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Role of Organic and Natural Farming in Regenerative Agriculture

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Abstract: ***Regenerative agriculture aims to restore soil health, enhance biodiversity, and ensure long-term sustainability of farming systems. Organic and natural farming practices play a pivotal role in achieving these goals by reducing dependency on chemical inputs, improving soil fertility, and promoting ecological balance.***

Natural farming, a regenerative agriculture is advocated and promoted worldwide to produce safe and quality produce and to live in harmony with nature. It is "Chemical free farming" or "do-nothing farming" is a sustainable farming approach that aims to work with nature instead of trying to change it. Natural farming, exemplified by Zero Budget Natural Farming (ZBNF), goes even further by minimizing external inputs altogether. It relies on indigenous methods like Jeevamrith and Beejamruth to nurture soil health and control pests naturally.

The challenges in modern agriculture, including persistent hunger and malnutrition despite significant increases in production due to the Green Revolution. There are several negative impacts of chemical-based agriculture on soil health, environmental health and human health, particularly in countries like India with a large agricultural population. To address these issues, many are turning to alternative farming methods, such as organic and natural farming. Organic farming, rooted in traditional practices, aims to preserve soil health and produce food sustainably.This paper discusses the interconnection between organic and natural farming with regenerative agriculture, focusing on their impact on soil health, biodiversity, and sustainability. The research explores the benefits, challenges, and future prospects of integrating these systems to enhance agricultural resilience and productivity in a sustainable manner.

Keywords: Organic farming, Natural farming, Regenerative agriculture, Zero Budget Natural Farming, Soil health, Sustainability, Biodiversity

I. INTRODUCTION

Agriculture has been the backbone of human civilization, yet the modern era of intensive farming has led to serious environmental consequences such as soil degradation, biodiversity loss, and climate change.In many parts of the world, persistent and widespread hunger and malnutrition continue topose serious challenges, even in light of the notable increase in agricultural productionbetween 1960 and 2015, which can be partially attributed to productivity-enhancing GreenRevolution technologies and the extensive use of land, water, and other natural resourcesfor agricultural purposes.This has caused food supply chains to dramatically lengthen. Furthermore, all ruralsettlements save the most remote ones have seen an increase in the consumption of prepared,packaged, and processed goods. But even by 2050, the present rate of advancement wouldnot be enough to end hunger by 2030. For a variety of causes, modern chemical-basedagriculture has resulted in lower crop yields and higher production costs (Intawongse&Dean, 2006; Ayansina& Oso, 2006; Sreenivasa *et al*. 2010; Singh *et al*. 2011).

The potential for conservation agriculture exists on around 16% of India's land area; the restland is unsuitable for cultivation. Therefore, crop production efficiency needs to be raisedin order to alleviate food scarcity in highly inhabited placesRegenerative agriculture has emerged as a promising solution to restore the health of the planet while maintaining productivity. It integrates practices that restore ecosystem functions, rebuild soil organic matter, and enhance resilience to climate variability. Organic and natural farming systems are at the core of regenerative agriculture as they focus on working with nature rather than against it.

II. MATERIALS AND METHODS

The research for this paper is based on a qualitative analysis of secondary data, including published journal articles, government reports, and research studies from national and international sources. The data were reviewed to identify key principles, benefits, and outcomes of organic and natural farming systems in relation to regenerative agriculture. Comparative evaluation methods were used to analyze their contribution to soil fertility, crop productivity, biodiversity enhancement, and sustainability.

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III. ORGANIC FARMING

Organic farming is a method of agriculture that focuses on producing crops and livestock naturally without using synthetic chemicals such as fertilizers, pesticides, or genetically modified organisms (GMOs). It relies on biological processes, crop rotation, composting, green manuring, and the use of natural fertilizers to maintain soil fertility and ecological balance. The main goal of organic farming is to promote sustainable agriculture by preserving the health of the soil, environment, and consumers. It encourages biodiversity, conserves natural resources, and produces safe, nutritious, and chemical-free food. By avoiding harmful agrochemicals, organic farming helps reduce pollution, improve soil structure, and enhance the long-term productivity of the land. This eco-friendly approach supports both environmental sustainability and rural livelihoods, making it an important step toward achieving food security and healthy living for future generations.

