

Krishi Ujala

A MONTHLY MAGAZINE ON MODERN AGRICULTURE

SOIL HEALTH & ORGANIC FARMING

The Foundation of
Healthy Crops &
Sustainable Future



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Practical & Proven Methods



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10 Signs Your Soil Needs Immediate Attention**Rekha Kumari¹****¹Msc. Scholar, Department of Soil Science, G.B.P.U.A.T, Pantnagar****Abstract :**

Soil is the foundation of agriculture, providing plants with essential nutrients, water, air, and physical support. However, continuous cultivation, excessive use of chemical fertilizers, improper irrigation, and climate change have accelerated soil degradation across many agricultural regions. Declining soil health directly affects crop productivity, input-use efficiency, and farm profitability. Recognizing early warning signs of soil deterioration enables farmers to take timely corrective measures and restore soil fertility before irreversible damage occurs. This article discusses ten visible and measurable indicators that signal declining soil health, explains their underlying causes, and provides practical, sustainable management strategies. By adopting integrated soil management practices, including organic amendments, balanced fertilization, crop rotation, and conservation agriculture, farmers can improve soil productivity, ensure long-term agricultural sustainability, and enhance resilience against climate variability.

Introduction

Healthy soil is the foundation of productive agriculture and sustainable farming. It is a living ecosystem made up of minerals, organic matter, water, air, beneficial microorganisms, insects, and earthworms that work together to support healthy plant growth. However, continuous cultivation, excessive tillage, overuse of chemical fertilizers, monocropping, erosion, and poor irrigation practices gradually degrade soil health. As fertility declines, crop productivity and profitability are also affected. Fortunately, soil often shows early warning signs before severe degradation occurs. Recognizing these signs allows farmers to take timely corrective measures and restore soil fertility.

1. Declining Crop Yield Despite Fertilizer Application

One of the earliest signs of unhealthy soil is a steady decline in crop yield even after applying the recommended amount of fertilizers. This usually indicates poor soil organic matter, nutrient imbalance, compaction, or reduced microbial activity. Regular soil testing, balanced fertilizer application, crop rotation with legumes, and the addition of farmyard manure or compost can help restore soil productivity.

2. Hard and Compacted Soil

Healthy soil should be loose and easy for roots to penetrate. If the soil becomes hard after drying or is difficult to cultivate, it may be compacted. Compacted soil restricts root growth, reduces water

infiltration, and limits oxygen availability to plant roots and beneficial microbes. Incorporating organic matter, reducing heavy machinery traffic, and growing deep-rooted crops are effective ways to improve soil structure.

3. Water Stagnation After Rainfall

Healthy soil absorbs rainwater quickly. When water remains standing on the field for long periods after rainfall or irrigation, it is a sign of poor soil structure or inadequate drainage. Waterlogging can damage roots and reduce nutrient uptake. Improving drainage, increasing soil organic matter, and adopting minimum tillage practices can enhance water infiltration and soil health.

4. Soil Erosion

The loss of fertile topsoil due to rain or wind is a serious indicator of soil degradation. Topsoil contains most of the nutrients, organic matter, and beneficial microorganisms required for healthy crop growth. Farmers can minimize soil erosion by using cover crops, mulching, contour farming, vegetative barriers, and conservation tillage to protect the soil surface.

5. Fewer Earthworms

Earthworms are natural indicators of healthy soil because they improve soil aeration, nutrient cycling, and organic matter decomposition. A noticeable decline in earthworm populations may indicate excessive pesticide use, soil compaction, low organic matter, or acidic soil conditions. Applying compost or vermicompost and reducing chemical pesticide use can help restore earthworm activity.

6. Yellowing or Stunted Crops

Yellow leaves, poor plant growth, and uneven crop development often indicate nutrient deficiencies or poor soil fertility. Deficiencies of nitrogen, zinc, iron, sulphur, and magnesium are common in degraded soils. Soil testing, balanced fertilization, biofertilizers, and improved organic carbon management can correct these deficiencies and promote healthy crop growth.

