Traditional Organic Techniques for Indoor Garden

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CHAPTER 1
INTRODUCTION TO ORGANIC AGRICULTURE: A REVIEW STUDY

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ABSTRACT:

Organic farming, a comprehensive method of farming based on sustainability and environmental care, is gaining popularity as a solution to the problems caused by traditional agricultural methods. The main principles, advantages, difficulties, and international relevance of organic agriculture are summarized in this article. It highlights the fundamentals of organic farming, such as managing soil health, conserving biodiversity, and using fewer synthetic inputs, by synthesising current findings. The research examines how organic farming may improve food security, lessen negative environmental effects, and support rural lives. It also explores issues with certification, scalability, and striking a balance between yield and sustainability. This assessment emphasizes the need for legislative support, research, and education to promote the principles and practice of organic agriculture by highlighting the rising consumer demand for organic goods

KEYWORDS:

Agriculture, Farms, Food, Organic, Soil.

INTRODUCTION

Organic farming is based on the principles and logic of a living organism, in which all components (soil, plants, farm animals, insects, farmers, and environmental factors) are interdependent. This is achieved by using, wherever practical, agronomic, biological, and mechanical approaches, adhering to the interactions' guiding principles, and utilizing natural ecosystems as models. Many of the practises employed in other sustainable agricultural systems, such as intercropping, crop rotation, mulching, and integrating crops and animals, are also utilized in organic agriculture. However, the fundamental principles that distinguish organic agriculture as a distinct agricultural management system are the use of natural (non synthetic) inputs, the enhancement of soil structure and fertility, and the adoption of a crop rotation plan[1], [2].

According with the Guidelines of Organically Food Produce of the Codex Alimentarius (2007), an organic production system is designed to: Enhance biological diversity within the whole system; Increase soil biological activity; Maintain long-term soil fertility, recycle wastes of plant and animal origin in order to return nutrients to the soil, thus minimizing the use of non-renewable resources, rely on renewable resources in locally organized agricultural systems; Promote the healthy use of soil, water and air as well as minimize all forms of pollution that may result from agricultural practices; Promote the careful processing methods agricultural products in order to maintain the organic integrity and vital qualities of the product at all stages; Become established on any existing farm through a period of conversion, the appropriate length of which is determined by site-specific factors such as the history of the land, and type of crops and livestock to be produced [3], [4].

Additionally, the International Federation of Organic Agriculture Movements (IFOAM), a nonprofit organisation networking and promoting organic agriculture globally, has produced standards for organic production and processing that have been extensively embraced by the organic community.

IFOAM (2002) states that the following tenets form the foundation of organic farming practices. The aim of organic agriculture is to maintain and improve the health of ecosystems and creatures, from the tiniest in the soil to humans, whether in farming, processing, distribution, or consumption. Given this, it should refrain from using fertilizers, pesticides, animal medications, and food additives that might be harmful to one's health.

Ecological principle

Organic farming should be based on dynamic ecological cycles and processes and should cooperate with, model, and support them. Organic management has to be adjusted to the size, ecology, and culture of the area. Reusing, recycling, and managing materials and energy effectively can help reduce inputs, enhance environmental quality, and save resources.The fairness concept emphasises that people participating in organic agriculture should conduct their interpersonal interactions in a way that provides equity for all stakeholders, including farmers, employees, processors, distributors, merchants, and consumers. Additionally, it demands that circumstances and possibilities for life be given to animals in accordance with their physiology, natural behaviour, and wellbeing. The management of natural and environmental resources utilised in production and consumption should be fair from a social and ecological perspective and should be done so with regard to future generations. Systems of production, distribution, and commerce must be transparent, equal, and take into account the true costs to the environment and society[5].

The "Principle of Care" asserts that in organic agriculture, management, technological advancement, and responsibility are the primary priorities. To guarantee that organic farming is safe, secure, and environmentally sound, science is required.However, it must take into account workable solutions derived from actual experience, accumulated traditional knowledge, and indigenous wisdom, as well as avoid serious hazards by embracing suitable technology and eschewing unexpected ones, like genetic engineering.To improve sustainability, organic agriculture aims to have a positive impact. What does sustainability imply, though? Sustainability in agriculture refers to the effective management of agricultural resources to meet human needs while also preserving or improving the environment's quality and protecting natural resources for future generations. Therefore, sustainability in organic farming must be seen holistically, taking into account ecological, economic, and social factors.

An agricultural system can only be said to be sustainable if all three criteria are met.By using crop rotations, organic manure, mulches, and fodder legumes to supply nitrogen to the soil fertility cycle, organic agricultural practices are proven to improve soil structure and fertility.Preventing soil erosion and compaction by growing relay and mixed crops to preserve the soil.Promoting biological diversity by using natural pest controls such as biological control and plants with pest control properties as opposed to synthetic pesticides, which are known to kill beneficial organismssuch as bees, earthworms, and natural pest parasites and often pollute water and land when used improperly.

Performing crop rotations, which promote a variety of food crops, fodder, and underutilised plants; this may help with on-farm conservation of plant genetic resources in addition to enhancing overall farm output and fertility employing renewable energy, integrating livestock, tree crops, and on-farm forestry into the system; recycling the nutrients by employing crop leftovers (straws, stovers, and other non-edible portions) either directly as compost and mulch or via animals as farmyard manure. In addition to draught animal power, this increases revenue via the sale of organic meat, eggs, and dairy goods. The system's integrated tree crops and on-farm forestry provide food, money, fuel, and timber.Equity between and among generations is another aspect of sustainability. By lowering the loss of arable land, water pollution, biodiversity erosion, GHG emissions, food losses, and pesticide toxicity, organic agriculture improves societal well-being.

DISCUSSION

Traditional knowledge and culture are the foundation of organic agriculture. Its agricultural practises adapt to the specific biophysical and socioeconomic limits and possibilities of the local area. The economic climate and growth of rural areas may be enhanced through using regional resources, regional expertise, and establishing connections between farmers, consumers, and their markets.In order to maximize farm production, reduce farm susceptibility to weather whims, and ultimately improve food security, whether via the food the farmers produce or the cash from the items they sell, organic agriculture places a strong emphasis on variety and adaptive management.Organic farming seems to increase employment in rural regions by 30%, and labour productivity is greater for each hour worked. Organic farming helps small-holders access markets and generate revenue by better utilising local resources. It also relocalizes food production in market-marginalized regions[6], [7].

In wealthy nations, organic yields are typically 20% lower than high-input systems, but in dry and semi-arid regions, they may be up to 180% greater. In humid environments, rice paddy yields are comparable but perennial crop output is lower, while agroforestry adds extra benefits.Operating expenses in organic agriculture are much cheaper than those in conventional agriculture (seeds, rent, maintenance, and labour costs range from 50–60% for grains and legumes to 20–25% for dairy cows and 10–20% for horticultural products). This is a result of decreased labour cash expenses, which include both paid and family labour, cheaper irrigation costs, and lower input prices for synthetic inputs. However, overall expenses are only marginally cheaper than traditional because of additional expenditures made during conversion such as new orchards and animal quarters) and certification, which raises fixed costs (such as land, buildings, and equipment.

New export potential is brought about by the demand for organic goods. Exports of organic goods often command premiums of 20% or more over comparable goods grown on non-organic farms. By raising household incomes under the correct conditions, market returns from organic agriculture may be able to support local food security.It's difficult to break into this profitable sector. To ensure that their farms and companies uphold the organic criteria imposed by different trade partners, farmers must yearly hire an organization that certifies organic products. Farmers cannot market their food as "organic" during the 2-to-3-year conversion phase to organic management and lose out on price premiums. Customers anticipate residue-free organic products, which is why this is the case. However, in accordance with the Codex Guidelines on Organically Produced Food (2007), goods produced on land managed organically for at least a year but less than the two- to three-year criteria might be marketed as "transition to organic", however, relatively few markets have emerged for such goods[8], [9].

While the majority of manufacturers in developing nations have focused on the EU and North American export markets, local market potential for organic food is now expanding globally.Alternative alternatives to certification have developed globally, acknowledging the part local organic markets play in fostering a thriving organic industry. Consumers and organic farmers have established direct routes in industrialized nations for the home delivery of non-certified organic products such as community supported agriculture. Farmers in the USA are technically excluded from certification if they sell modest amounts of organic goods.Participatory Guarantee Systems (PGS) are increasingly being accepted as a viable alternative to third-party certification in developing nations such as India, Brazil, and the Pacific islands.

DISCUSSION

More recently, organic farming has emerged as a viable alternative for enhancing family food security or lowering input costs. This behavior is being seen in industrialized nations as a result of the economic crisis. Farmers either consume their own produce or sell it on the open market at no premium since it is not certified. The goals of organic farmers are frequently to maximize interactions between the land, animals, and plants, preserve natural nutrient and energy flows, and enhance biodiversity, while also protecting the health of the family farmers and contributing to the overall goal of sustainable agriculture.A transitional phase is necessary when switching from a conventional to an organic system, during which the organic practices are gradually implemented in accordance with a set plan. It is crucial to properly assess the farm's current position during this time and decide what steps need to be implemented [10], [11].

1. Farm characteristics: size, distribution of plots and crops, types of crops, plants, and animals included in the farm system.

2. Soil analysis: a review of the soil's composition, organic matter concentration, erosion rate, and/or degree of contamination.

3. Climate: temperatures, chances of frost, humidity, and the amount and distribution of rainfall.

4. Sources and treatment of organic matter (manures).

5. The presence of equipment or housing systems for animals.

6. Restrictive elements, including those related to labor, capital, and market access.

Larger farms make up the bulk of intensively managed farms in Asia, Latin America, and Africa that heavily depend on outside inputs. These farms mostly cultivate a small number of annual or perennial income crops, strongly reliant on the use of fertilizers for plant nutrition and pesticides and herbicides for the management of pests, diseases, and weeds. On these farms, farm animals are often not included in the nutrient cycle and crops are frequently planted without a scheduled rotation. On these farms, diversification is often minimal. To allow for considerable mechanization, trees and shrubs are often cut down, and crops are typically cultivated on their own. Potential difficulties in converting such farms: It often takes many years to establish a diversified and balanced agricultural system with a built-in capacity to control itself.

It could take substantial work to replenish the soil's natural fertility by adding a sizable quantity of organic matter.In the early years of conversion, giving up high input external fertilizers reduces yields until soil fertility is restored and yields increase.Learning a lot and closely monitoring crop growth, the behaviour of pests, diseases, and natural enemies, as well as the dynamics of new techniques and practices, are often required.However, if the following procedures are followed, the conversion process may be accomplished.

Increase agricultural system diversity

Choose the best annual crops for the region, then rotate them in a predetermined order. Include legume crops in the rotation to provide nitrogen to the following crops, such as beans or leguminous feed crops. To promote insect control and natural enemies, plant hedges and flower strips.Commence recycling priceless agriculture byproducts. Establish a composting operation on the farm using harvest waste and, if available, manure, and combine the compost with topsoil. By introducing stable organic matter into the soil, this will strengthen the soil's structure and increase the soil's ability to feed plants and retain water. To feed soil organisms and increase soil fertility, green manures may provide a significant amount of plant material. Bring farm animals into the equation. Animals raised for farming provide extra animal products and supply essential manure cultivate cover crops. The soil is protected by using cover crops or mulching perennial crops.

On the same plot of land, farmers using traditional methods and minimal outside assistance may cultivate a wide variety of crops in a densely mixed system, switching crops at random. There may be a small number of animals maintained, including chickens, pigs, cattle, and/or goats, who distribute the excrement in their feeding areas and provide relatively little manure for the plants. For the purpose of making charcoal and firewood, the trees may be drastically chopped. Burning rubbish and bushes could be a regular habit, particularly while preparing land. Due to unpredictable and inadequate precipitation, harvests are definitely low and becoming harder. The crops could just be enough to feed the family, leaving little to be sold to make money. Traditional farmers already adhere to certain organic farming principles by using farm-owned resources, cultivating many crops at once, and rearing animals. However, there are still several practises that set such farms apart from organic farms. The following issues must be resolved in order to convert.

Refrain from burning agricultural wastes after harvesting since doing so usually isn't a good idea because it eliminates important organic matter and harms soil organisms.Establish well-organized intercropping and crop rotation systems as part of your diversification strategy.Amass knowledge and expertise in the management and enhancement of soil fertility, particularly with reference to compost production.Refrain from indiscriminately chopping down trees for fuel and charcoal. Create a mechanism for collecting animal waste for composting. Implement strategies to stop soil from eroding and to keep it from drying out. Pay close attention to meeting the farm animals' nutritional and medical needs. Prevent seed contamination with disease by learning about its cycles and countermeasures. Keep harvest and storage losses to a minimum.

In this system, several conversion techniques include, put intercropping and planned crop rotation into practice. Leguminous green manure cover crops and a mix of annual and perennial crops are required. Crop and soil management will be made easier by the use of 15 carefully chosen or upgraded crop types with high resistance to plant pests and diseases.The growing conditions for the crops and the encouragement of greater development will be improved by the proper integration of animals into the agricultural system, as well as by the planting of rows of nitrogen-fixing trees between annual crops, which will also provide more food for the ruminant animals. Better housing is also required to make it easier to gather animal excrement for use in fields.Increasing soil fertility, for instance, by adding high-quality compost to the soils.In organic farming, compost is a very important fertilizer. After harvest, gather the crop wastes for composting or incorporate them into the soil instead of burning them. The plant matter and animal manures should be routinely gathered for composting. Another option for feeding the soil and the crops is to plant nitrogen-fixing legumes in between annual crops. It is recommended to take further steps to prevent soil erosion, such as constructing trenches, planting trees along the slope, and covering the soil with live or dead plant matter.

CONCLUSION

In conclusion, organic agriculture represents a fundamental change in how we manage natural resources and produce food, with an emphasis on ecological balance, sustainability, and human welfare. Long-term soil fertility and resilience are promoted by placing a focus on creating healthy soils via practises including crop rotation, composting, and less tillage. Promotion of biodiversity and integrated pest management help control pests without using chemicals, with the least amount of harm to ecosystems.It is impossible to overestimate the potential of organic agriculture to solve urgent global issues like biodiversity loss and climate change. Organic farming contributes to the reduction of greenhouse gas emissions, water conservation, and biodiversity preservation by eliminating synthetic inputs. Additionally, its emphasis on regional and diversified food systems promotes greater food security and greater resistance to disturbances.Although there are still difficulties, such as the need for standardized certification procedures and the need to resolve yield differences between organic and conventional systems, support for organic agriculture is expanding. Market expansion is being driven by consumer demand for healthier and more ecologically friendly goods, which is motivating farmers to switch to organic farming methods. Governments and international organizations are crucial in facilitating this transformation via the development of skills, financing for research, and policy incentives.The principles of organic farming, which are based on sustainability and harmony with nature, provide a workable route towards a more resilient, fair, and ecologically conscious agricultural future. To improve methods, overcome obstacles, and promote the spread of organic agriculture's beneficial effects on the environment and global food systems, continued cooperation among farmers, researchers, governments, and consumers is crucial.

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CHAPTER 2
CLIMATIC RELATED CHANGES TO CONVERSION

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ABSTRACT:

The impact of climate change on different conversion processes has a substantial impact on how civilizations use resources and energy. The many effects of climatic changes on conversion technologies, systems, and tactics across industries are examined in this study. This study explains how changes in temperature, precipitation patterns, and severe events affect the effectiveness, accessibility, and viability of energy and resource conversion by analyzing current studies. In order to assure continuing operation in the face of changing climatic circumstances, it evaluates the vulnerabilities of current conversion systems and emphasizes the need of innovation and adaptation. Additionally, the importance of international collaboration and policy frameworks in promoting resilient conversion practices are emphasized. The need of including climate concerns into conversion planning and design is emphasized by this assessment, which also highlights the need for a comprehensive strategy that strikes a balance between technical development and climate adaptation

KEYWORDS:

Crops, Farmers, Farming, Organic, Soil.

INTRODUCTION

It will be more difficult to convert a farm to organic farming in a region with little rainfall, high temperatures, or strong winds than in an area with widespread rainfall and comfortable temperatures. The benefits of adopting organic practises will also be more apparent in dry environments than they would be in ideal humid environments. For instance, adding compost to the topsoil or planting holes would improve the soil's ability to retain water and raise the tolerance of the crop to water shortage.Water is lost via transpiration from plants and soil evaporation at significant rates in hot, dry climates. Strong winds may further increase these losses by accelerating soil erosion. Because biomass output is often low and the organic matter content of the soils is generally low, there is a significant reduction in the nutrients that are available to the plants [1], [2].

Protecting the soil from intense sun and wind, as well as boosting the amount of organic matter and water that the soil receives, are the keys to enhancing crop yield under these circumstances. Composting or growing green manure crops may both enhance the amount of organic matter in the soil. Increasing the output of plant biomass, which is required for compost manufacturing, is the issue in the case of compost production.High aboveground biomass output and quick breakdown of soil organic matter suggest that nutrients are readily accessible to the plants in warm, humid climates. However, there is a significant chance that the nutrients will be lost and readily washed away. To prevent soil depletion under these circumstances, it's crucial to maintain a balance between the production and breakdown of organic matter.Combining several methods to safeguard the soil and provide it with organic matter turns out to be the most fruitful course of action. These techniques include planting a variety of crops in many layers, preferably including trees, cultivating nitrogen-fixing cover crops in orchards, and adding compost to the soil to improve its organic matter content and hence boost its ability to hold onto water and nutrients[3], [4].