IV. METHODS OF ORGANIC FARMING

1) Crop Rotation:

Growing different crops in a sequence to maintain soil fertility and reduce pest buildup. For example, cereals followed by legumes help fix nitrogen in the soil.This practice significantly boosts soilfertility, improves pest and disease control, and minimizes weed growth. To enhance soilhealth indicators like soil carbon, nitrogen, and aggregate stability, integrating perennialssuch as lucerne into crop rotation systems is essential (Barbieri *et al.*, 2017).

2) Intercropping:

Intercropping is another valuable technique in organic farming, offering benefits likeefficient weed control and increased overall output for farmers. This practice involvesconcurrently growing multiple crops in the same area, utilizing crop combinations tomanage weeds and prevent soil erosion (Pathania, 2020).

3) Cover Cropping:

Plants known as cover crops are cultivated with the primary aim of improving soil qualityrather than for commercial harvest. Within the realm of organic farming, the practice ofcover cropping involves intentionally growing specific plant species to protect and coverthe soil between the main crop seasons or periods of fallow (Scavo *et al.*, 2022).

4) Green Manuring:

Planting green manure crops (like sunhemp or dhaincha) and ploughing them into the soil improves soil organic matter and nutrient content.

5) Composting:

Composting converts organic waste such as crop residues, animal dung, and kitchen waste into nutrient-rich humus that enhances soil soil fertility.

6) Use of Organic Manures:

Organic fertilizers like farmyard manure (FYM), vermicompost, and biofertilizers provide essential nutrients and improve soil structure.

7) Mulching:

Covering the soil with organic materials (leaves, straw, crop residues) to conserve moisture and suppress weeds.

8) Use of Biofertilizers

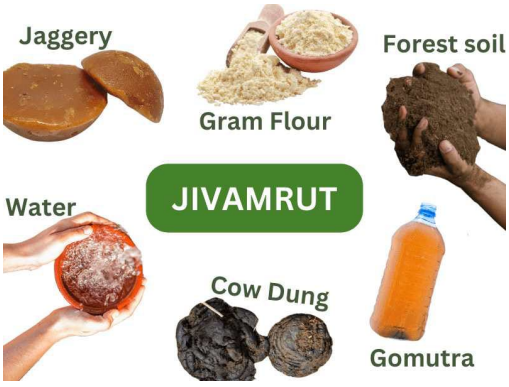
Microorganisms such as Rhizobium, Azospirillum, and Azotobacter fix atmospheric nitrogen and enhance plant growth.Utilizing diverse microbial strains like algae, fungi, and bacteria, bio-fertilizers play acrucial role in catalyzing specific soil microbial processes to enhance nutrient availabilityin a form that plants can readily uptake.

V. NATURAL FARMING

Natural farming is a sustainable agricultural practice that relies entirely on natural processes and inputs, without the use of synthetic fertilizers, pesticides, or even organic manures from outside the farm. It is based on the principle that nature already has everything needed for healthy crop growth. Farmers focus on maintaining soil fertility and biodiversity by using practices like mulching, crop rotation, mixed cropping, and the use of cow-based products such as Jeevamrutha and Beejamrutha. Popularized in India by Subhash Palekar as "Zero Budget Natural Farming (ZBNF)," this method minimizes external costs and promotes self-sufficiency for farmers. Natural farming improves soil health, enhances microbial activity, conserves water, and reduces pollution. It not only produces safe and nutritious food but also helps restore ecological balance, making it a key approach for achieving sustainable and climate-resilient agriculture."The natural farming is resource-efficient, minimizing the use of financial and natural resources while increasing crop yield. By restoring soil and water-related ecosystems, it decouples agricultural productivity from ecosystem degradation and biodiversity loss"

VI. FOUR PILLARS OF NATURAL FARMING

1) Jeevamrutha:



Jeevamrutha is a fermented microbial culture, where "Jeeva" means a living organism and "Amrutham" signifies an elixir of life, indicating its ability to enhance the life of any living organism. Jeevamrutha is prepared by mixing 10 kg of local cow dung with 10 liters of cow urine, 2 kg of local jaggery, 2 kg of pulse flour, and a handful of garden soil. This mixture is then diluted to 200 liters with water.