7. Cracked Soil During Dry Weather

Deep cracks appearing in the soil during dry periods suggest poor soil structure and low organic matter. This problem is commonly observed in degraded clay soils, where moisture is rapidly lost. Regular application of compost, green manures, crop residues, and mulching helps improve soil aggregation and moisture retention.

8. Poor Seed Germination

Uneven or poor seed germination is often linked to unhealthy soil rather than poor-quality seed. Surface crusting, waterlogging, soil salinity, and nutrient imbalances create unfavorable conditions for seed emergence. Preparing a fine seedbed, maintaining proper soil moisture, improving drainage, and adding organic amendments can significantly improve germination rates.

9. Excessive Weed Growth

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An unusually high population of weeds may indicate underlying soil problems. Certain weed species thrive in acidic, compacted, or nutrient-deficient soils, while others dominate waterlogged fields. Instead of simply removing weeds, farmers should identify and address the underlying soil conditions that encourage their growth.

10. Low Organic Matter

Organic matter is the engine of soil fertility. It improves soil structure, enhances water-holding capacity, increases microbial activity, and makes nutrients more available to plants. Soils with low organic matter often have reduced fertilizer efficiency, poor moisture retention, and lower crop yields. Regular incorporation of farmyard manure, compost, vermicompost, green manure crops, and recycled crop residues is essential for rebuilding soil health.

Best Practices for Restoring Soil Health

Maintaining healthy soil requires continuous care and sustainable management. Farmers should conduct soil testing every two to three years, apply organic manures regularly, practice crop rotation, reduce unnecessary tillage, retain crop residues, use biofertilizers, avoid excessive chemical inputs, prevent soil erosion through mulching and cover crops, and maintain proper irrigation and drainage. Regular monitoring of soil health indicators helps prevent long-term degradation.

Conclusion

Healthy soil is the cornerstone of productive and sustainable agriculture. Warning signs such as declining yields, compacted soil, waterlogging, erosion, fewer earthworms, poor crop growth, cracked soil, uneven germination, excessive weeds, and low organic matter should never be ignored. By recognizing these symptoms early and adopting integrated soil management practices, farmers can restore soil fertility, improve crop productivity, reduce production costs, and build resilience against climate change. Protecting soil today ensures healthy crops, higher farm income, and a sustainable future for generations to come.

How to Restore Degraded Soil Naturally

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Abstract :

Soil degradation has become one of the greatest challenges facing modern agriculture, threatening food security, farm profitability, and environmental sustainability. Continuous monocropping, excessive tillage, overuse of chemical fertilizers and pesticides, soil erosion, and poor water management have significantly reduced soil fertility and biological activity in many agricultural regions. Natural soil restoration focuses on rebuilding soil organic matter, improving soil structure, enhancing microbial diversity, and restoring nutrient cycling without relying heavily on synthetic inputs. This article discusses practical and eco-friendly approaches to restoring degraded soils, including the use of organic manures, cover crops, crop rotation, conservation tillage, biofertilizers, mulching, and efficient water management. These sustainable practices not only improve soil productivity but also increase resilience to climate change while ensuring long-term agricultural sustainability..

Introduction

Healthy soil is one of the most valuable natural resources available to farmers. It supports plant growth by supplying nutrients, storing water, allowing root development, and providing a habitat for billions of beneficial microorganisms. However, decades of intensive farming practices have caused widespread soil degradation across the world. Excessive use of chemical fertilizers, repeated deep tillage, removal of crop residues, erosion, and poor irrigation practices have reduced soil organic matter, damaged soil structure, and weakened biological activity. As a result, many farmers experience declining crop yields despite increasing production costs. Restoring degraded soil naturally is not only environmentally responsible but also economically beneficial, as healthy soils require fewer external inputs and produce more resilient crops. By adopting nature-based farming practices, farmers can gradually rebuild soil fertility and ensure sustainable agricultural production.

Increase Soil Organic Matter

Organic matter is the foundation of healthy soil because it improves soil structure, increases water-holding capacity, enhances nutrient availability, and supports beneficial microorganisms. Degraded soils are often characterized by low organic carbon levels, making them less productive and more vulnerable to erosion. Farmers can restore soil organic matter by applying well-decomposed farmyard manure, compost, vermicompost, green manure, and recycled crop residues. Regular

addition of organic materials gradually improves soil fertility, encourages microbial activity, and enhances long-term productivity.