Successful organic farming demands a deep understanding of how natural processes work and what management options are available. For organic farming to be effective, there must be a desire to understand how to support natural processes and preserve and enhance harvests. It is advised that farmers who are interested in adopting organic farming practises get in touch with local farmers who currently practise organic farming so they may learn from them. Some farmers may excel at composting, cultivating green manures, and brewing tea from plants or manures.

Learning from seasoned farmers enables one to get first-hand knowledge in local settings and learn about the benefits and possible difficulties of applying organic farming practises.In order to successfully transition their farm to organic agriculture, farmers need to understand how to enhance soil fertility, maintain healthy crops, best promote farm variety, and maintain healthy animals.How to effectively market and add value to organic goods.Farmers should start learning from their own experience on their farms after gathering information about the needs, opportunities, and key conversion practises. Farmers are advised to gradually introduce organic practises, choosing one practise at a time and testing them on single plots or single animals alone, to reduce chances of crop failure and animal losses and prevent frustrated overload. But which techniques ought one to choose first? Farmers should naturally begin by using techniques that are low risk, cheap expenditure, need minimal specialized expertise, involve little extra effort, and have a strong short-term effect. Among the suggested interventions are those shown.

Mulching is a simple method of weed management and soil protection for annual crops. It involves covering the soil with dead plant debris. Most current cropping methods may use this practice.Where to get suitable plant material, however, may be the primary concern.Intercropping is a typical practice in organic farming to diversify output and get the most out of the land. Typically, a leguminous crop like beans or a green manure crop is grown in alternate rows with maize or another cereal crop or vegetable. To prevent crop competition for light, nutrients, and water during intercropping, extra care must be taken. Understanding of arrangements that support the development of at least one crop is necessary for this[5], [6].

Composting - The development and yields of crops may be significantly impacted by the application of compost to the fields. Farmers will need enough plant materials and animal manures, if any are available, to start compost manufacture. If these resources are in short supply, farmers would first have to start creating plant materials on the farm by planting fast-growing legumes that produce a lot of biomasses and, if necessary, bringing in cattle to produce manure. Farmers should get training from an expert individual to become acquainted with the composting process.Although it costs nothing to produce compost properly, it does take some knowledge, expertise, and extra labour.Green manuring is a technique that many farmers are unfamiliar with in which a type of leguminous plant is grown for biomass production and soil absorption. In spite of this, this practise may significantly boost soil fertility. Improved fallows, seasonal green manures in crop rotation, or strips between crops are all possible ways to cultivate green manures. Knowledge of the suitable species is initially necessary for proper green manuring[7], [8].

DISCUSSION

Organic pest management is the careful pairing and control of plants and animals to stop the spread of pests and diseases. Although bio-control agents may be used at first, ecological methods that create a pest/predator balance are the most effective way to manage organic pests. While choosing resistant crop varieties is essential, there are other ways to prevent pest outbreaks, such as choosing sowing times that do not coincide with pest outbreaks, enhancing soil health to resist soil pathogens, rotating crops, encouraging natural biological agents for control of disease, insects, and weeds, using physical barriers to ward off insects, birds, and other animals, modifying habitat to encourage pollinators and natural enemies, and trapping pests in pheromone attractants.Use of healthy seeds and planting materials, as well as strong and/or upgraded cultivars, may have a significant impact on crop productivity. Information about the choice of seeds and planting materials, particularly the availability of better cultivars and seed treatments, may be necessary for this practise. Because of their resistance to local circumstances, locally adapted seeds are often favoured[9], [10].

Leguminous tree planting

In perennial crop plantations such as those for banana, coffee, or cocoa, the planting of leguminous trees like gliricidia, calliandra, and sesbania, which offer shade, mulching material, and nitrogen through nitrogen fixation, may improve the growing conditions of the fruit crop. Additionally, certain leguminous plants provide suitable cattle feed. This procedure requires some understanding of the leguminous trees' optimal planting patterns as well as the shade and space needs of tree crops.Own farm production of animal feed Farmers may plant grasses and leguminous fodder crops alongside, between, or in rotation with other crops to boost the feeds that are readily accessible for the cattle. Farm-grown feed is the greatest option when evaluating feed sources since animal feed must be of organic origin.

Terraces and soil bunds are important soil conservation techniques that should be built along the arcs of hills. This procedure lays the groundwork for future increases in the soil fertility on slopes. Although it is very relevant, its implementation calls for a lot of work and specialised skills.The organic farm is seen as 'one organism,' therefore growing certain crops is not the only thing that is being done. Instead, the emphasis is on selecting crops that can be quickly incorporated into the current agricultural system and will help to enhance it. But the decision also relies on the farmer's understanding of the best ways to manage the crops, how they contribute to a varied family diet, and how much demand they have on the market. Planting trees for shade, as a windbreak, for firewood, for feed, for mulching material, or for other uses can usually be advised. Farmers may need to grow leguminous cover crops in addition to growing crops for food in order to provide high-protein feed for livestock and to be used as green manures to feed the soil.

Selection criteria for crops during conversion

a. First and first, organic farmers need to provide enough food for their families. To earn money for other household needs, individuals can also desire to raise crops for the market. Additionally, farmers want to cultivate crops that boost soil fertility. Legumes and pasture grass must be grown by farmers who raise cattle.

b. In general, farmers should choose crops that have a low failure risk. Maize, sorghum, millet, beans, and peas are just a few examples of cereals and legumes that are particularly well suited for conversion since they are inexpensive to grow, often have modest nutritional requirements, and are resistant to pests and diseases. Many of the conventional crops may also be kept and sold in local marketplaces. Most vegetables are one example of a high-value short-term crop that is more delicate to develop and extremely vulnerable to pest and disease assault. Therefore, unless the farmer can tolerate certain harvest losses, they shouldn't be planted on a wider scale.

c. Crops that can be sold at the farm gate, at a roadside market, or that can be transported directly to markets in close-by metropolitan areas should be included in the list of crops to be grown for sale. It can be necessary to have some market knowledge in order to choose the best harvest to sell. Traders or exporters must provide precise information on the crops, required types, quantities, quality, regularity, and season before making decisions on crops for local or export markets.

d. High-value perennial crops, such fruit trees, need at least three years from the date of planting until the first harvest. They are thus suitable crops during the time of conversion. The species and types used in new plantations must be carefully chosen to meet the needs of the organic market and the manufacturing process. Old existing cultivars may need to be replaced in order to convert an existing orchard if they are very sensitive to diseases and their product quality does not meet market expectations.

e. The supply of suitable growth circumstances will also affect a crop's performance. A crop variety will grow more successfully if it is well-suited to the local soil and climatic conditions as well as to prevalent pests and illnesses.

Hedge, other crop, and/or agroforestry tree planting might be beneficial to establishing a varied agricultural system.Growing leguminous green manures feeds the soil with nutrients. Although green manures don't provide cash right away, they do make the soil more fertile and productive in the long run. Farmers often inquire about the length of time organic crops take to develop because they want to see results quickly.Crop growth speed is not a goal of organic farming. When growth circumstances are better than previously, crops will expand more quickly and broadly. Although excessive use of synthetic fertilisers and sprays may make crops cultivated in the normal manner grow more quickly. In order to be less vulnerable to pests and illnesses and to have a healthy physical and nutritional structure, organic crops are encouraged to grow at their normal, natural pace. However, organic farmers take great care to ensure that their crops develop healthily and offer high results.Once sufficient experience with various practises has been gathered, a third stepthe deployment of organic practises over the whole farmshould be explored. A farmer may call themselves an organic farmer as soon as organic farming methods are used on the whole farm.Usually,implementing organic practises consistently is the first step in a protracted process of enhancing the production system.

1. Increasing the production of farm-owned biomass and recycling organic waste to improve soil fertility.

2. Promoting beneficial interactions among all components of the agricultural system (the farm ecosystem) to improve pest and disease self-regulation.

3. Achieving the best possible livestock and feed production balance.

Growing organically also entails constantly gaining new knowledge via personal observation, outside experiences, exchanging insights with other organic farmers, and integrating new knowledge on your farm to make it more sustainable.

Pesticides

It is the duty of organic farmers to prevent synthetic pesticides from being sprayed on their crops A farmer that practises organic farming may cultivate organic foods and fibre even if the neighbour does not. Organic farmers should protect their organic fields by taking any of the following precautions to prevent pesticide drift from neighbouring fields onto their crops: Planting natural hedges along the boundary with neighbouring fields can reduce the risk of pesticide spray drift through wind or run-off water. The boundary region around the fields should be as broad as possible[11], [12].Organic producers should channel water away from upstream fields to prevent runoff or consult with farmers upstream to discuss ways to cooperate to reduce the danger of contamination via water. In order to encourage their neighbours to embrace organic farming methods or reduce the chance of polluting nature, organic producers should share their expertise and experiences with their neighbours.

Genetically Modified Organisms (GMOs)

These crops are grown through means other than pollination and by bridging natural barriers to introduce isolated genes from plants, animals, or microbes into the crop genome. As a result, using genetically modified goods should be avoided in organic farming, and organic farmers should take precautions to prevent GMO contamination of their crops.

However, the danger of GMO contamination is anticipated to rise with the expanding usage of GM crops in traditional agricultural systems. Cross-pollinating species, like rapeseed or maize, as well as insect-pollinated plants, like soybean or cotton, are more likely to get infected by a neighbouring genetically modified crop. The danger of GMO contamination is reduced for species that are mostly vegetatively pollinated, such as potatoes, cassava, and bananas. If GMO and organic goods are not adequately separated during storage and transit, there is a danger of physical contamination in addition to genetic contamination throughout the production and market chain.Farmers are advised to use either individually chosen seeds or organic or untreated seeds to lower the danger of GMO contamination. Verify the seeds' provenance to ensure they didn't originate from farms nearby or from farms that were in close proximity to GM crops (at least a distance of 1 km).

If you buy seeds from a dealer, be sure they are registered and able to provide proof of the seed's provenance. Verify that he is not a part of GM reproduction and production. Ask your merchant for a certificate attesting to the presence of non-GM seeds, and find out whether they participate in the GM seed market.Look about the breeding practises of the particular crops you are considering. The majority of hybrid plants, like maize, may travel up to three kilometres (km) by the wind or bees.

Some agricultural seeds may remain viable in the soil for five to twenty years. Therefore, care must be taken to ensure that no GM crops have been planted on land intended for organic farming. If GM crops are grown in this area, establish safety (buffer) zones around your fields to lessen the danger of GMO pollen spread. 27 organic fields should be isolated from GM crops at a distance that is around 2-3 times greater than that needed to produce a specific species' seed. The isolation distance shouldn't be less than 2 to 3 km for the dissemination of crucial GM crops like maize. This will significantly lessen the spread of GMOs via pollen. Additionally, boundaries or hedges with higher plant species, such sugarcane or trees, might hinder cross-pollination with GM crops for wind-pollinated crops like maize. Use sowing and harvesting equipment, transporters, processing facilities, and storage facilities that are not utilised by GM farmers to prevent any physical GM contamination. If you must continue using the same equipment, a thorough cleaning is required. Do not keep GM goods next to organic ones in storage. Wherever feasible, GMO-free zones should be promoted, particularly for local seed production.

CONCLUSION

A thorough reevaluation of how we harness and convert resources is required since climatic changes are inextricably entwined with conversion processes. The impact of changing climatic patterns on conventional conversion systems has a noticeable impact on energy output, water management, agriculture, and industrial production.The need for adaptation is urgently highlighted by the vulnerabilities that climate change has revealed. In order to endure changing environmental conditions and harsh occurrences, existing conversion technologies must be modified or completely rebuilt. To improve conversion efficiency while adjusting to the new normal of climatic unpredictability, innovative strategies including distributed energy systems, water-efficient technology, and robust infrastructure are available.Policy frameworks are essential for ensuring the effective incorporation of climate adaption within conversion practises. The use of climate-resilient technology and practises should be encouraged and mandated by governments and international organisations. Crosssectoral cooperation and information exchange are essential for the creation of multidisciplinary solutions that comprehensively address the problems brought on by climate changes.Conversion processes serve as key areas of intervention as we deal with the complexity of climate change. Societies can manage the possibilities and difficulties posed by climate changes to ensure a sustainable and resilient future for resource and energy conversion by embracing innovation, adaptation, and policy assistance. Governments, businesses, academics, and communities must all work together to push conversion practises in the direction of sustainability and climate resilience.

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CHAPTER 3
EXPLORING THE MULCHING IN ORGANIC AGRICULTURE

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ABSTRACT:

Applying organic or inorganic materials to the soil surface is known as mulching, and it is a key method in organic agriculture that has several agronomic and environmental advantages. The benefits, drawbacks, and uses of mulching in organic agricultural systems are covered in this essay. It explains how mulching promotes optimum plant development and production by increasing soil moisture retention, suppressing weed growth, regulating soil temperature, and improving soil structure. It is also investigated how mulching aids in nutrient cycling, lessens erosion, and lessens the effects of climate change. This analysis emphasizes how crucial it is to choose the right mulch type, thickness, and application period in order to maximize the benefits of mulching techniques in organic agriculture.

KEYWORDS:

Crops, Irrigation, Mulching, Organic, Water.

INTRODUCTION

The earth is sometimes covered with things like plastic sheets or even stones. But in organic farming, the word "mulching" solely refers to the utilization of natural, biodegradable plant components. Preventing soil erosion from wind and water: soil particles can't be swept or washed away. Keeping the soil wet by lowering evaporation: plants require less irrigation or may utilize the available rain more effectively in dry places or seasons. These benefits come from keeping a healthy soil structure, which improves the penetration of rain and irrigation water since no crust forms and the pores are maintained open.Feeding and protecting soil creatures: Organic mulch material is a great source of food for soil organisms and offers ideal circumstances for their development. Suppressing weed growth: Weeds will find it challenging to grow through a layer of mulch that is thick enough[1], [2].

Providing nutrients to the crops: as organic mulch material decomposes, it continuously releases its nutrients, fertilizing the soil. Increasing the content of soil organic matter: some of the mulch material will be converted to humus. Preventing the soil from heating up too much: Mulch provides shade to the soil and the retained moisture keeps it cool.The kind of material used for mulching will have a significant impact on its outcome. Material that breaks down quickly will only protect the soil for a little period of time, but will nourish the crops while it does so. Hardy materials will break down more gradually and keep the soil covered for a longer period of time. Spreading organic manures, such as animal dung, on top of mulch may speed up the breakdown of the material and increase the nitrogen content[3], [4].

A cover crop or weedsCrop waste, grass, tree pruning, and hedge cuttings are just a few examples.Wastes from forestry or agricultural processingMulching has many benefits, however it may also become problematic under certain circumstances: In the wet and safe environment of the mulch layer, certain organisms may grow too quickly. Under a mulch layer, slugs and snails may swiftly grow in number. Ants or termites that may harm crops could potentially discover the perfect environment to survive.In certain instances, there is a higher danger of contracting pests and illnesses when agricultural leftovers are employed as mulch. Crop stalks such as cotton, maize or sugar cane can harbour harmful organisms like stem borers. If there is a chance that the disease can spread to the next crop, diseased plant material should not be utilized.

Crop rotation is crucial to minimizing these dangers.When mulching with carbon-rich materials like straw or stalks, nitrogen from the soil may be utilized by microorganisms to break down the mulch. As a result, nitrogen may not be accessible for plant development right away.The availability of organic material is often the main barrier to mulching. Its production or collection often requires effort and may be in competition with crop production.The soil is most susceptible towards the beginning of the rainy season, therefore if at all feasible, the mulch should be spread then. Seeds or seedlings may be directly sown or planted in between the mulching material if the layer is not too thick. In vegetable plots, it is better to wait to apply mulch until the young plants have grown a little more resilient since the byproducts of decomposition from new mulch material may hurt them.

If mulch is used before planting or sowing, the mulch layer shouldn't be too thick to prevent seedling encroachment. Mulch may also be used on established crops, ideally just after soil preparation. Between the rows, directly around individual plants (particularly for tree crops), or uniformly distributed throughout the field are all options for application.A mulch-based method of cultivating rice was created by the pioneer of Japanese organic farming, Fukuoka. One month before to harvest, white clover is seeded amid the rice. A little while later, rye for the winter crop is sowed. The rice straw is returned to the field after the harvested rice has been threshed and utilized as a loose mulch layer. White clover and rye both emerge through the mulch, which is present until the rye is harvested. The mulch may be covered with chicken dung if the straw breaks down too slowly. This agricultural technique produces acceptable yields while requiring no soil tillage.