The mixture is kept in the shade, covered with a wet gunny bag, and stirred clockwise three times a day, allowing it to incubate. Jeevamrutha is a natural liquid fertilizer used in organic and natural farming to improve soil fertility and plant growth. It is prepared by fermenting cow dung, cow urine, jaggery, pulse flour, and farm soil in water for 24–48 hours. This promotes beneficial microorganisms in the soil, enhancing nutrient availability and soil health. Regular application of Jeevamrutha reduces the need for chemical fertilizers, boosts crop yield, and supports sustainable, eco-friendly farming practices, making it a key part of Zero Budget Natural Farming (ZBNF).

2) Beejamrutha:

Beejamrutha is a traditional seed treatment technique from ancient Indian agriculture. It involves preparing a nutrient-rich mixture applied to seeds before sowing. The name “Beejamrutha” comes from the Sanskrit words “Bheej” (seed) and “Amrutha” (nectar), highlighting its ability to revitalize and nourish seeds [19]. The preparation involves using local cow dung (a natural fungicide) and cow urine (an antibacterial liquid), along with lime and soil. The dung is tied in a cloth and soaked in urine for about 12 hours. Afterward, the dung is squeezed out, and 50 grams of lime are added to the urine. The seeds are then coated with Beejamritha and dried thoroughly before sowing. Leguminous seeds can be quickly dipped and dried.

3) Acchadana:

Acchadana, commonly known as mulching, is a natural farming practice where the soil surface is covered with organic materials such as straw, leaves, crop residues, or dried grasses. This technique helps to retain soil moisture, regulate soil temperature, and suppress weed growth. As the organic mulch decomposes, it adds nutrients and organic matter to the soil, improving its fertility and structure. Acchadana also supports beneficial microbial activity and reduces soil erosion, making it an important method in organic and natural farming for sustainable crop production.

4) Whapasa:

Whapasa refers to the presence of a mixture of 50% air and 50% water vapor in the spaces between soil particles. According to Palekar, plant roots need water in the form of vapors rather than liquid. Whapasa creates a microclimate in the soil, allowing soil organisms and roots to thrive with sufficient air and essential moisture. This microclimate increases water availability, enhances water-use efficiency, and builds resilience against drought. Most soil microorganisms and root hairs, which absorb water and nutrients, are active in the top 10-15 cm of the soil layer. Maintaining Whapasa in this soil zone is crucial

VII.PEST MANAGEMENT IN NATURAL FARMING USING ASTRAS

Table 1. Role of astras in pest management

Sl. No	Astras	Preparation	Control	Reference
1	Neemastra	The mixture is prepared by crushing 5 kg of neem leaves in water, then adding 5 liters of cow urine and 2 kg of cow dung. This mixture is fermented for 24 hours, with occasional stirring. After fermentation, the extract is filtered and diluted to 100 liters and can be applied as a foliar spray over an acre.	Mealy bugs and sucking pests.	[6]
2	Brahmastra	The formulation includes 10 liters of cow urine, along with 3 kg of neem leaves, 2 kg each of custard apple, papaya, pomegranate, and guava leaves. These ingredients are mixed together and boiled five times at intervals, allowing the contents to cool after each boiling session. After a resting period of 48 hours, the extract is filtered. Dilute 2 litres of extract in 100 litres of water for one acre.	It is effective against sucking pests and pod/fruit borers.	[7]
3	Agniastra	Mix 10 liters of local cow urine with crushed tobacco leaves, green chili, and garlic in an earthen pot. Add 5 kilograms of neem leaves pulp and boil the mixture thoroughly five times. Allow the solution to ferment for about 24 hours before straining it.	Aphids, sucking pests, stem borer, fruit borer and insects.	[8]
4	Dashparni	Neem leaves, Jatropa leaves, Heart-leaved moonseed leaves, Custard apple leaves, Karanja leaves, Castor leaves, Nerium leaves, oak leaves, green chilli, Garlic, Cow dung, Cow urine are the ingredients.	Controlling a wide range of insect pests and diseases.	[6]