Practice Crop Rotation

Growing the same crop repeatedly on the same land depletes specific nutrients and encourages the build-up of pests and diseases. Crop rotation helps restore soil health by improving nutrient balance and breaking pest cycles. Including leguminous crops such as pulses in the rotation naturally enriches the soil with nitrogen through biological nitrogen fixation. Diversified cropping systems also promote greater microbial diversity, improve soil structure, and reduce dependence on synthetic fertilizers.

Grow Cover Crops and Green Manures

Keeping the soil covered throughout the year is one of the most effective ways to restore degraded land. Cover crops such as cowpea, sunn hemp, dhaincha, and clover protect the soil from erosion, suppress weeds, improve moisture conservation, and add valuable organic matter when incorporated into the soil. Green manure crops decompose rapidly and release nutrients that become available to subsequent crops while improving soil aggregation and microbial activity.

Reduce Excessive Tillage

Frequent and deep tillage disturbs soil structure, accelerates the decomposition of organic matter, and destroys habitats for beneficial organisms. Conservation tillage or minimum tillage helps preserve soil aggregates, maintain moisture, reduce erosion, and support healthy microbial communities. Leaving crop residues on the soil surface further protects the land from temperature fluctuations and improves soil fertility over time.

Use Compost and Vermicompost

Compost and vermicompost are among the most effective natural soil amendments. They supply essential nutrients in a slow and balanced manner while improving soil texture and stimulating microbial activity. Vermicompost, produced through the action of earthworms, is particularly rich in plant nutrients, enzymes, and beneficial microorganisms that promote root growth and enhance nutrient availability. Regular application of compost not only restores degraded soils but also reduces dependence on chemical fertilizers.

Promote Beneficial Soil Microorganisms

Healthy soil contains billions of bacteria, fungi, actinomycetes, and other microorganisms that decompose organic matter, recycle nutrients, and suppress harmful pathogens. Excessive use of chemical pesticides and fertilizers often reduces microbial diversity. Farmers can restore biological activity by using biofertilizers, microbial inoculants, compost, and organic amendments. A

biologically active soil supports stronger root systems, improves nutrient uptake, and increases crop resilience to environmental stress.

Apply Mulching for Soil Protection

Mulching involves covering the soil surface with crop residues, straw, leaves, or other organic materials. This simple practice conserves soil moisture, regulates soil temperature, suppresses weeds, and prevents erosion caused by wind and rain. As organic mulches gradually decompose, they contribute valuable organic matter to the soil and stimulate biological activity. Mulching is particularly beneficial in drought-prone and rainfed farming systems.

Manage Water Efficiently

Both excessive irrigation and prolonged drought can degrade soil quality. Waterlogged soils lose oxygen, reducing root growth and microbial activity, while dry soils become compacted and prone to erosion. Efficient irrigation methods such as drip irrigation, sprinkler systems, rainwater harvesting, and proper drainage help maintain optimum soil moisture conditions. Balanced water management preserves soil structure and enhances nutrient availability for crops.

Prevent Soil Erosion

Soil erosion removes the nutrient-rich topsoil that is essential for crop production. Natural restoration requires protecting the soil surface through contour farming, terracing, grass strips, cover crops, agroforestry, and vegetative barriers. These conservation measures reduce runoff, improve water infiltration, and preserve valuable soil resources for future generations.

Monitor Soil Health Regularly

Restoring degraded soil is a gradual process that requires continuous monitoring and adaptive management. Regular soil testing helps farmers understand nutrient status, soil pH, organic carbon content, and other important indicators of soil health. By monitoring these parameters every two to three years, farmers can make informed decisions regarding fertilizer application, organic amendments, and crop selection, ensuring sustainable improvement in soil productivity.

