUTION**

Amir Raza provided basic idea, structured and wrote the article. Asif Ali contributed in proof reading, editing and type setting. Haroon Shahzad improved its technical contents.

#### **CONFLICT OF INTEREST**

There is no conflict of interest amongst authors

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