VIII. POLICY IMPLICATIONS UNDER NATURAL FARMING

A. Gujarat Model and Scheme for Promoting Natural Farming

In the Budget 2020-21, the Gujarat government introduced special financial assistance to promote natural farming practices under the Gujarat Atma Nirbhar package. Further two schemes were launched on 17 September 2020**.**

- Sat PaglaKhedut Kalyanna: Rs. 900 monthly subsidy for the maintenance cost of one cow to a farming family practicing Natural farming.
- Pagala for Natural Farming: Provision of Rs.1248 subsidy to farmers for purchase of a natural farming kit to prepare Jevamrita .

B. PrakritikKheti Khushhal Kisan Yojana

Government of Himachal Pradesh launched a new scheme **"**PrakritikKheti Khushhal Kisan Yojana**"** for sustainable agriculture through non-chemical, low cost, climate resilient and environment friendly natural farming in the year 2018-2019. Under the scheme financial assistance maximum upto Rs. 8000 is being provided for lining of cattle sheds which would facilitate collection of cow urine, Rs. 750/ drum and three drums per natural farming maximum up to Rs. 2250 for purchase of drum for input storage. A subsidy of 50% is being provided for the purchase of Desi cow limited to Rs. 25,500 and additional Rs. 5000 for the transportation purpose. One time assistance of Rs. 10000 per farmer family for preparation and sale of various natural farming formulations .

C. Pilot Project by Government of Rajasthan for Promoting Natural Farming

"As per the budget speech of the Honorable Chief Minister of Rajasthan, Rs 6,000 Lakhs willbe spent to benefit 36,000 farmers in 15 districts during FY 2021-22. 750 Village Panchayats have been selected in 15 districts for implementing the scheme during FY2021-22 and a provision of expenditure of Rs 200 Lakhs has been made. The department of finance has allowed using Rs 500 Lakhs from State head and Rs 1,500 Lakhs from the Farmers Welfare Fund.

D. Natural Mission on Natural Farming

"This mission was launched by the government of India to motivate farmers to adopt chemical free farming and enhance the reach of natural farming as a separate and independent scheme by up scaling the Bhartiya Prakritik Krishi Paddati schemes".

IX. RESULTS AND DISCUSSION:

Organic and natural farming practices contribute significantly to regenerative agriculture through several mechanisms. Firstly, they improve soil structure and fertility by enhancing organic matter content and microbial activity. Practices such as composting, green manuring, and crop rotation restore soil nutrients and promote long-term productivity. Secondly, these farming systems reduce pollution and greenhouse gas emissions by eliminating synthetic fertilizers and pesticides. The use of bio-inputs and natural pest control promotes ecological balance and reduces environmental degradation.

Natural farming approaches such as Zero Budget Natural Farming (ZBNF) in India have shown remarkable success in improving soil fertility and reducing farmers' dependence on external inputs. ZBNF emphasizes the use of indigenous cow-based formulations like Jeevamrutha, Beejamrutha, and Agniastra, which enrich soil microorganisms and improve crop health. Studies in Andhra Pradesh and Karnataka have reported that farmers practicing ZBNF achieved better yields, reduced costs, and improved soil quality compared to conventional systems.

In the context of regenerative agriculture, organic and natural farming not only enhance soil carbon sequestration but also mitigate climate change by reducing carbon emissions. These systems encourage minimal tillage, cover cropping, and perennial plantings, which help in maintaining soil structure and water retention. Farmers adopting such methods contribute to sustainable food production systems that support both human and environmental well-being.

X. CHALLENGES

Despite the multiple benefits, several challenges hinder the widespread adoption of organic and natural farming. Transitioning from conventional to regenerative practices often involves initial yield reductions and requires significant knowledge and training. Lack of market support, certification issues, and limited access to organic inputs are also major obstacles. Furthermore, policy frameworks in many developing countries still prioritize input-intensive agriculture, slowing the shift toward sustainable systems.