Maintain soil moisture: During dry spells, certain soils are better equipped to provide crops with water than others. A soil's capacity to hold and absorb water is significantly influenced by its organic matter concentration and soil type. Up to three times as much water may be stored in clay-rich soils as compared to sandy soils. Like a sponge, soil organic matter serves as a reservoir for water. In order to preserve the soil, avoid crusting on the surface, and limit drainage, crop residue or a cover crop is used. Cracks and pores in the soil are kept open by roots, earthworms, and other soil life. Less water evaporates and more soaks into the ground. Evaporation may be significantly decreased by adding a thin layer of mulch to the soil. It shields the soil from the sun's rays and keeps it from being too hot. The drying out of the soil layers underneath may be slowed down by shallow digging of the dry top soil (capillary vessels are broken). The expense of irrigation is reduced via improved soil water retention[5], [6].

Utilize rainwater more effectively by ripping throughout the dry season so that farmers may plant as soon as the rains begin.Because they both utilized water, green manure and cover crops are not always an effective approach to reduce soil evaporation. Consider applying other kinds of mulch in dry places, including crop waste or plant remnants brought in from outside the field. This will aid in keeping moisture where it can benefit the crop—in the soil.Only a small portion of the water after heavy rainfall seeps into the soil. A significant portion is lost to crop loss as a result of surface runoff. The infiltration of rainfall must be improved in order to use as much of the available rainwater in the soil. The most crucial factor in maintaining topsoil with a healthy soil structure and many cavities and pores (due, for example, to earthworms) is to achieve a high infiltration rate. To develop such a beneficial top soil structure, cover crops and mulch application are appropriate. Additionally, they aid in slowing the flow of water, giving the infiltration more time to occur.

Each pit is 20 cm in width and 20 cm in depth. The holes are partially left open after planting to allow for water collection. When the earth is dry, it is difficult to dig planting trenches.

However, they provide high yields in places where crops could ordinarily perish from a lack of water. The pits may be created once and then utilised season after season. Keep the soil covered, and to improve the fertility of the pits, add compost or fertilizer.There may not be enough water in low-rainfall locations to cultivate crops over the whole region. Use of contour bunds and catchment strips is a possibility on easy slopes (less than 3%).

Catchment strips are regions without any crops. When it rains on this terrain, the contour bund traps the water as it rushes downslope. To utilize this water, arrange rows of crops behind the bund. Even with very little rain, this may offer a good harvest. Apply crop leftovers as a mulch over the cultivated areas to stop erosion, promote water infiltration, and reduce evaporation. He sub-soils these strips to a depth of 0.77 meters using a subsoil driven by a tractor. In order to direct precipitation towards the crop, he contours the soil in between the strips so that it slopes in that direction. In each strip, he plants two rows of maize, and in the spaces between the strips, he plants a cover crop like cowpea. Since the strips are durable, crops may be grown on them year after year. The strips' soil progressively becomes more fertile as agricultural wastes build up there. Maize with a legume crop in rotation will boost the soil's fertility even further. With less than 400 mm of rain every season, the farmer has been able to produce up to 6 t/ha of maize.

Fields may get water from highways as well as from other unproductive places like walks and household complexes. It could be able to redirect water from existing infrastructure, such the ditches under fanya juu terraces. Or, specific bunds may be constructed to enclose fields next to a road. Directing the water into a pond, which may be used to irrigate crops, is an additional option. Small, semicircular earth bunds are known as half-moon micro catchments. They are known as "demilunes" and are fairly prevalent in the Sahel's arid borders. The half-moons collect water that is down a hill. Sorghum, millet, and cowpeas, among other crops, may be grown in the bottom part of the half-moons.

DISCUSSION

During dry seasons, extra water from the rainy season may be used. There are several ways to store rainwater for irrigation, but the majority require a lot of work or are expensive. Pond storage provides the benefit of allowing for the growth of fish, although water is likely to be lost via infiltration and evaporation. These losses may be prevented by building water tanks, but doing so requires the right building supplies. The advantages and disadvantages of building water storage infrastructure, including the loss of agricultural land, should be considered before making a decision.The choice of crops and a suitable farming strategy are the main determinants of whether irrigation is required. It goes without saying that not all crops (or even all kinds of a given crop) need the same quantity of water, nor do they all need it for the same length of time. While some crops are very resistant to drought, others are quite vulnerable. Deep-rooted plants are less susceptible to brief droughts because they can draw water from deeper soil layers.Many crops may now be cultivated outside of their traditional agro-climatic zone with the use of irrigation. This might have some benefits in addition to the previously listed harmful effects. It could allow for the cultivation of land that would not otherwise be suitable for farming without irrigation. Alternately, sensitive crop production might be moved to regions with lower pest or disease load[7], [8].

There are irrigation methods with more or fewer negative effects and with better or lower efficiency. If irrigation is required, organic farmers should carefully choose a method that does not overuse the water supply, does not damage the soil, and has no detrimental effects on the health of the plants.Drip irrigation systems are one possible choice. Water is administered directly to the single crop plants using thin, perforated pipes from a central tank. Water is flowing continuously but very slowly, giving the plant' root zones enough time to be penetrated. In this manner, the soil is not harmed and the least amount of water is wasted.

Drip irrigation system installation may be quite expensive. However, some farmers have created low-cost drip irrigation systems using resources found nearby. Whatever irrigation technique the farmer opts for, he will achieve greater efficiency if it is coupled with other actions to enhance the soil's structure and water retention, as mentioned above.

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Half-moons are useful for restoring damaged terrain.During dry seasons, extra water from the rainy season may be used. There are several ways to store rainwater for irrigation, but the majority require a lot of work or are expensive. Pond storage provides the benefit of allowing for the growth of fish, although water is likely to be lost via infiltration and evaporation. These losses may be prevented by building water tanks, but doing so requires the right building supplies. The advantages and disadvantages of building water storage infrastructure, including the loss of agricultural land, should be considered before making a decision.The choice of crops and a suitable farming strategy are the main determinants of whether irrigation is required. It goes without saying that not all crops or even all kinds of a given crop need the same quantity of water, nor do they all need it for the same length of time. While some crops are very resistant to drought, others are quite vulnerable. Deep-rooted plants are less susceptible to brief droughts because they can draw water from deeper soil layers.Many crops may now be cultivated outside of their traditional agroclimatic zone with the use of irrigation. This might have some benefits in addition to the previously listed harmful effects. It could allow for the cultivation of land that would not otherwise be suitable for farming without irrigation. Alternately, sensitive crop production might be moved to regions with lower pest or disease load.There are irrigation methods with more or fewer negative effects and with better or lower efficiency. If irrigation is required, organic farmers should carefully choose a method that does not overuse the water supply, does not damage the soil, and has no detrimental effects on the health of the plants.

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Some crops have robust, deep roots, which enhances soil structure. They have the ability to dislodge hardpans and draw moisture and nutrients from the soil's core. Some have several small, shallow roots. They link the soil and draw nutrients from the surface. To let air and water to penetrate the earth, they create many small holes. Legumes (like groundnuts and beans) fix nitrogen in the soil, which promotes soil fertility. Other crops, like maize, may use this nitrogen when their green portions and roots decompose.

Higher, more consistent yields are the end result, and costly artificial fertilizer is not required. Planting the same crop year after year discourages certain weeds, insects, and illnesses, therefore it aids in weed, pest, and disease management. Planting other crops disrupts their life cycle and stops them from proliferating. Growing a variety of grain, beans, vegetables, and fodder results in numerous forms of output, including more products to sell and a more diverse diet. Crop rotation may substitute for soil ploughing in certain aspects since it helps aerate the soil, recycles nutrients, and controls weeds, pests, and diseases. Rotation has several benefits that intercropping, strip farming, and relay farming do not.

Crop choice

Answering the following question is important before choosing the crops. What should I produce? Food, fodder, fuel, fence posts, thatch, and medicines are just a few of the numerous things that crops may generate. Some crops, like cotton, are grown by farmers exclusively for the money. You may be able to sell any extra produce from other crops, such vegetables or grains, if you don't utilized it all yourself. Make sure there is a market for your primary product or rotation crop if your goal is marketing.Will it flourish? This relies on a number of variables, including the season (certain crops and kinds do not grow well at specific seasons of the year), the soil's fertility, and the quantity of rain or moisture in the soil.

What kind of roots are they? Tall cereals (such as millets, maize, sorghum, and others), finger millets, and certain legumes (such as pigeonpea and sunn hemp) have robust roots that extend up to 1.2 metres into the earth. If the soil is compacted, their roots are a suitable option since they increase the soil's structure and porosity.Does it increase the fertility of the soil? By capturing nitrogen from the air, legumes increase the fertility of the soil. They take some of it for personal use and leave the remainder in the ground. If cereals and other plants are cultivated as the next crop in the rotation or intercropped with the legume, they may make use of this nitrogen.

Does it adequately cover the ground? Because they are grown widely apart and have erect leaves, tall cereals do not effectively cover the soil. After being planted, numerous legumes (such as lablab, groundnut, cowpea, and beans) and short grasses (such as Brachiaria, Cenchrus, and Andropogon) soon cover the land. We refer to crops as "cover crops" when that is actually their primary purpose. We refer to legumes (beans, groundnuts) whose primary function is to supply food as being food legumes.What other crops does it work with? Try to discover crop combinations that work well together. For instance, cereals thrive when grown in conjunction with legumes (either edible legumes or cover crops) because the legumes' fixation of nitrogen benefits the cereals. Usually, it doesn't work well to combine two distinct grains or legumes. Grow trap crops like Crotalaria or Tephrosia to encourage Striga to germinate and die when they cannot locate any appropriate plants (such as maize or sorghum) to live off of if you have Striga issues in your field. Finding the ideal crop mix for your scenario may be more challenging. You may experiment with different pairings with your neighbours to determine which one's work. Alternatively, you might ask extension agents, academics, or farmers in other communities what they recommend[11], [12].

CONCLUSION

In conclusion, mulching is a key strategy in organic agriculture, providing a number of advantages that support resilient and sustainable agricultural systems. In areas where water is scarce, maintaining soil moisture by mulching is essential for ensuring continuous crop development and productivity, especially during dry spells. Another important benefit is weed control, which lessens competition for resources and reduces the need for synthetic pesticides.Mulching promotes root development and microbiological activity by reducing extremes in soil temperature and enhancing soil structure. The improved soil health makes it easier for plants to get nutrients, which reduces their dependency on outside inputs. Mulching also helps to stop soil erosion, which is important for preserving soil fertility and avoiding sediment discharge into water bodies.Mulching fits in well with the concepts of reducing the use of synthetic inputs and environmental preservation in the context of organic farming. Based on regional circumstances, crop kinds, and management objectives, the right mulch materials, such as cover crops, straw, or compost, should be chosen. It is important to understand that although mulching has several advantages, its efficacy might change based on the crop's needs, soil type, and environment.Mulching practices will be essential to the success of organic agriculture as it becomes more and more popular worldwide. The optimization of mulch application techniques and their adaptation to various agro-ecological environments need ongoing research and practical knowledge. To improve mulching methods, inform stakeholders, and promote mulching's wider use in organic agriculture, farmers, researchers, and extension agencies should work together.

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CHAPTER 4
A COMPREHENSIVE REVIEW OF INTER-CROPPING

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ABSTRACT:

The simultaneous growth of two or more crops close to one another is known as intercropping, and it has attracted widespread attention for its potential to improve resource utilization, yield stability, and overall agro-ecosystem resilience. The ideas, advantages, difficulties, and ramifications of inter-cropping systems are covered in detail in this study. The processes underlying the increased resource efficiency, decreased pest and disease pressure, and varied revenue streams that intercropping may provide to farmers are highlighted in this study by analyzing current studies. Successful inter-cropping depends on the choice of complementary crop combinations, ideal planting patterns, and efficient management strategies. Furthermore, the importance of intercropping in sustainable agricultural landscapes is highlighted by the ecological and environmental benefits, such as soil protection and biodiversity enhancement. This study emphasizes the relevance of inter-cropping in promoting global food security via its ability to alter monoculture-dominated agricultural systems, while recognizing the practical limits and difficulties.

KEYWORDS:

Crops, Intercropping, Manure, Plants,System.

INTRODUCTION

According to Moller and Johnson (2009), intercropping is the practice of planting two or more crops next to one other, whether it be two or more cash crops, a cash crop and a cover crop, or another non-cash crop that benefits the main crop. To maintain a healthy level of competition among the intercropped species, further management is necessary for this practice. When two or more crops are growing side by side, each one needs enough space to maximize cooperation and reduce competition. Four factors need to be taken into account in order to achieve this:

1) Spatial organization,
2) Plant density,
3) Crop maturity dates, and
4) Plant architecture.

In intercropping, there are at least four standard spatial configurations. The majority of useful systems are variants of these:Row intercropping is the practice of cultivating two or more crops at once, with at least one of those crops being planted in rows. This may be advantageous in instances when tall crops are used to protect shorter crops from heat stress or drought by providing shade and lowering wind speed.Growing two or more crops side by side in strips that are broad enough to allow for independent crop production with machinery yet near enough for the crops to interact, such as growing beans and maize together. A bacterium that fixes nitrogen is connected to the roots of legumes. They thus compete modestly for resources with non-legumes and, in certain situations, even provide nitrogen to nearby plants[1], [2].

Relay intercropping is the practice of planting a second crop into a standing crop while it is still in the reproductive stage but before it is ready to be harvested (for example, putting lettuce next to tomato plants). The lettuce will fill in the empty area left by the tomatoes until they branch out to span the whole width of the bed, and it gets harvested about the same time the tomatoes do.Growing two or more crops simultaneously in a pattern of rows that is not clearly defined is known as mixed intercropping for additional information on potential combinations. To lessen pests, certain crops may also be planted as a border crop or as trap crops at the hedges of the main crop. The pest stops when it encounters the trap crop, which is significantly favored to the main crop when entering the field from the margins. Before the pest spreads to the main crop, where management would be more challenging and ineffective, the trap crop may be treated with a natural pesticide. Consequently, planting crops in different rows substantially streamlines management.

Crop rotation may also be hampered by intercropping. Given that one key premise of crop rotation is the separation of plant families over time, it could be challenging to transplant two plant families that are combined in the same area. A successful crop rotation might be maintained, nevertheless, with careful planning. Consider a farm where lettuce, tomatoes, squash, and other vegetables are grown. To keep certain diseases and pests under control, a straightforward rotation would place each of the crops in a separate year, with a three-year gap before a crop is repeated on the same bed.A cover crop may be any plant that promotes soil fertility while covering the soil. It can be a leguminous plant that also has other advantages, or it might be an invasive weed that produces a lot of bio-mass quickly. The ability of cover crops to keep the soil constantly covered and develop quickly is one of its most crucial qualities.An excellent cover crop has the qualities listed below: The seeds are inexpensive, simple to get, harvest, store, and spread[3], [4].

Rapid growth and the ability to quickly cover the soil are two key requirements. Pest and disease resistance is another.Produce a lot of dry material and organic matter, fix nitrogen from the air, and add it to the soil. They also have de-compacting roots and can rejuvenate deteriorated soils.Easy to handle as a single crop or in combination with other crops; useful as fodder and food grains in the tropics and subtropics, the cowpea, or Vigna unguiculata (Niébé), is a significant grain legume. It has a few qualities that make it the perfect cover crop. It tolerates drought well and requires very little water to flourish.It can fix nitrogen and thrives in very depleted soils.Because it can tolerate some shade, it may be used as an intercrop.It is very resistant to pest attack and produces eatable grains that may be utilised as protein-rich animal feed.In sub-Saharan Africa, cowpea is often interplanted with maize, sorghum, millet, and cassava by subsistence farmers.Alfalfa (Medicago sativa), red clover (Trifolium incarnatum), faba beans (Vicia faba) and hairy vetch (Vicia vellosa) are other legumes that are utilised as cover crops. Non-legumes that are utilised as cover crops to enhance soil structure and supply organic matter to the soil Barley (Hordeum vulgare), buckwheat (Fagopyron esculentum), oats (Avena sativa), annual rye (Lolium multiflorum), and winter wheat (Triticum aestivum) are among the crops used for this[5], [6].

DISCUSSION

Crop and livestock systems are combined in this practise. Cropping in this situation gives animals food in the form of grass, nitrogen-binding legumes, leys (improved fallow with seeded legumes, grasses, or trees), weeds, and crop leftovers. Animals function as a kind of savings account in addition to providing draught and manure for crops when they graze beneath trees or on stubble (FAO, 2001).Pigs, chickens, a vegetable garden, and a fish pond are all kept on an experimental farm in Thailand. Animal faeces are used to produce biogas, fertiliser, and fish feed. Additionally, waste from crops and people are put to the biogas unit. The fishpond uses liquid biogas generator effluent, while the garden uses solid waste. The positions of the pond and garden are sometimes switched, allowing the nutrients from one to feed the other.

Cropping systems should be set up such that a canopy of plants covers the soil virtually constantly. When planting and spreading arable crops, proper scheduling might assist prevent exposed soil from being washed away during the rainy season. A green manure crop may be planted after the primary crops have been harvested. Crops should be cultivated horizontally (along contour lines) rather than vertically on slopes. This has a significant impact on erosion prevention by slowing the flow of surface water. Intercropping of fast-growing species, such beans or clover, may assist to protect the soil in the early stages of the primary crop in crops that require some time to create a protective canopy[7], [8].