Benefits of Natural Soil Restoration

Restoring soil naturally offers multiple long-term benefits beyond increased crop yields. Healthy soils improve water-use efficiency, reduce fertilizer requirements, support beneficial biodiversity, increase carbon sequestration, and enhance resilience against droughts and floods. They also contribute to improved food quality, reduced production costs, and greater environmental sustainability. Investing in soil restoration today creates healthier farms, stronger rural livelihoods, and a more secure agricultural future.

Conclusion

Degraded soil can be restored successfully through patience, sustainable management, and nature-based farming practices. Increasing organic matter, practicing crop rotation, growing cover crops, reducing tillage, using compost and biofertilizers, conserving water, preventing erosion, and regularly monitoring soil health work together to rebuild soil fertility and biological activity. Although soil restoration is a gradual process, its benefits are long-lasting, resulting in healthier crops, improved farm income, and greater resilience to climate change. Farmers who care for their soil today are investing in the productivity and sustainability of future generations.

Soil pH Management for Different Crops

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Abstract

Soil pH is one of the most important factors influencing crop growth, nutrient availability, microbial activity, and overall soil health. It determines the chemical environment in which plant roots absorb essential nutrients and directly affects fertilizer efficiency. Most agricultural crops perform best within a specific soil pH range, and even fertile soils can produce poor yields if the pH is too acidic or too alkaline. Improper soil pH can lead to nutrient deficiencies, toxicities, reduced microbial activity, and poor root development. Effective soil pH management involves regular soil testing, appropriate use of soil amendments such as lime and gypsum, balanced fertilization, organic matter incorporation, and selecting crops suited to local soil conditions. This article discusses the importance of soil pH, its effects on crop productivity, and practical strategies for managing soil pH for

Keywords: Soil pH, Soil acidity, Alkaline soil, Liming, Gypsum, Soil fertility, Nutrient management, Sustainable agriculture

Introduction

Soil pH is a measure of the acidity or alkalinity of the soil and is expressed on a scale of 0 to 14. A pH value below 7 indicates acidic soil, while values above 7 indicate alkaline soil, with pH 7 being neutral. Although soil contains many nutrients, plants can absorb them efficiently only when the soil pH falls within an appropriate range. Soil pH also influences microbial activity, decomposition of organic matter, nitrogen fixation, and the availability of essential nutrients such as phosphorus, iron, zinc, calcium, and magnesium. Continuous cultivation, excessive fertilizer use, poor irrigation practices, and natural weathering often alter soil pH over time. Therefore, understanding and managing soil pH is essential for improving crop yields, maintaining soil fertility, and ensuring long-term agricultural sustainability.

Why Soil pH Matters

Soil pH determines the availability of nutrients to plants and the activity of beneficial soil microorganisms. In acidic soils, nutrients such as phosphorus, calcium, and magnesium become less available, while toxic elements like aluminium and manganese may increase to harmful levels. In highly alkaline soils, micronutrients such as iron, zinc, manganese, and boron become unavailable, resulting in nutrient deficiencies despite their presence in the soil. Maintaining the correct soil pH

improves fertilizer efficiency, encourages healthy root development, enhances microbial activity, and increases crop productivity.

Ideal Soil pH for Different Crops

Different crops require different soil pH ranges for optimum growth. Most cereals, including wheat, maize, and rice, perform well in soils with a pH between 6.0 and 7.5. Pulses generally grow best in slightly acidic to neutral soils with a pH of 6.0–7.0, where nitrogen-fixing bacteria remain highly active. Oilseed crops such as mustard, groundnut, and soybean prefer soils with a pH between 6.0 and 7.5. Vegetable crops usually produce higher yields in soils ranging from pH 6.0 to 7.0, while fruit crops such as mango, guava, citrus, and pomegranate perform well in soils with a pH between 5.5 and 7.5 depending on the species. Tea thrives in strongly acidic soils, whereas crops like barley, cotton, sugar beet, and asparagus tolerate slightly alkaline conditions better than most crops. Matching crop selection with the existing soil pH improves nutrient uptake and overall productivity.