XI. CONCLUSION

Organic and natural farming form the foundation of regenerative agriculture by promoting ecological harmony, improving soil health, and ensuring long-term sustainability. These practices have proven potential to transform modern agriculture into a climate-resilient and environmentally sound system. For successful implementation, government policies, research institutions, and farmers must collaborate to strengthen support systems, provide training, and develop markets for organic produce.

The future of agriculture depends on adopting regenerative principles that align productivity with environmental stewardship.

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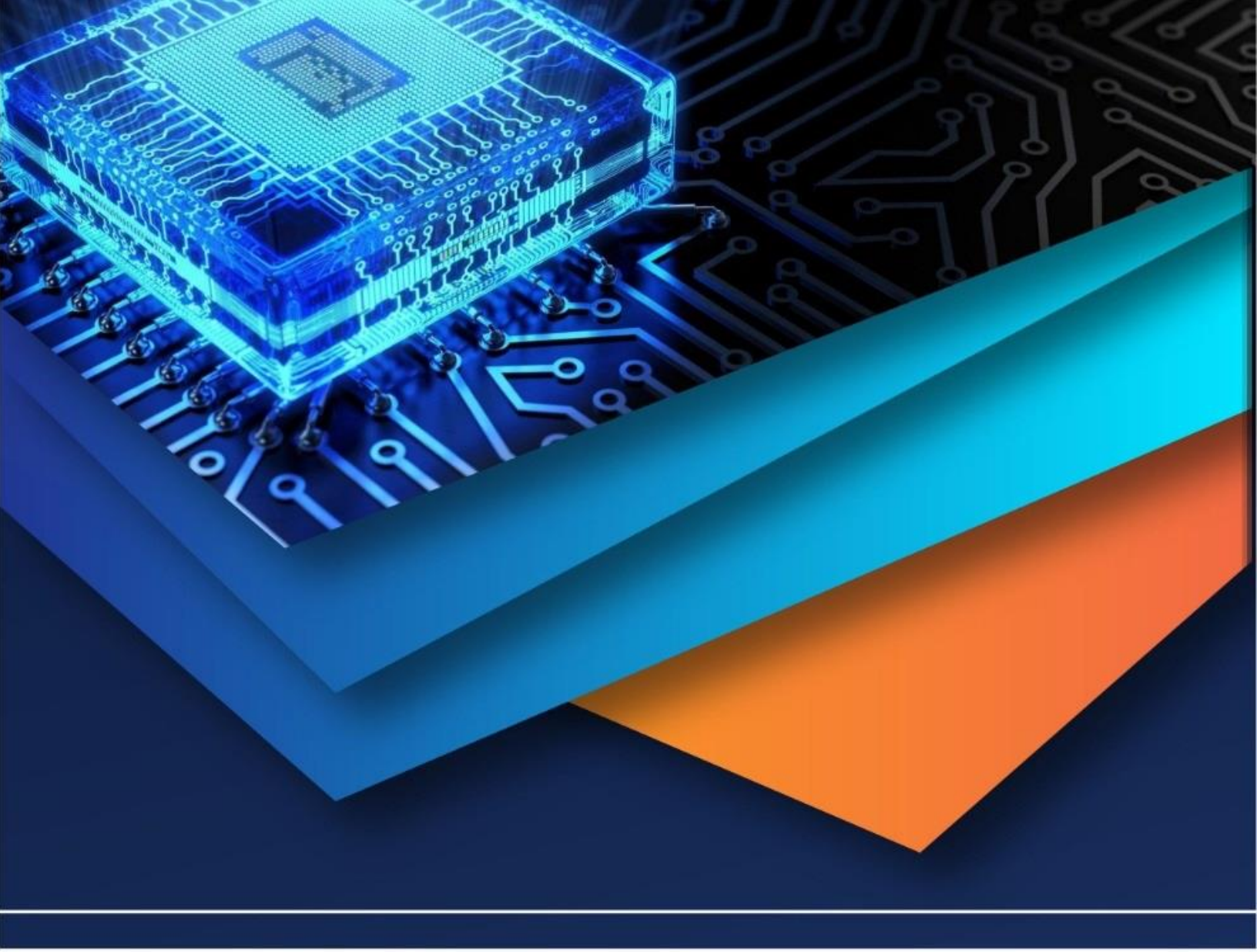

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