Knowing which crop was previously produced in a certain plot within the field or farm may be easily remembered with the use of a well-kept field record book. This is particularly helpful if the data include detail earlier instances of plant pests or illnesses in each agricultural plot.For instance, pests and soil illnesses may accumulate throughout the course of a sensitive crop's life. When the same crop or a crop of a similar kind from the same family is produced in the same field, it will be susceptible to the pests and illnesses that have accumulated from the preceding crop(s) and may not thrive. If the land is kept fallow (unplanted) for a period or a new crop is planted that is tolerant or resistant to the specific pest or disease, this may be avoided. Planting a crop from a different family will avoid the same complex of pests and illnesses, which is still preferable. As a consequence, soil issues will decrease, and the original crop may once again be cultivated effectively.

To prevent nutrient depletion, it is necessary to monitor the intake and outflow of plant nutrients using a soil testing programme. Nutrient-poor soils are unable to sustain crop development or active populations of helpful microbes, both of which are necessary for a productive soil. The best use and management of soil fertility and soil physical qualities are necessary for increasing agricultural sustainability, in addition to efficient water and crop management. Both depend on the biological activity of the soil and its biodiversity. To achieve this, management techniques that increase soil biological activity and improve long-term soil production and health must be used.The process of composting involves turning organic waste from plants or animals into humus in piles or pits. breakdown in the composting process happens more quickly, reaches greater temperatures, and yields a better-quality product than unmanaged breakdown of organic waste[9], [10].The heating phase, the cooling phase, and the maturing phase are the three key stages of the composting process. These stages, however, are difficult to distinguish from one another.

The Heating Phase

The temperature within the compost heap increases to 60 to 70 °C after 3 days of its setup and often remains at this level for 2-3 weeks. The heating phase is when the majority of the breakdown takes place, and at this time, mostly bacteria are active. The energy generated by the bacteria when they break down readily decomposable material is what causes the high temperature. The composting process often and effectively involves the warm temperature. Diseases, bugs, weed roots, and seeds are all destroyed by heat.Due to the fast growth of their population, the bacteria have a very high oxygen requirement at this first stage of composting. High temperatures in the heap indicate that the bacteria have enough oxygen to survive. Lack of oxygen in the heap will prevent bacterial growth and cause the compost to acquire a disagreeable scent. Additionally, humidity is necessary for the composting process since bacteria need humid environments to function. Due to the intense biological activity and significant evaporation that take place during this period, the requirement for water is highest during the heating phase.The pH of the compost heap rises as the temperature rises, resulting in a reduction in acidity.

The Cooling Phase

After the bacteria have transformed the readily digestible material, the temperature in the compost heap gently drops and stays between 25 and 45 °C.As the temperature drops, fungus congregate and begin to break down materials like straw, fibers, and wood. The temperature of the heap does not increase as a result of this slower decomposition process.The pH of the composting material decreases as the temperature lowers (i.e., the acidity rises).

The Maturing Phase

During the maturing phase, humid acids and antibiotics are accumulated and nutrients are mineralized.

1. During this stage, red compost worms and other soil creatures begin to live in the heap.
2. The compost is now ready to be used, has lost roughly half of its initial volume, and resembles black, rich soil. The longer it is held going forward, the less effective it will be as a fertiliser, but the more it will be able to strengthen the soil.
3. The compost uses a lot less water during the maturing stage than during the heating stage.

Various systems and approaches

The two types of composting systems are batch-fed and continuously fed:

Continuously fed systems

During the composting process, these systems do not heat up. If there is a constant flow of wastes (like kitchen waste), they are useful. They don't, however, have the benefits of the heating step.

Batch-fed systems

These systems result in a heated composting process since all of the material is decomposed at once. Due to the high temperature of composting, they have the benefits of reducing nutrient loss, killing weed seeds and illnesses, and producing compost of exceptional quality quickly (within a few weeks). Composting in pits can be a preferable option if there isn't much water available since pits are better at retaining humidity than heaps are.

Vermi-composting is a composting technique that makes use of earthworms. Earthworms aerate the organic matter, hasten the composting process, and add nutrients and enzymes from their digestive systems to the final product. You may produce compost year-round by vermicomposting, both inside and outside in the summer.Plants are produced as green manures to store nutrients for the primary crop. They are worked into the topsoil after they have amassed their maximal biomass. Growing a green manure differs from growing a legume crop in the rotation since they are often harvested before blooming. Fresh plant material that has been mixed into the soil rapidly releases nutrients and will completely decay in a short amount of time. As old or coarse material (such as straw, twigs, etc.) decomposes more slowly than fine material, it will have a greater impact on the development of soil organic matter than on crop fertilization [11], [12].

Collecting fresh plant material from elsewhere and incorporating it into the soil is an alternative to establishing a green manure crop in the field. For instance, trees and/or shrubs growing next to crops in an agroforestry system may provide a significant amount of green material that may be utilised as mulch or green manure.With their roots, they enter the soil, loosen it, and bind nutrients that would otherwise be washed away.They keep weeds from growing and shield the soil from sunshine and erosive forces.When legume plants are grown, nitrogen from the air gets incorporated into the soil. Some green manures, like beans and peas, may be grown as fodder plants or even utilised to provide food for people.Green manures decompose and release a variety of nutrients in the right proportions for the primary crops to use, increasing crop productivity.The added plant matter enriches the soil with organic matter and promotes the activity of soil organisms. This enhances the soil's ability to store water and its structure.Thus, green manuring is a low-cost method of enhancing soil fertility and the nutrient content of the primary crops cultivated.Things to think about prior to growing green manure. Where there is a dearth of beneficial equipment, labour requirements for ploughing, seeding, pruning, and incorporating plants into the soil are the greatest. Green manures compete with the primary crops for nutrients, water, and light if they are inter-planted. When a plant's old or coarse parts are integrated into the soil, nitrogen may become momentarily immobilized and inaccessible to plant development. If space and food are few, it could be more suitable to produce a food crop and recycle the crop leftovers rather than a green manure crop, or to intercrop a green manure crop with the primary crop.Green manures provide long-term advantages that are often not immediately apparent.

The Use of Green Manure

a) Planting green manure.

If planted as part of a crop rotation, the timing of sowing must be set such that the green manure may be removed and incorporated into the soil prior to the planting of the subsequent crop.

1. Water is necessary for the germination and development of green manures.
2. Each case requires testing to determine the appropriate seed density. Depending on the species selected.
3. In most cases, extra fertilization is not required. To benefit from the legume's ability to fix nitrogen, it may be required to inoculate the seeds with the right rhizobia when growing legumes for the first time in a field.

b) Tilling the soil with the green manure

Timing

To reduce nutrient losses from the decaying green manure, the interval between digging in the green manure and planting the next crop shouldn't be greater than 2 to 3 weeks.

Crushing

When the plants are still young and tender, green manures are worked in most readily. It is best to cut up tall or confine bulky and hard plant components in green manure plants to facilitate simpler breakdown. Decomposition will take longer the older the plants are. Just before blooming is the finest time to dig in green manure plants.

Depth of incorporation

Green manures shouldn't be worked into the ground too deeply. Instead, they should only be pushed into the top layer of soil (5 to 15 cm for heavy soils, and 10 to 20 cm for light soils). The substance may also be left on the soil's surface as a mulch layer in hot, humid conditions.

Many different plants, particularly legumes, may be grown as green manure crops. The selection of suitable species is crucial. Most essential, they should fit into the crop cycle and not represent a danger of spreading diseases and pests to other crops. They should also be tailored to the local growing circumstances, particularly the soil and rainfall.Farmyard manure is made up of animal waste and bedding material, which is often straw or grass, depending on whether animals are housed in stables or not (full-time or part-time). Organic manure from farms is incredibly beneficial.

Farmyard manure has a number of qualities and impacts, including the following: It is rich in nutrients; only a portion of the nitrogen it contains is immediately accessible to plants; the remainder is released when the manure breaks down. When dung and pee are combined, they provide a well-balanced supply of nutrients for plants because animal urine contains nitrogen that is readily accessible in the short term. Phosphorus and potassium are both readily available from farmyard waste and commercial fertilisers. Porphyrin content is high in chicken dung. However, it's critical to understand where the manure came from since chicken excrement from traditional farms is polluted with heavy metals. Organic manures help increase the amount of organic matter in the soil, which increases soil fertility.

CONCLUSION

In conclusion, inter-cropping offers a viable way to advance resilient, sustainable agricultural systems that strike a balance between production and environmental preservation. The simultaneous production of many crops adjacent to one another has a number of advantages, including increased resource and land efficiency and less vulnerability to pests and diseases. Increased yields and stability are a result of the synergistic interactions between intercropped plants, such as nutrient sharing and insect deterrence.Planning is essential for successful intercropping, taking into account variables including crop compatibility, spacing, and management techniques. Farmers must adjust their intercropping plans to meet the needs of the local market and agroecological circumstances. The potential benefits in terms of higher production and risk reduction make intercropping a method worth investigating, even if it does complicate crop management and resource allocation.Intercropping supports more resilient and sustainable landscapes by improving soil health, preventing erosion, and preserving biodiversity. Additionally, it complies with the expanding customer need for a variety of locally grown products. Intercropping is a realistic approach that can promote agricultural sustainability while assuring food supply for a rising population as global agricultural systems confront problems brought on by climate change, resource shortages, and food security issues. In order to realize intercropping's full potential as it transforms from a traditional practice to a contemporary, scientifically informed strategy for resilient and productive agriculture, it is crucial to continue research, extension initiatives, and farmer education.

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CHAPTER 5
STORAGE OF FARMYARD MANURE: A REVIEW STUDY

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ABSTRACT:

Farmyard manure (FYM) storage has an important role in sustainable agriculture because it affects soil health, nitrogen management, and environmental quality. This review looks at the many aspects of FYM storage, including approaches, things to think about, and difficulties. For FYM to retain its nutritional value and avoid losing nutrients via leaching and volatilization, it must be stored properly. The impact of various storage methods on nutrient retention are examined in this research, along with mitigation options for issues including odour creation and nutritional imbalances. Additionally, the detrimental effects of inappropriate FYM storage on the environment are examined, highlighting the need of using best practises to reduce adverse effects on water quality and air quality. Farmers and decision-makers may improve nutrient cycling, soil fertility, and overall agricultural sustainability by understanding the complexities of FYM storage.

KEYWORDS:

Manure, Pests, Plants, Soil, Storage.

INTRODUCTION

To get high-quality manure, farmyard waste should preferably be collected and kept for a time. Composting the farmyard waste yields the finest results. Manure that is kept in anaerobic environments, such as pits that are flooded, is of lower quality.If the animals are housed in stables, collecting farmyard manure will be simpler. In order to absorb the liquid during storage, the manure should be combined with dry plant material (straw, grass, agricultural leftovers, leaves, etc.). Longer straw may absorb less water than straw that has been chopped or crushed by spreading it out on the side of the road.Typically, the manure is piled or dumped in a pit just adjacent to the stable. If it is covered with new bedding material, it may also be kept inside the stable as bedding. Farmyard manure should always be shielded from the sun, wind, and rain. Nutrient losses should be prevented by avoiding both water logging and drying out. The storage area has to be impermeable and slope slightly. The urine from the stable and the liquid from the manure pile should ideally be collected in a trench. The heap is surrounded by a dam that prevents unchecked urine and water inflow and outflow[1], [2].

Dry climates and dry seasons are ideal for manure storage in pits. The danger of drying out and the need to moisten the pile are both decreased by storage in pits. However, since the hole has to be excavated out, there is a larger chance of waterlogging and it takes more work. For this technique, a hole that is 90 cm deep and has a modest incline at the bottom is excavated. After being squeezed, the bottom is initially coated with straw. Each layer in the hole is compacted, roughly 30 cm deep, and covered with a thin layer of dirt. After filling the hole to a height of approximately 30 cm above the ground, 10 cm of earth is added on top.Controlling the manure pile's humidity is necessary. It shouldn't be excessively moist or dry in order to prevent nutritional losses. The following are a few markers to check the manure's humidity.

A yellow-green tint and/or unpleasant odour are indicators that the manure is too moist and not adequately aerated. If white fungus forms (threads and white spots), the manure is too dry and should be dampened with water or urine. The circumstances are optimal if the manure displays a brown to black tint across the heap.The main components of microbial fertilizers are organic matter and a source of sugar or starch, which are fermented with certain bacterium species. Because the items are living things, they should be used with caution. As the organisms might be dead, they shouldn't be utilised beyond their expiration date.Even while there has been considerable study on the use of microbes and their benefits, there is currently little practical knowledge of such goods. It is advised to test products on a limited scale and compare the results to a control plot to determine their effects. However, keep in mind that microbial fertilisers cannot take the place of proper humus management on a farm[3], [4].

Most of the bacteria and fungus found in commercially produced goods are often found in soil. Therefore, microbial inocula increase the presence of the particular species. To save expenses, some farmers create their own microbial fertilisers. Some microorganisms mineralize the soil to supply nutrients.

Others fix nitrogen from the environment in order to add it. Azotobacter and Rhizobium are a few of them. Other microorganisms, such mycorrhizal fungi, aid in providing phosphorus to plants. The bacterium Azospirillum and Azotobacter can fix nitrogen.

The varied group of bacteria known as pseudomonas species may use a wide variety of substances that plants release when their roots leak or die. They have the capacity to solubilize phosphorus and might aid in the prevention of soil-borne plant diseases.The mineral fertilisers that are permitted in organic farming are built on naturally ground rock. They are only permitted to be used in conjunction with organic manures, however. They may disrupt soil life and lead to imbalanced plant nutrition if they include readily soluble nutrients. Mineral fertilisers may sometimes be environmentally problematic since they need energy for collection and transportation and in some instances result in the destruction of natural ecosystems.

For a plant to be healthy, living things must interact with their surroundings. In monocultures, plant health is more at danger, and farm diversity promotes a balanced relationship between various plants, pests, and predators. This is why controlling the number of pest or disease populations may be done effectively via ecosystem management. Due to their environmental adaptation, certain crop types have more efficient defences than others, which lowers their risk of infection.

The fertility of the soil has a significant impact on a plant's overall health. The plant grows stronger and is less prone to infection when nutrients and pH are properly adjusted. Climate-related aspects, such as appropriate temperatures and an adequate water supply, are other elements that are essential for a healthy plant. The plant may experience stress if one of these circumstances is unsuitable[5], [6].

Stress reduces plants' defence systems, making them vulnerable to pests and diseases. Growing a variety of healthy plants is therefore one of an organic farmer's top priorities. This prevents a number of insect and disease issues.The farmer may choose efficient preventative crop protection methods with the assistance of knowledge of plant health and the ecology of pests and diseases. It's critical to intervene at the most delicate times since so many elements might affect the growth of a pest or illness.

DISCUSSION

This may be achieved by choosing a selected strategy, using management practises at the proper time, or combining many approaches in an appropriate way. The following are some crucial proactive crop protection measures.

Selection of adapted and resistant types

Select varieties that are well suited to the local environment (temperature, nutrient availability, pests and disease pressure), since this promotes healthy growth and makes them more resilient to pest and disease infections.

Clean seed and planting material selection

Use safe seeds that have been tested for weeds and diseases at every stage of production, and use planting material from reliable suppliers.Utilizing appropriate cropping systems.

Mixed cropping systems

It may reduce the burden from pests and diseases since there are more helpful insects in a diversified system and fewer host plants for the pests to feed on.Green manuring and cover crops increase the biological activity in the soil and can enhance the presence of beneficial organisms (but also of pests; therefore, a careful selection of the proper species is needed). Crop rotation lowers the risk of soil-borne diseases and increases soil fertility.

Use of balanced nutrient management

Consistent growth reduces a plant's susceptibility to disease. A balanced potassium supply helps to avoid fungal and bacterial infections. Excessive fertilisation may cause salt damage to roots, which may lead to secondary infections.

Input of organic matter

Stabilises soil structure and thus improves aeration and water infiltration Supplies substances that strengthen the plant's own defence mechanisms Increases microorganism density and activity in the soil, thereby reducing population densities of pathogenic and soil borne fungi.Applying the right soil cultivation techniques helps decompose diseased plant parts, controls weeds that act as hosts for pests and diseases, and safeguards the microorganisms that control soil-borne illnesses[7], [8].

Use appropriate water management practises

Avoid water on the leaves as water borne illness spreads with droplets and fungal disease germinates in water; Avoid water logging as these stresses the plant and promotes pathogen infections.

Protecting and promoting natural enemies

Create a perfect environment for them to thrive and procreate Refrain from using goods that are harmful to them.

Choosing the best planting time and spacing

Most pests and diseases only affect plants during specific life stages, so it's important to pick the best planting time so that this vulnerable stage doesn't coincide with a period of high pest density.

Use correct sanitation techniques

Eliminate plant leftovers from diseased plants after harvesting; Remove contaminated plant components (leaves, fruits) from the ground to stop the illness from spreading.