Managing Acidic Soils

Acidic soils are common in regions with high rainfall, where nutrients such as calcium and magnesium are gradually leached from the soil profile. These soils often show poor root growth, low phosphorus availability, and aluminium toxicity. The most effective method of correcting acidic soils is the application of agricultural lime, which neutralizes excess acidity and increases soil pH gradually. Incorporating organic matter such as compost, farmyard manure, and green manure also helps buffer soil acidity while improving soil structure and microbial activity. Balanced fertilizer use and avoiding excessive application of acid-forming fertilizers further help maintain a suitable soil pH for crop production.

Managing Alkaline Soils

Alkaline soils are widespread in arid and semi-arid regions where excessive evaporation leads to the accumulation of salts and sodium. These soils often exhibit poor soil structure, low water infiltration, and deficiencies of iron, zinc, manganese, and phosphorus. Soil reclamation begins with improving drainage and applying gypsum to replace exchangeable sodium in sodic soils. Incorporating organic matter increases microbial activity and improves soil aggregation, while the use of acid-forming fertilizers, where appropriate, can gradually reduce soil pH. Foliar application of micronutrients often provides immediate relief from nutrient deficiencies in alkaline soils.

Role of Organic Matter in pH Management

Organic matter plays a crucial role in maintaining stable soil pH by acting as a natural buffer against sudden changes in acidity or alkalinity. Compost, vermicompost, crop residues, and green manures not only improve soil structure but also enhance nutrient availability and stimulate beneficial microbial populations. As organic materials decompose, they release organic acids that improve

nutrient solubility and help maintain a balanced soil environment. Regular application of organic amendments is therefore an essential component of long-term soil pH management.

Importance of Soil Testing

Regular soil testing is the most reliable method of determining soil pH and identifying nutrient deficiencies before planting a crop. Soil analysis provides valuable information on pH, organic carbon, nutrient status, and salinity, enabling farmers to make informed decisions regarding fertilizer application and soil amendments. Testing soil every two to three years helps prevent unnecessary input costs, improves fertilizer-use efficiency, and ensures that corrective measures are applied before crop performance declines.

Integrated Soil pH Management Practices

Successful soil pH management requires an integrated approach rather than relying on a single practice. Farmers should monitor soil pH regularly, apply lime or gypsum according to soil test recommendations, increase organic matter through compost and crop residues, practice crop rotation, use balanced fertilizers, maintain proper irrigation and drainage, and select crops suited to the existing soil conditions. Combining these practices creates a stable soil environment that supports healthy plant growth and long-term soil productivity.

Benefits of Proper Soil pH Management

Maintaining an optimum soil pH significantly improves nutrient availability, fertilizer efficiency, root growth, microbial activity, and crop yield. Healthy soil pH reduces nutrient losses, minimizes fertilizer wastage, increases resistance to pests and diseases, and enhances water-use efficiency. It also contributes to improved soil structure, greater biodiversity, and sustainable agricultural production while reducing environmental pollution caused by excessive fertilizer use.

Conclusion

Soil pH is often referred to as the "master variable" of soil health because it influences nearly every biological and chemical process occurring within the soil. Even the best crop varieties and fertilizers cannot perform efficiently if soil pH is unsuitable. Regular soil testing, timely correction of acidic or alkaline conditions, incorporation of organic matter, and adoption of integrated nutrient management practices are essential for maintaining optimum soil pH. By managing soil pH according to crop requirements, farmers can achieve higher productivity, better fertilizer efficiency, healthier soils, and sustainable agricultural development for future generations.

Role of Earthworms in Soil Fertility

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Abstract

Earthworms are among the most beneficial organisms in agricultural soils, playing a vital role in maintaining soil fertility and ecosystem health. Often referred to as "nature's ploughmen" or "ecosystem engineers," they improve soil structure, enhance nutrient cycling, increase water infiltration, and promote microbial activity. Their feeding and burrowing activities convert organic residues into nutrient-rich casts, improving soil aeration, root penetration, and moisture retention. Healthy earthworm populations are strong indicators of fertile and biologically active soils. However, intensive tillage, excessive use of chemical fertilizers and pesticides, and declining organic matter have significantly reduced earthworm populations in many agricultural regions. This article explores the ecological importance of earthworms, their contribution to soil fertility, factors affecting their populations, and practical methods to conserve and promote earthworms for sustainable agriculture.