The cornerstone of efficient management is routine monitoring of pests, diseases, and weeds. Information about the particular pests, illnesses, and weeds existing in the area, village, or agriculture fields is required in order to control them and the harm they cause.

Typical pest attack symptoms on agricultural plants

The majority of agricultural pests are caused by insects, mites, and nematodes. In Africa, however, crops may also be harmed by animals like elephants, monkeys, or voles as well as by birds like sparrows, starlings, and crows.The types of insects that cause harm include those that bite and chew (such as caterpillars and weevils), pierce and sucking (such as aphids and psyllids), and bore (such as borer and leaf miner). Some move slowly (like caterpillars), quickly (like fruit flies), are concealed (like stem borer), or are simple to see (like caterpillars, weevils).

Pest harm is often species-specific: Caterpillar or weevil damage is indicated by leaves with holes or missing pieces; aphid damage is shown by curled leaves. Mites are extremely minute and cannot be seen with the human eye. Damaged or rotting fruits are often produced by fruit fly larvae, withering plants may also be caused by noctuid larvae or the stem borer, and branches or trunks with holes may have been attacked by lignivorous insects. On plant components that have been bitten, certain mite species, such as spider mites, weave a characteristic tissue that makes them easy to spot. Fruits and foliage on plants become yellow if mites are present. Nematodes are also incredibly minute, making it difficult to see them with the human eye. They primarily target the roots of plants, which cause them to deteriorate and perish.

Fungi, bacteria, or viruses are the main culprits in most crop illnesses. According to estimates, fungi are the primary cause of two-thirds of infectious plant illnesses. They consist of anthracnose, all white and true rusts, smuts, needle casts, leaf curls, mildew, and sooty mould. In addition, among many other diseases, they are to blame for the majority of leaf, fruit, and flower spots, cankers, blights, wilts, scabs, and root, stem, fruit, and wood rots. Plants may wither and perish in pieces or as a whole.Any of the four following major issues are brought on by bacteria. Anywhere in a plant, some bacteria release enzymes that break down the cell walls. As a result, the plant's components begin to deteriorate (sometimes referred to as "rot"). Some bacteria create toxins that are often harmful to plant tissues and lead to the plant's early demise. Others create a lot of highly sticky sugars, which as they move through the plant clog the tiny channels that carry water from the roots up to the shoots and leaves, causing the plant to die quickly once again. Finally, proteins produced by other bacteria resemble plant hormones. These cause plant tissue to overgrow and develop tumours.

Viruses often lead to systemic illnesses. Chlorosis, or a change in colour, is often seen in leaves and other green portions. Affected leaves develop light green or yellow spots of varying sizes, shapes, and colours. These patches might create recognisable mosaic patterns, which would reduce the plant's overall growth and vitality.The secret to effective management is careful and ongoing monitoring of pest and disease levels at crucial stages of a crop's development. The farmer may do this by regularly surveying the field. It enables the farmer to take action before the pest or disease causes lasting harm.The practise of scouting helps prevent the needless usage of plant extracts. It's crucial to use these compounds and oils sparingly since they also harm beneficial insects (like pyrethrum, derris, and tobacco). If the use of these drugs is not controlled, numerous parasitoids and pest predators may also be eliminated. The overuse of these chemicals may potentially cause bugs to develop a resistance. As a result, scouting should be coordinated and organised. It is crucial to get a representative random sample of the crop 65 garden's general state. For improved decision-making, the scout (farmer) must thus pay attention and note any discoveries[9], [10].

The most typical pattern used in pest and disease scouting programmes includes moving around a field in an M-shaped or zigzag pattern. This pattern is often used because it is simple to teach, practical to implement, and guarantees that every area of the field is covered. Different traps may also be employed to keep an eye on insect pests. The basic concept is to learn more about the presence of insect pests in the field, particularly those that are quickly moving (mobile) such as fruit flies and lepidopteran pests.Bait traps may be used to catch fruit flies. For instance, tiny-holed PE bottles with water, some cow pee, fruit flesh, a small dead fish, and a drop of detergent or soapy water may all be partially filled. After that, these bottles are hanged from trees and examined every three days. Yellow plastic cards with an adhesive coating work well for catching leafhoppers and aphids. Blue cards are suitable for monitoring thrips, whereas yellow-orange plastic boards are suitable for white flies. Where noctuid pests such as moths, cutworms, African armyworms, and cotton bollworms are an issue, light traps are particularly necessary. Caterpillars must be visually inspected inside cutworm-infested crops by morning[11], [12].

In order to increase the plant's ability to defend itself and stop the spread of the illness, organic disease management and control heavily emphasises plant strengthening. Plant cell wall thickening, which prevents pathogens from entering cells, is one common manifestation of induced resistance. Another is the pathogen dying along with the infected cell walls, which stops it from spreading by also killing the pathogen.

The farmers themselves may produce a number of chemicals that cause resistance. Some are derived from plants including gigantic knotweed (Reynoutria sachalinensis), efeu (Hedera helix), and rhubarb. Compost teas and herbal teas are instruments that may be created on a farm to improve crop health and fertility and to ingest soluble nutrients, advantageous microbes, and advantageous metabolites (products that support plant growth and development) into the leaves and roots. Although compost extract is a fertiliser, it may also make plants more resilient. Mature compost is prepared by mixing it with water in a ratio of 1:5 to 1:8 (vol/vol: 1L of compost for every 5 to 8 L of water) and stirring it well before allowing it to ferment for 3–7 days. For every litre of liquid, one teaspoon of molasses may be added since it helps the bacteria grow. The fermenting location has to be dry and protected from the elements. The extract is well mixed after the fermentation phase and before to application. It is then filtered and diluted at a ratio of 1:5 to 1:10 before use.

Stinging nettle, horsetail, comfrey, clover, seaweed, and other plants may be used to make plant extracts, either by themselves or in combination with marine byproducts like fish waste or fishmeal. 1:10 or 1:5 dilutions are used as foliar sprays or soil drenches. Generally speaking, it is advised to apply compost extracts or teas every 7 to 10 days to ward against infections and to improve soil microorganisms.

Other species that destroy pests, such as fungus, bacteria, viruses, insect predators, and insect parasitoids, are pests' natural enemies. In order to maximise the influence of natural enemies already existing in the agricultural environment, the organic farmer should work to preserve them. The following techniques may be used to accomplish this:Reduce the use of organic pesticides as much as possible (chemical pesticides are already prohibited in organic farming).

Let certain pests exist in the field so they may act as hosts or food for natural foes. Create a system of agricultural diversification, such as mixed cropping. Include host plants that serve as food or cover for natural enemies (such blooms that attract adult helpful insects). There are several ways to increase floral variety inside and next to agricultural fields.

Hedges

Use natural shrubs that are known to attract parasitoids and pest predators by providing nectar, pollen, alternate hosts, and/or prey. This trait is seen in most types of blooming shrubs. However, caution should be used to avoid using plant species that are known to serve as additional hosts for pests or diseases.

CONCLUSION

In summary, farmyard manure storage is essential for enhancing nutrient management and advancing sustainable agricultural systems. The efficiency of FYM as a beneficial organic fertiliser is directly influenced by the effective nutrient retention during storage. Composting, anaerobic digestion, and covered storage are a few storage techniques that each have their own advantages and difficulties. According to their unique situation, farmers should carefully weigh these possibilities, taking into account elements like available area, climate, and resources. In addition to guaranteeing nutrient-rich organic matter for soil enrichment, well managed FYM storage also lowers the chance of environmental pollution. Inadequately stored FYM may cause uncontrolled leaching and volatilization of nutrients, which can lead to water contamination and greenhouse gas emissions. Farmers may help to mitigate these harmful externalities by using suggested storage practises. To improve best practises and meet new difficulties, FYM storage solutions need constant study and innovation. Additionally, extension services and educational initiatives should focus on educating farmers about the advantages of good FYM storage and helping them adopt practical methods. In the end, incorporating efficient FYM storage techniques into agricultural systems would increase soil health, maintain nutrient cycling, and foster a more ecologically conscious way of farming.

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CHAPTER 6
EXPLORING THE IMPORTANCE OF THE NATURAL PESTICIDES

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ABSTRACT:

Due to their lower environmental effect and potential for long-term pest control, natural pesticides generated from botanical, microbiological, or mineral sources have drawn a lot of interest as alternatives to synthetic chemical pesticides. The effectiveness, mechanisms of action, and advantages of natural pesticides in agricultural and ecological environments are examined in this essay. It is clear from a thorough analysis of current studies that natural pesticides may efficiently manage pest populations while causing the least amount of damage to non-target creatures and ecosystems. Creating integrated pest control techniques is made possible by the wide range of active chemicals contained in natural pesticides. To be widely used, they must overcome obstacles including fluctuating potency, regulatory complications, and a short shelf life. In order to fully utilize the potential of natural pesticides for a more sustainable and resilient future, scientists, farmers, and policymakers must continue their research, education efforts, and cooperation.Due to their lower environmental effect and potential for long-term pest control, natural pesticides generated from botanical, microbiological, or mineral sources have drawn a lot of interest as alternatives to synthetic chemical pesticides. The effectiveness, mechanisms of action, and advantages of natural pesticides in agricultural and ecological environments are examined in this essay. It is clear from a thorough analysis of current studies that natural pesticides may efficiently manage pest populations while causing the least amount of damage to non-target creatures and ecosystems. Creating integrated pest control techniques is made possible by the wide range of active chemicals contained in natural pesticides. To be widely used, they must overcome obstacles including fluctuating potency, regulatory complications, and a short shelf life. In order to fully utilize the potential of natural pesticides for a more sustainable and resilient future, scientists, farmers, and policymakers must continue their research, education efforts, and cooperation.

KEYWORDS:

Control, Crops, Natural, Pesticides, Weeds.

INTRODUCTION

Some plant species contain substances that are poisonous to insects. These substances are referred to as botanical pesticides or botanicals when they are taken from the plants and used on afflicted crops. Plant extracts have long been used to manage pests. Tobacco, rotenone (Derris sp.), and pyrethrinshave all been extensively utilised in both small-scale subsistence farming and commercial agriculture. Contact, respiratory, or gastrointestinal toxins make up the majority of plant pesticides. As a result, they are not very choosy and instead focus on a variety of insects. As a result, even helpful creatures may be impacted. However, the toxicity of these pesticides is often rather low, and selective application may greatly minimise their detrimental impact on beneficial species. Additionally, since botanical pesticides are often extremely biodegradable, they lose their effectiveness after a few days or a few hours. Due to their greater environmental safety in comparison to chemical pesticides, this further lessens their detrimental effects on beneficial creatures[1], [2].

Botanical preparation and usage need some knowledge, but not a lot of resources or infrastructure. Under many conventional agricultural systems, it is a widespread practice.

NEEM

Neem includes a number of insecticidal chemicals that are obtained from the neem tree Azadiracta indica that is native to dry tropical climates. The primary active component, azadiractin, prevents and eliminates a variety of caterpillar, thrip, and whitefly species. The neem solution may be made from both seeds and leaves. Although neem leaves are accessible all year round, neem seeds have a greater concentration of neem oil. Neem solutions lose their potency after being prepared for around 8 hours and when they are exposed to sunshine. Neem is most effective when used at night, just after preparation, in humid environments, or when plants and insects are moist. For making a neem solution, many recipes are available.

Advice for farmers on the formulation of neem pesticides: Neem seed kernel extract from Ghana, Africa, was tested on cabbage during farmer trainings and had a very effective deterrent impact on the diamondback moth (Plutella xylostella). The recipe is as follows: Mix 1 L of water with 30 g of neem kernels (72 seeds from which the seed coat has been removed). Give it a night. The next morning, strain the mixture through a fine cloth before using it right away for spraying. It shouldn't be diluted any further.Neem cake, also known as powdered neem seed or neem kernel powder, has a great deal of promise as a fertiliser and may deter nematode infestations on the roots of crops like tomatoes. Neem cake should be added to the planting pit (200g per m2) and combined with the substrate. Nematodes and other root pests will be repelled and even killed by the neem cake. Pests will be eliminated from the plant's above-ground areas by the translocation of insecticides (azadirachtin)[3], [4].

Pyrethrum

Pyrethrum is a Chrysanthemum that resembles a daisy. Because pyrethrum requires chilly temperatures to form its blossoms, it is planted in mountainous regions of the tropics. Chemicals called pyrethrins are obtained from the dried pyrethrum flower. To create a dust, the flower heads are ground into a powder. This dust may be sprayed directly on surfaces or mixed with water. Most insects are instantly paralysed by pyrethrins. Low dosages produce a "knock down" effect rather than killing. Higher dosages are lethal. Pyrethrins should be kept in darkness since sunshine causes them to degrade extremely fast. Pyrethrins should not be used with lime or soap solutions since both strongly alkaline and extremely acidic environments hasten the decomposition of the substance. While powder formulations may lose up to 20% of their potency in a year, liquid formulations are stable in storage.

Advice for farmers on the formulation of pyrethrum pesticides: Dried and pulverised flowers are used to make pyrethrum powder. Sprinkle on affected plants either directly or in combination with a carrier like as talc, lime, or diatomaceous earth. Add soap to the mixture of 20 g of pyrethrum powder and 10 L of water to create liquid pyrethrum extract to increase its potency. Apply immediately as a spray after straining. This should be done in the evening for the optimum results. Alcohol may also be used to extract pyrethrum.

Chilli Pepper

Capsicum pepper and chillies both have insecticidal and insect repellant properties.Advice for farmers on how to make insecticides for chillies: 200 g of chiles need to be ground into a fine powder, boiled in 4 L of water, and then given another 4 L of water along with a few drops of liquid soap to create the chilli extract. This concoction may be used as a spray to repel snails, tiny caterpillars, ants, and aphids.

Garlic

Garlic possesses qualities that prevent insects from feeding, are insecticidal, nematicidal, and repellant. According to certain sources, garlic is efficient against a variety of insects at various stages of development (egg, larvae, adult). Ants, aphids, armyworms, diamondback moths, whiteflies, wireworms, and termites are included in this. Garlic has a broad-spectrum, non-selective impact and may even kill beneficial insects. As a result, it has to be used carefully.

Advice for farmers on how to make insecticides for garlic: 100 g of garlic should be chopped or ground and added to 0.5 L of water to create the garlic extract. After letting the mixture sit for 24 hours, whisk in the liquid soap and 0.5 L of water. Spray at 8:00 in the evening after diluting at 1:20 with water. Chilli extract may be used to increase effectiveness. There are numerous other plant extracts with known insecticidal properties, including tobacco (Nicotiana tabacum), yellow root (Xanthorhiza simplicissima), fish bean (Tephrosia vogelii), violet tree (Securidaca longepedunculata), and nasturtium (Nasturtium trapaeolum), which has historically been used to control pests in Africa[5], [6].

DISCUSSION

The following plants may be cultivated as intercrops or along the edge of crop fields: anise, chillies, chives, garlic, coriander, nasturtium, spearmint, and marigold. These plants are known to have a repelling effect on many pest insects (aphids, moths, root flies, etc.). Neem cake is known to keep mice away, while marigold is particularly effective in keeping root nematodes away.Some botanicals, although being "natural" and often utilised in agricultural systems, may be harmful to people and very poisonous to natural enemies. For instance, one of the most dangerous organic poisons for humans and other warm-blooded creatures is nicotine, which is produced from the tobacco plant. Pyrethrins have no harmful effects on people or warm-blooded animals. However, allergic responses in people are frequent. Inhaling the dust might result in a rash, headaches, and nausea. A short field experiment should be conducted to determine the effects of a novel botanical insecticide on the environment before it is used on a wide scale. Avoid using natural pesticides as your only choice! first, comprehend the ecology and how plants affect it! When preparing and using the crude extract, avoid having direct skin contact with it. It is best to avoid getting plant extracts in your eyes. When storing the plant extract, be careful to keep it out of the reach of children. While applying the extract, use protective clothes over your eyes, mouth, nose, and skin. After handling the plant extract, wash your hands.

Other natural insecticides that are permitted in organic farming include plant extractions. There are instances when using these items is appropriate, even if some of them have a restricted range of selectivity and are not totally biodegradable. The best way to achieve the desired impact is usually in conjunction with preventative crop protection techniques. Examples include:To combat aphids and other sucking insects, use soft soap solutions. Light mineral oil: harmful to natural enemies! Effective against a variety of insect pests.Sulphur prevents spider mites from harming natural enemies. Sulphur works most well as an acaricide at temperatures above 12 °C. However, sulphur may harm plants if it is present in an environment that is dry and hot (over 32° C). Additionally, it doesn't mix well with other insecticides. To prevent phytotoxicity, sulphur shouldn't be used alongside or after treatments with oil[7], [8].

Plant ashes

Wood ashes from fireplaces may be effective against ants, potato moths, leaf miners, stem borers, and termites. Ash should be applied directly to infected plant portions and insect populations. The ash will dry up the bugs' delicate bodies. To keep pests like weevils away from grain storage, wood ashes are often utilised. Ash is also used to combat infections that are spread via the soil.

The majority of the time, sulphur is utilised to treat plant diseases including downy and powdery mildew. Its ability to stop spore germination is the key to its effectiveness. For this reason, it must be used before the illness develops in order to have an impact. Sulphur may be administered as a liquid or as dust. Other insecticides cannot be used along with it. When lime is combined with sulphur to aid in its penetration into plant tissue, lime-sulphur is created. At lower concentrations, it is superior than elemental sulphur in terms of effectiveness. However, using it across large areas is often discouraged by the smell of rotting eggs. Since more than 150 years ago, fruits, vegetables, and ornamentals have been effectively treated with Bordeaux combination (copper sulphate and lime). Bordeaux combination, unlike sulphur, has both fungicidal and antibacterial properties. As a result, it may be used to treat ailments including bacterial or fungal leaf spots, powdery mildew, downy mildew, and different anthracnose infections. One reason the Bordeaux combination has been so 75 successful is its capacity to last through rain and cling to plants. Bordeaux combination includes the alkaline mineral lime (calcium hydroxide), which balances the acidic copper sulphate.

Advice for farmers on making the Bordeaux mixture

There are several formulations of bordelaise. The following formulation is one of the most widely used, most efficient, and least phytotoxic formulations for general use: 90 grammes of blue copper sulphate and 4,5 litres of water should be combined (in a non-metallic container). Mix 4.5 litres of water and 125 grammes of slaked lime in a different non-metallic container. Stir both, combine the two solutions, and stir one more. In acknowledgment of the fact that copper, like sulphur, is phytotoxic and that the degree of toxicity is correlated with the age of the plant tissue being treated, this formulation was created. Bordeaux application in warm weather (over 85° F or 30° C) may result in leaf loss and yellowing. In addition, if it rains shortly after a Bordeaux treatment, leaf burn could happen. Applying this fungicide to young, delicate fruit tree leaves requires caution. Corn and sorghum, which are regarded as copper-sensitive plants, should not be treated with Bordeaux combination. Copper hydroxide and copper oxychloride are two additional, widely used, and reasonably priced copper compounds. They are acceptable in organic farming as long as the quantity of treatments is properly adhered to and a suitable soil amendment is followed to avoid copper buildup in the soil[9], [10].

Due to the active ingredients aluminium oxide or aluminium sulphate, acidic clays have a fungicidal action. Although they are often less effective, they are utilised as an alternative to copper goods. Additionally, milk has been utilised in the treatment of blights, mildew, mosaic viruses, and other viral and fungal infections. It works well to spray 1 L of milk in 10 to 15 L of water once every ten days.Plant diseases like rust and mildew have been managed using baking soda. Spray with a concoction of 50 g of gentle soap and 100 g of baking or washing soda. With 2 L of water, dilute. Spray only once, and then wait as long (a few months) as you can between applications. Because of potential phytotoxic effects, avoid using during hot weather, and test the combination on a few leaves first.It is well known that several plant extracts contain fungicidal properties. Garlic and onion are powerful treatments for a variety of illnesses, including bacterial, fungal, and mildew infections. To aid in the resistance to fungi like mildew, Mexican and African marigolds are used as a crop "strengthener" on potatoes, beans, tomatoes, and peas. The leaves of sweet basil and pawpaw (Carica papaya) are both fungicidal in general. It is well known that several other plant species contain fungicidal properties. The variety of plant extracts available in each location might be changed with the use of traditional knowledge[11], [12].

However, weeds may also negatively impact the crop's environment. For instance, there is less movement of air and light among the agricultural plants. Diseases find the perfect conditions to proliferate and infect plants in this dimmer and more humid environment.Preventing issues rather than treating them is a fundamental tenet of organic farming, as we have seen several times up to this point. This also holds true for weed management. In organic farming, effective weed control entails preventing weeds from growing at the wrong time or in the wrong location and posing a major threat to crop growth.

The crop is not consistently harmed by weed competition throughout the course of the whole cultivation cycle. A crop is most vulnerable to weed competition during the early stages of development. A young plant is delicate and very dependent on the right amount of nutrients, light, and water for growth.

The crop may become weak if it must compete with weeds at this stage, making it more susceptible to infestations of pests and diseases. Later in the growing season, weed competition is less detrimental. However, certain weeds may interfere with harvesting and so lower crop yields. After the crop's most crucial development phase, weeds shouldn't be entirely neglected, but generally speaking, their importance decreases.

The choice and timing of weed control strategies should be influenced by these factors. These procedures generally try to maintain the weed population at a level that doesn't impair the quality of the crop or cause financial loss to the cultivation of it.The simultaneous use of many preventative measures is possible. The significance and efficacy of the various techniques are greatly influenced by the kind of weed and the surrounding surroundings. However, several techniques are widely employed because they work well against a variety of weeds:Choose tall crops and kinds with larger leaves over petite, narrow-leaved ones if you want to outcompete late-arising weeds. While some will tolerate weeds, certain kinds will hinder and suppress them. For instance, in several African nations, there are witchweed (Striga) resistant maize and cowpea cultivars that perform better at the same amount of weeds when other kinds are more impacted.

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Time and density of sowing

The best growing circumstances promote the best crop plant growth and their capacity to outcompete weeds. Crop spacing correctly will guarantee that weeds have the least amount of room to grow and will reduce competition from weeds.This will successfully stop weed growth. The limiting weeds and the seasons in which they grow must be identified in order to use this strategy. If one is available, a weed calendar for the area or region might be useful. It will be used to control weeds in an effective and timely manner.

Balanced fertilization

It may assist the crop's optimal development and encourage the crop to outgrow weeds.The overall amount of weed pressure as well as the variety of weeds may be affected by soil cultivation techniques. For instance, weed pressure may rise in minimal-tillage systems. Weed treatments before planting may be useful at lowering weed load since weed seeds can grow between soil cultivation and crop sowing. Using a superficial stubble treatment to combat persistent weeds is effective. To enable the weed roots that have been exposed to the surface to dry out, it should be done in an environment with dry weather.

Pasturing

Sheep and goats are increasingly used to control weed development in perennial crops including coffee, mangoes, avocadoes, and cocoa. Due to the propensity of cattle for grasses, broadleaf plants often prevail in situations involving cattle. To combat this selective grazing, it is vital to rotate with sheep and goats that favour broadleaves.

CONCLUSION

In conclusion, using natural pesticides is a positive step towards resolving the environmental and health issues raised by the use of traditional chemical pesticides. They are useful instruments for advancing sustainable agricultural practises because of their intrinsic biodegradability, decreased toxicity to creatures other than their intended targets, and potential for integrated pest control. While there are certain difficulties in using natural pesticides, these difficulties are rapidly being overcome by improvements in formulation, standardisation, and regulatory frameworks. The use of natural pesticides into pest control systems may play a crucial role in accomplishing these aims as we work to strike a balance between the requirements of food production and environmental preservation. The most efficient and environmentally sound results, however, will come from a comprehensive strategy that takes into account elements like crop rotation, habitat modification, and biological management. As more information about the potential advantages and drawbacks of natural pesticides becomes available, stakeholders from all areas of agriculture must work together to ensure their responsible and efficient application in the quest for a more sustainable and peaceful coexistence between agriculture and the environment.

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CHAPTER 7
SOIL CULTIVATION AND TILLAGE IN ORGANIC AGRICULTURE

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ABSTRACT:

This essay explores the needs for animal feed and soil cultivation/tillage practises in the context of organic farming, two crucial facets of sustainable agriculture. It explores the complicated connection between giving animals the right nutrition and preserving soil health via ethical farming practises. In reviewing the protein, carbohydrate, fat, vitamin, and mineral requirements of animals, the study highlights the importance of precision feeding in maximizing their health and output. It also examines different soil cultivation and tillage methods used in organic agriculture, from no-till practises to reduced tillage. This study provides insights into the comprehensive integration of animal nutrition and soil care within the principles of organic farming by examining scientific literature and real-world applications.

KEYWORDS:

Cultivation, Farmers,Plants, Seeds, Soil.

INTRODUCTION

The soil should be worked for a variety of reasons. The following are the most crucial ones Improve the aeration nitrogen and oxygen from the air Encourage the activity of the soil organisms. Loosen the soil to allow plant roots to penetrate it.Improve water infiltration Lower evaporation. Eliminate or manage weeds and soil pestsPrepare the area for seeds and seedlings by adding agricultural wastes and manures to the soil; Fix any soil compaction brought on by earlier actions;Any kind of soil cultivation has an effect on soil structure that is more or less damaging. Regular tillage speeds up the breakdown of organic matter in tropical soils, which might result in nutrient losses. Certain soil organisms may suffer great damage if soil layers are mixed. If exposed before the arrival of heavy rains, soil that has undergone tillage is extremely susceptible to soil erosion On the other hand, minimal tillage approaches support the development of a natural soil structure with a crumbly top layer rich in organic matter and teeming with soil life. As there is no abrupt breakdown of organic waste and nutrients are captured through a vast network of plant roots, nutrient losses are minimized. As long as there is a continuous plant cover or a enough inflow of organic material, soil erosion won't be an issue. Finally, growers may avoid hiring a lot of workers[1], [2].

As a result, each organic farmer will need to choose which kind of soil cultivation is best for their circumstances. The organic farmer should strive to minimise the negative effects of soil cultivation while reaping its benefits. He or she should also use techniques that preserve the soil's inherent properties.There is a chance of soil compaction when soils are worked in wet circumstances or when heavy gear is used, which inhibits root development, reduces aeration, and causes water logging.Farmers should be mindful of the following factors in areas where soil compaction might be a problem:Avoid driving on your property just after it has rained since this increases the danger of soil compaction when the soil structure is disrupted under wet circumstances.Smearing of the plough sole may occur while ploughing damp soils.

High soil organic matter content lowers the danger of soil compaction. Once soil compaction has occurred, it is extremely difficult to reestablish a healthy soil structure. Sand-rich soils are less likely to get compacted than clay-rich soils.Various cultivation techniques are used at various times of the cropping cycle, depending on the goal of the soil cultivation: after harvest, before sowing or planting, or when the crop is in the standing stage.The remains from the previous crop are mixed into the soil before preparing the seedbed for the next crop to hasten decomposition. In order to prevent crop damage to the next crop, crop leftovers, green manure crops, and farmyard manure should only be pushed into the top 15 to 20 cm of soil. This is because deeper soil layers do not fully decompose.Primary tillage in annual crops or new plantings is often carried out with a plough or a similar tool. In general, soil cultivation should result in a loosening of the medium-deep soil and a flat turning of the top soil. Deep turning soil cultivation distorts the soil's natural structure, damages soil organisms, and mixes the soil's layers together.

Prior to sowing or planting, the surface of the ploughed soil is crushed and smoothed by secondary soil cultivation. The aim of seedbed preparation is to provide enough loose soil with the right clod size. In order to enable weed seeds to develop before the crop is seeded, seedbeds might be prepared early if weed pressure is significant. After a few days, shallow soil tillage is adequate to eradicate the immature weed plants. Seedbeds may be created as ridges or mounds in areas where water logging is an issue.After the crop has taken root, weeds may be controlled by hoeing or other shallow soil cultivation techniques. Additionally, it improves soil aeration while simultaneously reducing moisture loss from deeper soil layers. Shallow soil cultivation may encourage the decomposition of organic materials, making nutrients accessible when crops are momentarily short in them[3], [4].Minimum and zero tillage in HondurasFarmers in Honduras' coastal area use the following minimal tillage system. The following steps are taken: The vegetation is first cut to the soil's surface; The soil is then opened along contour lines at plant row spacing; Organic manure is then applied; The crop is then seeded into these rows; The vegetation in between is routinely trimmed and utilized as a mulch. Leguminous plants may be used with this technique as cover crops.

Farmers report greater overall yields, less soil erosion, less weeds, and a significant decrease in labour load with both techniques.Primary cultivation tools include a spade, a digging fork, a mouldboard plough, and a pole plough.Harrows, rakes, and cultivators are tools for secondary cultivation.Inter-row cultivators and hoes are tools for inter-row agriculture.Ridgers and hoes are tools for creating the land.Ideally, only organically grown and -propagated plant types should be used for plant production. Except for variations generated from genetic engineering which are not permitted in organic farming, conventionally bred variants are permitted if the number of organically grown varieties is extremely small or nonexistent for particular crops. However, conventionally developed variety seeds should be grown using only certified organic methods[5], [6].

Training of farmers' organisations that will specialise in this subject is essential to increase the quality of organically produced seed and plant material and to make the propagation less dangerous. All facets of propagation need training, including maintenance breeding, preventing unintentional cross-pollination, seed and plant health, phytosanitary concerns with vegetative propagation, cleaning and processing of seeds, short- and long-term storage, and marketing tactics. To provide farmers the most knowledge feasible, seed production should be paired with on-farm variety testing.First, the method of propagation must be identified: either vegetative propagation asexual reproduction through another part of the plant, such as potato tubers, sweet potato roots, bulbs in onion and garlic, cuttings in artichoke, stolons in strawberry, "spiders" or roots in asparagus, etc.; or generative propagation, or sexual reproduction (seeds), which is used for plants like lettuce, curly endive, pepper, eggplants, tomato, and beans.

Regardless of the technique of multiplication, all seeds and plant material should be free of weeds and diseases and come from reliable sources. Although seeds that have been certified as clean are often accessible to farmers, uncertified seeds should still be treated before use to get rid of illnesses that are transmitted via seeds. To avoid pests and diseases and maintain crop yield, it is essential that the seeds, seedlings, cuttings, or other plant material employed be healthy throughout the storage period.Farmers choose seeds with specific traits to suit their individual needs, including yield, quality factors like colour, texture, and flavour, climatic adaptation, pest and disease resistance, fodder value, soil enrichment through nitrogen fixation, and a deep root system.

A seed's genetic, physiological, physical, and health characteristics together make up good quality seed. To ensure genetic purity, the material must be of known origin, have undergone local testing, and have been grown in a secluded setting (far from other types to avoid intercrossing). A farmer or a plant breeder may create the seeds. where a farmer wishes to choose his own genetic material, he must take into consideration a number of factors. For example, he must choose the best plants on the farm with robust growth, high producing plants, excellent quality fruits (in terms of form, colour, and taste (where appropriate)), best fruit covering, good health, etc.The chosen plants should be taken care of with the greatest tenderness[7], [8].

DISCUSSION

Every plant that does not fit the specified kind should be removed, and the isolation distance must be rigorously adhered to. It is necessary to remove pests and illnesses from nearby plants. Fruits must be plucked when they are fully mature. The seeds should be removed immediately after being plucked. Depending on the plant family, different procedures must be followed for storage. For fresh tomato cultivars, for instance, the juice, seeds, and placenta should be placed in a glass jar for fermentation for 24 to 48 hours, depending on the ambient temperature, to prevent bacterial cancrosis issues from being transmitted by seeds. If the seeds are crushed together, the lumps must be manually broken apart. The seeds are then kept in brown paper bags with either wood ashes or diatomaceous earth. The ratio in the latter situation is 50/50 seeds and ash.

The ideal method for storing grains like rice is to sundry the seeds first; the process should be done at a low air moisture level. Neem oil should be applied to the grains before storage since it deters storage bugs.Physical botanical purity leads to physical quality. Farmers must keep the following in mind in this situation: Only pure seed of the chosen species should be stored, free from extraneous seeds. To avoid separation issues later, great care must be used while collecting lettuce, onions, carrots, broccoli, cabbage, and cauliflower to keep out weeds containing seeds.

It should have the least quantity of inert materialflower, fruit, etc. possibly.It should be of a good weight and size, and free from mechanical damage (for instance, wild radish seeds are highly delicate, and the cleaning procedure causes their seed cuticle to become quite brittle).Developing a healthy, organic soil that is rich in organic matter, nutrients, and microbes is the best way to ensure that plants grow strong, healthy, and free of nutritional or physiological imbalances that leave them vulnerable to pests and illnesses. Establishing strict controls over ill plants is necessary to prevent the spread of infection and sources of inoculation carried by insect vectors from the plant.Because farmers save excellent seeds from their own plots for the next season, traditional seeds are readily accessible locally. Farmers either purchase or trade seeds with one another, or they cultivate their own seeds. Seeds are hence inexpensive. Native seeds are designed for a subsistence economy, when farmers first raise crops for their own needs and/or save seeds for the next year, selling only the excess [9], [10].

Native seeds represent tribal wisdom. Using native seeds encourages self-reliance since a farmer employs his or her traditional knowledge, abilities, and wisdom to cultivate the crops. The variety of native seeds is a standout characteristic. Native seeds are resilient because they have evolved resistance to pests and illnesses through time. Traditional seeds have high levels of stress tolerance and are tailored to local agro-climatic conditions.Farming communities have long used conservation techniques known as ex-situ (off-field) and in-situ (in-field) conservation measures in the formal sector. Farmers have an excellent alternative for preserving agricultural variety via in-situ conservation, which also supports the evolutionary mechanisms that produce genetic variation. This is particularly important in many regions of the globe that experience drought and other stressors since it is under these intense environmental conditions that variants that are beneficial for breeding stress-resistance are produced. This permits ongoing host-parasite co-evolution in the case of illnesses or pests.