Keywords: Earthworms, Soil fertility, Soil health, Vermicompost, Organic farming, Soil biology, Sustainable agriculture

Introduction

Soil is a living ecosystem that supports countless organisms working together to sustain plant growth. Among these organisms, earthworms are considered one of the most valuable because of their remarkable ability to improve soil quality naturally. Charles Darwin once described earthworms as one of the most important creatures on Earth due to their contribution to soil formation. As they move through the soil, earthworms create tunnels, consume organic matter, and produce nutrient-rich casts that enrich the soil. Their activities improve physical, chemical, and biological properties of the soil, making it more productive and resilient. A healthy population of earthworms is often regarded as a sign of fertile soil capable of supporting sustainable crop production.

Earthworms as Nature's Soil Engineers

Earthworms continuously burrow through the soil in search of food, creating networks of channels that improve soil aeration and water movement. These tunnels allow oxygen to reach plant roots and beneficial microorganisms while enabling rainwater and irrigation water to penetrate deeper into the soil profile. Improved soil porosity also reduces surface runoff and minimizes soil erosion. By naturally loosening compacted soils, earthworms create an ideal environment for healthy root growth and efficient nutrient absorption.

Contribution to Nutrient Cycling

Earthworms feed on decaying leaves, crop residues, and other organic materials present in the soil. During digestion, organic matter is broken down into simpler forms, and the nutrients are released in forms readily available to plants. Their excreta, commonly known as worm casts, contain higher concentrations of nitrogen, phosphorus, potassium, calcium, magnesium, and several micronutrients than the surrounding soil. These nutrient-rich casts act as natural fertilizers, improving soil fertility and reducing the need for synthetic fertilizers over time.

Improvement of Soil Structure

One of the greatest benefits of earthworms is their ability to improve soil structure. Their burrowing activity mixes organic matter with mineral soil particles, creating stable soil aggregates that enhance water infiltration and root penetration. Well-aggregated soils are less prone to compaction and erosion and can retain moisture for longer periods. Improved soil structure also facilitates better seed germination and healthier crop establishment, particularly in degraded agricultural lands.

Enhancing Soil Microbial Activity

Earthworms play an important role in stimulating beneficial soil microorganisms. As organic matter passes through their digestive system, it becomes inoculated with bacteria, fungi, and actinomycetes that accelerate decomposition and nutrient cycling. Their casts provide a favorable habitat rich in nutrients and moisture, encouraging microbial growth. Increased microbial activity enhances soil fertility, suppresses certain soil-borne pathogens, and promotes healthier plant growth.

Role in Water Conservation

Healthy soils containing abundant earthworms absorb and retain water more effectively than compacted soils. Earthworm burrows create natural channels that increase water infiltration, reduce runoff, and improve groundwater recharge. Their activities also increase the soil's water-holding capacity by improving aggregation and organic matter content. As a result, crops grown in earthworm-rich soils are often more resilient to drought and water stress.

Earthworms and Vermicomposting

Earthworms are widely used in vermicomposting, a sustainable method of converting organic waste into nutrient-rich manure. Species such as *Eisenia fetida* efficiently decompose crop residues, vegetable waste, and farmyard manure into high-quality vermicompost. Vermicompost contains essential plant nutrients, beneficial microorganisms, enzymes, and growth-promoting substances that improve soil fertility and enhance crop performance. The use of vermicompost also supports waste recycling and reduces dependence on chemical fertilizers.

Factors Affecting Earthworm Populations

Despite their importance, earthworm populations are declining in many agricultural fields due to unsustainable farming practices. Excessive tillage destroys their burrows and exposes them to predators, while indiscriminate use of pesticides and certain chemical fertilizers can reduce their survival. Low organic matter, prolonged drought, waterlogging, and soil compaction also create unfavorable conditions for earthworm activity. Maintaining healthy soils therefore requires farming practices that protect these beneficial organisms.