Furthermore, under these circumstances, the only dependable supply of planting material is probably access to a large variety of native seeds. The intrinsic wide genetic foundation of such material determines their propensity to survive under such stressors.The majority of traditional farming methods employ a seed system that is based on the farmers' own local seed production. Farmers often store seed as a safety precaution to provide backup in the event of crop failure. For informal distribution of planting material within and across agricultural communities, farmers choose, produce, and save seeds. A community seed bank is one method for preserving genetic diversity among various plant and agricultural species. Low-cost community-level seed banks or seed storage facilities may aid in the preservation of historic variety' climatic mitigating traits while also providing farmers with a basis from which to choose specialized lines to match their changing demands. They also help communities produce crops of recognized quality and maintain pricing despite shifting market conditions, which helps to improve market outlets.

Thus, the growth of community seed banks aids in encouraging farmers' economic empowerment. In addition, establishing species suited to harsh conditions in field gene banks at key locations may serve as a reserve for regions where conventional crops may have utterly failed. These fields' germplasm resources may be shared with rural agricultural communities or used for further research on how they can be used in breeding programmes to increase food security.A closed or semi-closed system where nutrients and energy are recycled may be achieved by integrating animals into a farm Animals have the ability to transform inedible biomass such as grass, straw, and food waste into food while also improving the soil's fertility through their excrement[11], [12].

Numerous agricultural animals serve multiple purposes, produce manure, which is crucial for soil fertility; continually produce goods like milk or eggs for sale or personal use; recycle leftovers like straw or kitchen trash; act as draught animals for ploughing or transportation; and produce goods like meat, skins, feathers and horns.Serve as a bank or an investment vehicle. Have cultural or religious value prestige, rites, etc.; assist in weed management; assist in pest control e.g., dugs; and provide young stock for breeding or sale.Each role's importance will vary from animal to animal and from farm to farm. Additionally, it will rely on the farmer's unique goals.Healthy farm animals that can produce well over an extended length of time are the goal of organic farmers. A number of farm animal demands must be taken into account in order to accomplish this goal.

Clean sheds of sufficient size and with adequate light and fresh air. Sufficient freedom to move around and engage in their natural behaviour. Healthy conditions and veterinary follow-up, when necessary. Sufficient contact with other animals, but no stress from overcrowding. A balanced distribution of ages and sexes among herd animals.Organic animal husbandry includes meeting all of the requirements of the farm animals in addition to feeding them organic food and avoiding synthetic food additives and medications such as antibiotics, growth hormones. One of the key goals is the health and wellbeing of the animals. It is important to prevent mutilations, long-term tethering, and isolation of herd animals if feasible. Organic farming does not allow landless animal husbandry i.e., using feed from sources other than the farm or using land without grazing for a number of reasons.

CONCLUSION

The relationship between soil cultivation and tillage and animal feeding highlights the fundamental principles of sustainable and regenerative agriculture. Animals must get a balanced diet in order to grow, reproduce, and maintain good general health. Precision nutrition takes into account the various needs of various species, life stages, and environmental variables, which promotes effective feed utilisation and reduces waste.On the other hand, the philosophy of organic agriculture is based on responsible soil cultivation and tillage techniques. Soil structure, microbial diversity, and carbon sequestration are given priority by reduced tillage or no-till techniques. These procedures improve water retention and nutrient cycling, as well as soil health over the long run, preventing soil erosion and compaction.A harmonic method of doing sustainable farming is the combination of these two elements. The calibre of the feed, which in turn affects the calibre of the soil where the feed is generated, directly affects the calibre of nutrient-rich animal products. A positive feedback loop is created when nutrients are more readily available in the feed due to healthy soil with adequate microbial activity.By encouraging a comprehensive knowledge of agriculture as a linked system, organic farming embodies these concepts. It is feasible to establish regenerative cycles that benefit the land and the animals by coordinating animal feeding with ethical soil management. In the end, this strategy not only assures food security but also helps to protect ecosystems and benefit future generations.

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CHAPTER 8
ANALYZING THE FOOD REQUIREMENT OF ANIMALS

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ABSTRACT:

It is crucial for animals' health, wellbeing, and productivity that their nutritional demands be met. This essay explores the intricate world of animal food needs, focusing on the essential elements of a healthy diet, such as proteins, carbs, fats, vitamins, and minerals. It investigates the variables that affect the need for food, including species, age, physiological status, and environmental circumstances. This study offers a comprehensive picture of how correct food supply plays a key role in animal development, reproduction, and general performance by evaluating scientific findings and nutritional recommendations. It emphasizes the value of precision nutrition in contemporary animal husbandry and its implications for sustainable agriculture, human nutrition, and animal welfare.

KEYWORDS:

Animals, Breeds,Circumstances, Food, Organic.

INTRODUCTION

Farm animals must be fed properly and in adequate amounts if they are to produce milk, eggs, meat, and other products. It could be economically viable to retain fewer animals while still providing them with enough food if one's farm's ability to produce fodder is limited (which is often the case). Naturally, the kind of animal as well as its primary function e.g., chickens for meat or egg production, cattle for milk, meat, or draught, etc. will determine the proper amount and mix of feed ingredients. For instance, in the production of milk, cows should be fed fresh grass and maybe other feeds with an adequate amount of protein. Draught animals would quickly grow weary on the same diet[1], [2].

An animal will remain healthy and productive with a well-balanced diet. The sheen of an animal's hair or feathers often indicates if it is receiving the right quality and quantity of feed. Roughage grass, leaves should make up most of the feed for ruminants. If concentrates or supplements such as agricultural waste materials and byproducts are employed, they shouldn't include growth boosters or other artificial ingredients. There are many different leguminous plants that are high in protein that may be cultivated on the farm as cover crops, hedges, or trees as an alternative to purchasing pricey concentrates. Mineral salt bricks or other similar feed supplements may be utilized if the animal's needs can't be met by the existing fodder since they don't include artificial additives.In many tropical climates, advantageous times with plenty of fodder alternate with unfavorable times when there is hardly enough to feed the animals. However, raising livestock requires year-round provision of feed. On a farm, fodder may be generated as grazing land or as crops used for cutting grass or trees.

Although grazing needs less work than shed feeding, more acreage is required, and proper precautions must be taken to keep the animals away from other crops. Grazing is often the better choice for the health and wellbeing of the animals, even if it might result in decreased yield (milk, meat). However, one benefit of shed maintenance is that the excrement may be conveniently collected, stored, or composted and then used to the crops. The agro-climatic conditions, the cropping system, and the land availability will largely determine whether grazing or shed feeding is the most advantageous alternative. High productivity and animal-friendly management may be achieved best by combining shed feeding with grazing in a fenced area. But in vast grasslands and semi-arid regions, grazing can be the only practical choice[3], [4].

In the majority of smallholder farms, growing fodder will compete for space with growing crops. Each situation must be examined individually to see if fodder production and subsequently animal husbandry is economically more advantageous than crop production. However, there are ways to include fodder crops into farms without giving up a lot of area. Here are a few instances:Grass on bunds to prevent soil erosion; Grass fallows or green manures in the crop cycle; Crops with by-products like paddy straw or pea leaves; Hedges of appropriate plants; Shade or support trees;A successful herd management relies heavily on the management of pastures. The year-round use of proper management is also crucial. There are many various kinds of grasses, and each climate zone has a particular kind that is tailored to the circumstances there. In certain circumstances, it can be worthwhile to consider tilling the grazing area and sowing grass species that are better suited to the requirements of the animal.

The greatest hazard to grassland is undoubtedly overgrazing. The top soil is vulnerable to erosion after the protecting grass cover is eliminated. Re-cultivating degraded pastures or land with limited plant cover is challenging. As a result, it's critical that the usage and level of grazing on a certain parcel of land be compatible with that property's potential for yield. A pasture must be allowed enough time to recuperate after heavy grazing. The optimum method for managing the farm and the entire environment involves fencing off certain sections and rotating the grazing animals among other plots of land. "Grazing cells" are developed to rehabilitate overgrazed pastures, lower the prevalence of intestinal parasites that animals graze on, and boost land production. The kind of plants that develop in the pasture will depend on the amount and time of grazing as well as how often the grass is trimmed.Parasites and microorganisms that cause disease are nearly universal. Animals' immune systems, like those of people, are often capable of fighting off these pathogens. Animals' immune systems will also be less effective if they get inadequate nutrition, are unable to engage in their normal behaviours, or are experiencing social stress, much as in people[5], [6].

A healthy animal has a balance between the forces of illness pressure (germs and parasites) and resistance (immune system and self-healing powers). The farmer may affect both sides of this balance, increase the animal's resistance to germs and decrease the amount of germs by practicing excellent cleanliness.Enhancing animals' living circumstances and boosting their immune systems are the main goals of organic animal management. Of course, an animal has to be treated if it becomes ill. However, the farmer should also consider why the animal's immune system was unable to defend against the illness or parasite assault. And in order to enhance it, the farmer should consider how to improve the living conditions and sanitation for the animals.Similar to crop health, organic animal husbandry places more focus on preventative than on therapeutic measures to maintain animal health. Starting with breeding strong breeds as opposed to high-performing but vulnerable ones, this is the first step. The animals should also be housed in the best possible circumstances, which include enough room, light, and air, dry bedding, regular exercise (such as grazing), and good cleanliness.

DISCUSSION

The amount and quality of the animal's feed play a critical role in its health. Instead of giving animals commercial concentrates, which hasten their growth and increase their output, one should aim for a natural diet that meets the needs of the animal. Animals will seldom get ill in areas where all these preventative measures are implemented. Therefore, veterinary care should only be used as a last resort in organic farming. If therapy is required, herbal and conventional medicines based alternative medicine should be applied. Synthetic medications such as antibiotics, parasiticides, and anaesthetics should only be used if other treatments prove ineffective or insufficient; in these circumstances, the treated animals must be kept apart from untreated organic stock and excluded for a period of time such as at least three weeks from organic certification.Understanding the causes of or variables that promote illnesses in order to strengthen the animal's natural defence systems (and to avoid its manifestations in the future) is the basic principle for veterinary therapy in organic animal husbandry.

In contrast to crop production, if conventional therapy is ineffective, artificial techniques may be used to treat ill animals. Here, lessening animal suffering is prioritised above refraining from using poisons. However, the requirements of organic farming are quite apparent in that emphasis must be placed on management strategies that boost animal resilience, therefore halting the spread of illness. As a result, an outbreak of a disease should be seen as a sign that the animal's living circumstances are not optimum. By altering management practises, the farmer should attempt to determine the disease's source (or causes) and stop further outbreaks Animal products cannot be advertised as "organic" if conventional veterinary treatment has been used; withholding periods must be followed. This will guarantee that organic animal products are free of antibiotic and other residues. In any case, synthetic growth boosters are not permitted[7], [8].

Many nations utilise herbal remedies often. Some rural, traditional groups have a thorough understanding of the regional flora and their therapeutic capabilities. Plants may undoubtedly aid in the healing process, even if they do not immediately eradicate the disease's underlying cause. Nevertheless, producers must remember to pinpoint the disease's origin and reconsider their methods of management. In the long term, managing pastures or altering living circumstances will be more beneficial for parasite issues than any medication.Fighting parasites with Sweet Flag Sweet flag (Acorus calamus), for instance, is a plant that may be used as a natural parasite treatment. This plant may be found on the shores of rivers and lakes as well as in marshes or swampy ditches, and it can thrive in both tropical and subtropical climates. The thick root sections of the rhizomes, which are dried and powdered, work well as a pesticide against house flies, fleas, and bird lice. Approximately 15 g of powdered rhizome should be used for each adult bird for treating poultry with lice. Hold the bird by its feet upside down while applying the powder to allow the dust to penetrate the skin via the opened feathers. According to reports, the procedure is safe for the birds. When sprinkled on freshly dunged cows with fly maggot infestations, the sweet flag powder is also said to be beneficial against house flies. If cleaned with water infusion, it will also prevent newborn calves from vermin illness.

The farm animals may become poisoned after using herbal parasite cures.Therefore, it's crucial to understand the proper dosage and administration technique. The choice of breeds suited for local circumstances and organic feeding is vital since preventative methods for maintaining excellent animal health are of significant value in organic farming. This necessitates the availability of breeds that are suited. For organic animal breeding, traditional farm animal breeds could be a useful starting point. By choosing people that are specifically suited for organic settings, animals may be enhanced. They may be crossed with the right new breeds to produce a creature that combines the best qualities of both the old and new breeds.Organic farming practises natural reproduction for breeding. IFOAM guidelines state that although artificial insemination is acceptable, embryo transfer, genetic modification, and hormonal synchronization are not.In many locations, traditional breeds have been phased out in favour of high-performing ones during the last several decades[9], [10].

These novel breeds often rely on a rich food (concentrates) and ideal living circumstances, similar to high producing plant kinds. High performing breeds need regular veterinarian treatments since they are often more prone to ailments than conventional types. As a result, these new breeds may not be the best option for small farmers since the price of food concentrates and veterinary care is too costly in comparison to the revenue generated by the sale of the resulting goods. Additionally, organic farmers retain animals for a variety of reasons in addition to the primary animal product (such as milk). Therefore, breeding efforts should aim to maximise an animal's total performance while taking an organic farmer's many objectives into account. For instance, a breed of chicken ideal for organic smallholder farms may not have the best egg output, but it could have excellent meat production and the ability to be fed kitchen scraps and other items found around the farm. A suitable breed of cattle would have a high reproductive rate, be disease-resistant, and produce enough milk and meat while primarily consuming roughage and agricultural byproducts such as straw. If necessary, they may also be utilised for draught and transportation.

Typically, just the productivity per day or year is taken into account when comparing the output of various kinds of cows. High performance breeds often have shorter lives than conventional ones that produce less. A cow that produces 8 litres of milk per day over the course of her life would produce more milk overall than a high-breed cow that produces 16 litres per day but only lives for four years.As raising and feeding a calf or buying an adult cow need significant financial outlays in order to have a milk-producing cow, long-term output should be of great importance to the farmer. This has to be reflected in the breeding objectives, which up to this point have mostly focused on maximising short-term productivity.In many nations, herbal medications are often utilised. Some rural, traditional societies are well-versed in the medicinal qualities of the region's flora. Even if they don't immediately eradicate the disease's germ, plants may undoubtedly aid in the healing process. However, producers should not neglect to determine the disease's origin and to reconsider their management strategies. Long-term effectiveness of any therapy for parasite issues will be outweighed by changes in living circumstances or pasture management.

The sweet flag plant Acorus calamus is an illustration of how to employ a herbal medicine against parasites. This plant may be found growing in swampy ditches or marshes, along the sides of rivers and lakes, and in both tropical and subtropical climates. An efficient pesticide against house flies, fleas, and bird lice is the powdered dry rhizomes (thick root sections). For the treatment of poultry with a lice infestation, use 15 g of powdered rhizome per adult bird. Hold the bird by its feet upside down while applying the powder to allow the feathers to expand and the dust to reach the skin. The procedure is said to be secure for the birds. When sprinkled on new cow dung contaminated with fly maggots, the sweet flag powder is reportedly efficient against home flies. Additionally, if cleansed with water infusion, it will guard against vermin infection in newborn calves.

Herbal anti-parasitic treatments may be dangerous to farm animals as well! Therefore, understanding the proper dosage and administration technique is crucial!The choice of breeds appropriate to local circumstances and organic feeding is of utmost significance in organic farming since preventative methods for preserving excellent animal health are of great value. This calls for the availability of breeds that are appropriate. Organic animal breeding may be best started with traditional farm animal breeds. Animals may be made better by choosing people who are specifically suited for organic circumstances. They may be crossed with the right new breeds to produce a creature that combines the best traits of both classic breeds and the fulfilling procreation of new breeds.Natural reproduction methods are used in organic farming for breeding. The IFOAM guidelines allow artificial insemination but forbid embryo transfer, genetic modification, and hormonal synchronization.Traditional breeds have mostly been supplanted by high-performing ones during the last several decades in many locations.

Similar to high producing plant kinds, these novel breeds often need on a nutrient-rich diet (concentrates) and ideal environmental conditions to survive. High performing breeds often have a higher illness susceptibility than conventional types, necessitating regular veterinarian treatments. Because the prices of food concentrates and veterinary care are too costly in comparison to what can be made from selling the goods, these new breeds may not be the best option for small farmers. Furthermore, keeping animals is not only done for the purpose of producing the primary animal product, such as milk, for organic farmers. Therefore, breeding efforts should aim to maximise the animal's total performance while taking into account the many objectives of an organic farmer. For instance, a breed of fowl that is suited for small-scale organic farms may not have the best egg output, but it could have excellent meat production and the ability to be fed kitchen scraps and other items found around the farm. In addition to producing enough milk and meat while primarily consuming roughage and agricultural byproducts (such as straw), suitable cow breeds should also have high fertility, strong disease resistance, and the ability to be utilised for draught and transportation.

Typically, just the output per day or year is taken into account when comparing the output of various breeds of cows. However, breeds with high performance often have shorter lives than those with conventional, lower-producing breeding. The life milk output of a cow that produces, say, 8 litres per day over the course of 10 years would be more than that of a high-breed cow that produces 16 litres per day but dies after 4 years.Continuous production throughout a long-life span should be of great importance to the farmer since the investments to obtain a milk producing cow are rather significant, such as the training and feeding of a calf or the purchase of an adult cow. The breeding objectives, which up to now have mostly focused on maximising short-term productivity, should reflect this[11], [12].