Practices to Encourage Earthworms

Farmers can significantly increase earthworm populations by adopting sustainable soil management practices. Regular application of farmyard manure, compost, vermicompost, and crop residues provides a continuous food source for earthworms. Reducing unnecessary tillage helps preserve their burrows and habitat, while minimizing pesticide use protects them from harmful chemicals. Mulching, cover cropping, balanced irrigation, and maintaining adequate soil moisture further create favorable conditions for earthworm growth and reproduction. Integrating these practices into farming systems promotes a biologically active and fertile soil ecosystem.

Benefits of Earthworms in Sustainable Agriculture

Earthworms provide numerous economic and environmental benefits to agriculture. They naturally improve nutrient availability, reduce soil compaction, increase fertilizer-use efficiency, enhance water infiltration, and support beneficial microbial populations. Their activities reduce erosion, improve crop productivity, lower input costs, and contribute to long-term soil sustainability. Fields with healthy earthworm populations often require fewer external inputs while maintaining higher soil fertility and greater resilience to climate-related stresses.

Conclusion

Earthworms are indispensable partners in sustainable agriculture. Through their continuous burrowing, feeding, and casting activities, they improve soil structure, increase nutrient availability, stimulate microbial activity, and enhance water conservation. Protecting and promoting earthworm populations should be an essential component of modern soil management strategies. By reducing excessive tillage, increasing organic matter, minimizing harmful chemical inputs, and adopting conservation farming practices, farmers can harness the natural services provided by earthworms to restore soil fertility and achieve higher, more sustainable crop yield.

Traditional Bio-Inputs for Healthy Soil and Sustainable Farming

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Abstract

The increasing demand for sustainable agriculture has revived interest in traditional bio-inputs that improve soil fertility while reducing dependence on chemical fertilizers and pesticides. Among the most widely adopted natural farming formulations are Jeevamrut, Beejamrut, and Ghan Jeevamrut, developed and popularized under natural farming systems. These preparations are made using locally available materials such as indigenous cow dung, cow urine, pulse flour, jaggery, and soil from the farm. Rich in beneficial microorganisms and nutrients, they enhance soil biological activity, improve nutrient availability, promote healthy root development, and protect crops from diseases. This article explains the composition, preparation methods, applications, and benefits of Jeevamrut, Beejamrut, and Ghan Jeevamrut, highlighting their role in restoring soil health and promoting environmentally sustainable agriculture.

Keywords: Jeevamrut, Beejamrut, Ghan Jeevamrut, Natural Farming, Bio-inputs, Organic Agriculture, Soil Health, Microbial Activit

Introduction

Healthy soil is the foundation of productive agriculture, and maintaining its biological activity is essential for sustainable crop production. Over the years, excessive dependence on synthetic fertilizers and pesticides has reduced soil organic matter and weakened beneficial microbial populations. Natural farming offers an eco-friendly alternative by encouraging the use of biological inputs prepared from locally available resources. Jeevamrut, Beejamrut, and Ghan Jeevamrut are among the most effective formulations used by farmers to enrich soil fertility, improve nutrient cycling, and strengthen plant health. These preparations are inexpensive, easy to prepare, and suitable for farmers of all scales, making them an important component of sustainable agriculture.

What is Jeevamrut?

Jeevamrut is a liquid bio-fertilizer prepared by fermenting fresh dung and urine from indigenous cows with jaggery, pulse flour, water, and a small quantity of fertile soil. During fermentation, billions of beneficial microorganisms multiply rapidly, producing a nutrient-rich solution that stimulates soil biological activity. Jeevamrut is not a fertilizer in the conventional sense; instead, it acts as a microbial culture that activates the natural nutrient cycle within the soil. Regular application improves microbial diversity, enhances nutrient availability, promotes root growth, and increases soil

organic activity. Farmers generally apply Jeevamrut through irrigation water or as a soil drench at intervals of 15–20 days during the crop season.

Preparation of Jeevamrut

Preparing Jeevamrut is simple and economical. Fresh indigenous cow dung is mixed with cow urine, jaggery, pulse flour such as gram flour, a handful of fertile soil collected from the farm bund, and sufficient water. The mixture is stirred thoroughly twice daily for about five to seven days to encourage microbial growth. Once fermentation is complete, the solution is ready for application in the field. Since the ingredients are inexpensive and readily available, Jeevamrut offers a cost-effective solution for improving soil health.

What is Beejamrut?

Beejamrut is a natural seed treatment formulation used before sowing seeds or planting seedlings. It is prepared using fresh cow dung, cow urine, lime, water, and a small amount of fertile soil. The purpose of Beejamrut is to protect seeds from seed-borne and soil-borne diseases while encouraging rapid germination and healthy root development. Beneficial microorganisms present in the solution form a protective coating around the seed, suppressing harmful pathogens during the early stages of plant growth. Seed treatment with Beejamrut improves seed vigour, enhances root establishment, and reduces dependence on chemical fungicides.

Preparation and Application of Beejamrut

The ingredients are mixed thoroughly and allowed to stand for several hours before use. Seeds are dipped or coated uniformly with the prepared solution and then shade-dried before sowing. Seedlings intended for transplanting may also have their roots dipped in Beejamrut before planting. This simple practice significantly improves seed germination, reduces disease incidence, and supports healthy crop establishment.

What is Ghan Jeevamrut?

Ghan Jeevamrut is the solid form of Jeevamrut, developed for situations where liquid application is difficult or water availability is limited. It contains the same beneficial microorganisms and nutrients but is prepared as granules or small cakes that can be stored for longer periods. Ghan Jeevamrut gradually releases nutrients and microbial populations into the soil, making it highly suitable for field crops, horticultural plantations, and rainfed farming systems.

Preparation and Use of Ghan Jeevamrut

Ghan Jeevamrut is prepared by mixing indigenous cow dung, cow urine, jaggery, pulse flour, and fertile soil until a thick paste is formed. The mixture is then shaped into small balls or granules and dried under shade. After drying, it can be stored and applied near the root zone or mixed into the soil during land preparation. Because of its solid form, Ghan Jeevamrut is easy to transport, store, and apply, especially in areas where irrigation facilities are limited.

Benefits of Jeevamrut, Beejamrut and Ghan Jeevamrut

These natural bio-inputs offer numerous agronomic and environmental benefits. They increase microbial populations in the soil, improve nutrient availability, enhance organic matter decomposition, and stimulate healthy root growth. Their regular use improves soil structure, water-holding capacity, and overall soil fertility while reducing the need for chemical fertilizers and pesticides. Farmers also benefit from lower cultivation costs, healthier crops, and improved long-term productivity. Since all three formulations are prepared using locally available materials, they are economical and environmentally friendly.

Role in Natural Farming

Jeevamrut, Beejamrut, and Ghan Jeevamrut are important components of natural farming systems because they restore biological activity rather than relying solely on external nutrient inputs. These preparations encourage beneficial microorganisms to multiply, making naturally occurring nutrients more available to plants. They also improve soil biodiversity, support earthworm activity, and contribute to long-term sustainability. When combined with crop rotation, mulching, composting, and other conservation practices, these bio-inputs help create resilient farming systems capable of producing healthy crops while protecting natural resources.

Precautions During Preparation

For best results, farmers should use fresh dung and urine from healthy indigenous cows, as these are believed to contain a diverse range of beneficial microorganisms. Clean containers should be used during preparation, and the mixture should be stirred regularly to ensure proper fermentation. Direct sunlight should be avoided during fermentation and storage, as excessive heat may reduce microbial activity. Freshly prepared formulations generally provide the highest microbial population and should be used within the recommended period.

Conclusion

Jeevamrut, Beejamrut, and Ghan Jeevamrut represent simple yet highly effective technologies for improving soil fertility and promoting sustainable agriculture. These traditional bio-inputs strengthen soil biological activity, enhance nutrient cycling, improve crop health, and reduce production costs by minimizing dependence on synthetic chemicals. Their use not only restores degraded soils but also contributes to environmental conservation and long-term food security. As farmers increasingly adopt natural farming practices, these bio-inputs will continue to play a significant role in building resilient agricultural systems and ensuring healthy soils for future generations.