CONCLUSION

The key to effective livestock management and good animal care is an awareness of the nutritional needs of animals. A balanced diet has a direct influence on animal health, production, and the quality of goods made from them. It goes beyond simple nutrition.Because various animals have evolved to live on a variety of diets, it is essential to adjust nutrition to meet certain physiological demands. Animals that are young or breastfeeding have different nutritional ratio needs than animals that are adults. Utilisation of nutrients is also influenced by environmental conditions including temperature, humidity, and activity level. Modern animal husbandry is aware of the complex interactions between the need for food, animal care, and environmentally friendly practises. Precision nutrition enables more specific feeding techniques thanks to scientific study and developments in feed technology. This minimises the impact of livestock operations on the environment while simultaneously optimising animal development and output. Additionally, there is growing evidence of the link between animal and human diet. Animal products that are nutrient-rich benefit human health, highlighting the moral need to provide animals with high-quality food. The wider effects of sustainable agriculture emphasise the significance of effective feed conversion and lower waste output even more. In conclusion, knowing and satisfying an animal's nutritional needs goes beyond simply feeding. It is a dynamic science that integrates sustainability, ethics, and biology. By matching animal diet to their physiological requirements, we not only improve animal health and well-being but also promote a more responsible and holistic approach to agriculture that is advantageous to animals, people, and the environment.

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CHAPTER 9
EXPLORING THE DIFFERENT WAYS OF ORGANIC GARDENING

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ABSTRACT:

The term "organic gardening" refers to a wide range of methods that priorities sustainability, biodiversity, and soil health while yielding healthy crops. This essay examines numerous organic gardening techniques, such as companion planting, raised bed gardening, container gardening, and permaculture. Each approach is looked at for its particular benefits, drawbacks, and possible contributions to environmentally friendly gardening. This study offers a thorough review of the various organic gardening techniques by analyzing the scientific literature, real-world experiences, and case studies. It emphasizes how important it is to modify these techniques according to regional circumstances, encourage ecological balance, and advance the welfare of both gardeners and ecosystems.

KEYWORDS:

Certification,Farms, Gardening,Organic, Permaculture.

INTRODUCTION

The following topics adhere to organic principles even though this course primarily focuses on "organic gardening." In the most basic words possible, permaculture is the application of a complicated set of principles to the creation of an environmentally friendly, self-sustaining system. The biodynamic method is quite specific, and it is a field that calls for extensive research all by itself. Here are some quick summaries of the two ideas.Permaculture, in its purest definition, is a productive system built on beneficial perennial or self-replicating plant and animal species. In a larger sense, permaculture is a theory that includes creating stable, highly productive landscapes that provide resources like food, housing, and energy in addition to enabling social and economic infrastructures. The main components of permaculture are low energy and high variety inputs, in contrast to current agricultural methods used in Western civilizations. These components provide the foundation of landscape design, whether it is on a big farm or a small block.

The capacity of the site to meet the demands of the chosen plant kinds will limit the plants that may be chosen and employed, yet a permaculture system can be created on almost any sort of site. A permaculture system must be established after some degree of planning and designing. Considerations should be made for the climate, landform, soils, existing vegetation, and water availability. Patterns in the natural world may provide information about issues that may later become a problem or that may be advantageous.A well-designed permaculture garden will meet the requirements listed below:When fully developed, it creates a healthy, self-sufficient ecosystem where there is little interdependent competition between the many plants and animals. Only little modifications occur in the garden each year.

The plants and animals in the garden feed one another, requiring little (if any) outside input such as natural fertilizers or feed.Once the garden is established, little effort is needed to maintain it since bio-diversity (of plant, insect, and animal life) controls weeds, illnesses, and pests. Due to the mutually beneficial effects that companion planting and insect attraction have on one another, they are both essential components of this ecosystem.It is fruitful: a garden may be constantly harvested for food or other useful products.

Intensive land use

A lot can be done with a limited amount of space. The "Mandala Garden," which is built on a sequence of circles inside of each other and has few routes and simple, effective irrigation, is a popular design format.Plant types are diverse, which distributes cropping across the whole year and prevents periods when a "lot" is being removed from the system. The nutrients that are removed, which vary depending on the species of plant or animal, are also "evened out" in this way. For instance, to prevent the soil from becoming iron-deficient, plants that need minimal iron are cultivated close to others that do. The variety of species serves as a barrier[1], [2].

It evolves via an evolutionary process, changing quickly at initially, but this becomes slower over a long period of timepotentially never becoming completely stable. It can adapt to diverse slopes, soil types, and microclimates. To anticipate these ongoing, long-term changes is the designer's hardest difficulty.Large trees dominate the permaculture system's structure. Everything else will be impacted by the trees since they provide shade: Reduce temperature swings below provide insulation and light levels below. In any system, there should also be regions without giant trees but with shrubs and lower growing plants instead. This will help prevent water loss from the ground surface and serve as a wind barrier. There will be a difference in the ecosystem along the "edge" of a forested and unforested region. These "edges" provide growth circumstances for species that can't completely develop in the open or in an area with trees[3], [4].

In the southern hemisphere, a treed area's north edge is sunny but protected, and the south edge is chilly but still more protected than in the open. In the northern hemisphere, this is the opposite. The term "edges" refers to a kind of microclimate, which refers to a tiny region inside a larger site that has unique circumstances that favour certain species while allowing others to flourish elsewhere. In a permaculture system, pioneer plants are employed initially to produce greenery and help other plants, which take considerably longer to establish, grow. For instance, many legumes grow quickly, fix nitrogen (increasing the soil's nitrogen content), and improve the nutrients available to nut trees growing nearby. The legumes will eventually disappear as the nuts establish themselves. Pioneer plants usually have limited lifespans.

The practice of biodynamic farming and gardening originated from a set of lectures delivered by Rudolf Steiner in 1924. It has many traits with other non-standard growth methods, but it also has a number of distinctive qualities.It seeks to create a sustainable system where each element of the living system has a valued and appropriate role and sees the farm or garden as a "whole" organism.A little quantity of scientific data supporting biodynamics is now accessible.Some of the information available implies that biodynamic techniques are effective. However, much more study will be needed before mainstream farmers are persuaded broadly of the efficacy of these approaches, or even before the relative efficacy of several biodynamic techniques is correctly determined[5], [6].

DISCUSSION

Australia's Bill Mollison is credited with creating the "Permaculture" idea.The 'Father of Permaculture' is a title often given to Mollison, who was born in 1928. He co-created an integrated design system with David Holmgren. Agriculture, horticulture, ecology, land access methods, architecture, as well as the financial and legal administration of enterprises and communities, are all included in this.The idea of sustainable agriculture was created before the word "permaculture" was used to describe it. Microbiologist Masanobu Fukuoka retired from science to create a sustainable organic farming system that as nearly resembles nature as possible. The land is not tilled; instead, seeds are sown on the soil's surface, species are selected to outcompete weeds, and cover crops are cut and allowed to decompose on the soil's surface. Ducks are employed to remove undesired pests, straw from the previous season's crops is chopped up and utilised as mulch, and so on. The labour inputs into Fukuoka's system are likewise unusually minimal.The following Fukuoka novels are worth looking into:Even though these books are no longer in publication, they may still be found used through vendors like Amazon.com.Since before the 1950s, there has been an evolution of the organic movement. In recent decades, this movement has developed into a whole business. Commercial organic operation certification emerged in response to the requirement for quality control, client satisfaction, and consensus on what defines organic practises in this emerging business.While organic certification requirements are a representation of the commercial organic industry's methods, the organic movement typically employs more comprehensive beliefs and methods[7], [8].

Several nations have certification programmes for organic products. You must be familiar with and comprehend the policies of the nations where you intend to sell your organic product as well as those in which you raise it. The International Federation of Organic Agriculture Movements (IFOAM) serves as the organic movement and the certified organic industry's "umbrella" organisation on a global level. According to IFOAM, their purpose is as follows:IFOAM is a global organisation that represents a wide variety of stakeholders in organic agricultural initiatives. Distribution of information on organic farming, advocacy for the organic movement on a global scale, and the creation of criteria for what constitutes "organic agriculture" are among its main tasks.

The government often regulates organic agricultural certification on a nationwide level. In certain nations, the government may provide direct services for organic certification. The government may certify commercial groups to provide certification services in other nations.Around the globe, a variety of organic groups have been founded. To verify that organic product meets with national and international norms, the certifying organisations collaborate with government organisations and analogous entities abroad. One of the major objectives of organic standards is to limit what may be marketed as "organic" and to provide more widespread quality assurance procedures to lessen customer misunderstanding. The certification of organic producers is in their best interests[9], [10].

Beyond the farm, the certification procedure is involved. The certifiers may also certify importers, exporters, wholesalers, input producers and packers, transporters, packing sheds, and processors. In the last twenty years, and even in the past five years, there has been a significant shift in the structure and level of certification. Future growth and change in the certified organic sector are anticipated to occur. Even while the complexity of organic certification is sometimes attacked, it really reflects the complexity and immense diversity of the organic sector.

Organic Production's Transition

It takes time to decide whether to convert a farm to organic practises. Even though it may be started whenever, organic farming needs a lot of preparation and consideration.Changeover is often a gradual process that takes into account the farm's current status and eligibility for organic farming techniques. What processes, tests, and techniques must be employed, as well as how long it will probably take, will depend on the sort of organic categorization the farm is seeking for example, organic or biodynamic. Most certifying organisations demand a minimum of two or three years between the introduction of organic practises on the farm and a fully certified organic business, therefore the conversion to a completely organic farm takes several years.

There are always going to be compromises made while switching to organic products. For instance, during the conversion phase, the manufacturing quality or volume would likely decline.However, the advantages in the long run will probably outweigh the short-term financial setback.Every certifying authority will take a different approach, and the changeover process is likely to vary from nation to nation. But generally speaking, the changeover to certified organic production goes as follows.

A certifying body officer conducts the first inspection. The farmer creates a management plan. The farmer will probably be questioned by the officer on their management techniques, the inputs they employ, goings-on on nearby farms, and any other pertinent matters.A panel within the certification organisation reviews the certification officer's report and decides whether to approve or reject the application for certification. The officer will likely collect a sample of soil or vegetation to test for chemical residues.By operating in accordance with the guidelines outlined in the certification standard, the producer starts the conversion to certified organic agriculture.

The farmer is referred to as "in conversion to organic" at this time. The producer may promote their goods as "certified in conversion to organic" throughout the "conversion" time. There might also be a time when the producer is "under supervision," obligated to operate in accordance with the rules but not allowed to promote their goods as "certified" or "in conversion to certified organic.The certified property will still be inspected by the certifying organization.These checks are probably conducted yearly.The enterprise will be certified as completely organic after the conversion phase, which is typically at least three years. Ordinarily, inspections continue as long as the farmer adheres to the certification requirement.

The Management Plan Specifies

Previous land uses

Depending on the certification authority, it may need three to five years of non-chemical usage before a piece of land may be recognised as organic.

System of record keeping

In order to be certified, farmers must maintain thorough records of their inputs, outputs, and management practises. This ensures product traceability and enables the certification organisation to assess management practises.

Farm Management

Keep track of weather information

By knowing what has occurred in the past, you may make predictions about what is likely to occur in the future.Crop records, including the date of sowing, the kind of seed used, the germination time and rate, the length of time from sowing to harvest, and the location of harvest, for example, if crops should be harvested separately from "buffer zones." Use of farm equipment; weed control; irrigation; crop rotation; use of cover crops; control of fertilisation; control of pests and diseases; use of propagation materials.

Operator Management

Understanding and staying current with pertinent developments and trends is crucial for good farm management.Keeping up with industry developments is crucial because it will help you plan for the future, adjust to shifting conditions, mitigate negative financial effects, and profit from positive developments. You can do this by subscribing to trade magazines, attending shows, field days, associations/societies/clubs, using the internet, listening to radio shows or watching TV shows, visiting the department of agriculture, etc.Today's non-agricultural businesses have an impact on farming. Keep up with local, national, and worldwide news since decisions and advancements in areas such as politics, science, or economics, among others, may have an immediate and significant impact on how viable agricultural companies are. daily radio or television news, purchasing and reading at least one newspaper on the weekends, and maybe keeping up with happenings online. Some trade or professional organizations are adept at keeping track of and advising farmers of possible long-term effects of such changes.For people who are interested in organic gardening and organic agriculture, both as a movement and as an industry, there are a tonne of materials accessible. Instead of providing you with a list of contacts, the purpose of this section is to provide you background information that will help you locate connections that specialize in your area of interest. The following are some areas that you may wish to look into.

Reference materials

Find literature on the group of plants you are researching by going to a bookstore or library. If your local bookstores or libraries are lacking in particular books, online retailers are a great resource. The internet is also regularly used to find niche book vendors. This information may also be found in telephone directories. Please be aware that some of these books may no longer be available.Sir Albert Howard, Nicholas Lampkin, Rudolf Steiner, Alex Podalinsky, Masanobu Fukuoka, Miguel Altieri, F. H. King, and Lawrence Hills are among authors to seek for.

Online Lookups

Finding what you're looking for quickly and satisfactorily may be done by doing an online search for organic gardening knowledge. In addition, if you are unsure of what to search for, it may be sluggish and stressful. To obtain general information, try searching for terms like "organic," "organic farming," or "organic agriculture." Try key terms like "organic certifier," "organic certification," and "organic symbol holder" if you're seeking for information about organizations, organic certifiers, etc.Other helpful keywords can be: "Try a different search engine and check if they provide a wider selection of sites if you are not satisfied with one search engine (or even if you are).You will discover certain websites are useful and others are not when you explore the internet. Always attempt to ascertain the website's age (as well as the information it includes) and evaluate the source's credibility.

Groups

There are several organic agricultural and horticultural groups, so you're sure to find one that piques your curiosity and matches your level of commitment in organic farming. International institutions like the International Federation of Organic Agriculture Movements (IFOAM) are among these groups. The Rodale Institute in the United States, Garden Organicformerly HDRA, the Organic Organisation in the United Kingdom, Elm Farm Research Centre in the United Kingdom, The Soil Association in the United Kingdom, OGA - Organic Growers of Australia, National Association for Sustainable Agriculture Australia (NASAA), and Organic Food Chain (OFC) in Australia are smaller centres of organic expertise.

CONCLUSION

The variety of techniques used in organic gardening is evidence of how flexible and inventive sustainable farming methods are. Raised bed gardening improves soil drainage and structure while providing flexibility for urban people with limited area. Companion planting uses the natural connections between plants to ward off pests and enhance nutrient intake, while permaculture designs a whole ecosystem that reflects the complexity of nature. There are advantages and things to keep in mind for each strategy. The accessibility of container gardening is offset by possible difficulties with fertilizer and water control. If raised bed gardening is not properly maintained, the benefits of the soil may be negated. Synergy between companion plantings is possible but needs careful planning. The complicated design of permaculture requires a thorough comprehension of ecological concepts. The effectiveness of these organic gardening techniques depends on a subtle fusion of understanding, practice, and circumstance. It is crucial to adapt to local circumstances, including climate, soil type, and resource availability. The gardener's dedication to observing nature and developing an ethic of environmental management is equally significant. In conclusion, the many different organic gardening techniques are evidence of humanity's capacity to coexist peacefully with nature while promoting biodiversity and subsistence. Adopting these practises not only produces wholesome fruit but also fosters a closer relationship with the land and ecosystems that support us. The blending of ancient knowledge and modern ideas will shape the future of organic gardening and lead to resilient, fruitful, and environmentally thriving landscapes.

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CHAPTER 10
ORGANIC FARMING IN EUROPE: OPPORTUNITY AND CHALLENGE

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ABSTRACT:

The growth of organic farming in Europe presents both a chance and a threat for contemporary agriculture. This study explores the complex environment of organic farming in Europe, including its potential advantages and concomitant difficulties. It explores the benefits of organic practises in terms of socioeconomics, the environment, and health, stressing how they are consistent with consumer demands for sustainable and better food alternatives. The report also discusses the challenges faced by organic farmers, such as crop fluctuation, market competitiveness, and difficult certification processes. This study offers a thorough overview of the organic agricultural industry in Europe by examining case studies and empirical data. It emphasizes the necessity of encouraging regulations, technology advancement, and information sharing in maximizing the benefits of organic farming while overcoming the difficulties it poses.

KEYWORDS:

Agriculture, Crops, Europe, Nitrogen, Production

INTRODUCTION

An intriguing prospect for growth is organic farming.Many European nations see organic farming as a way to improve yields and pricing while revitalizing farms with sustainable practises. Many governments are aware of this potential and support organic farming financially.The amount of certified organic land has significantly increased in recent years thanks to government assistance and a wide network of organic inspection bodies [1], [2].The considerable increase in demand for organic goods in various Western European nations has been the primary factor behind the extension of organically certified regions in Europe to date. In recent years, several processors in addition to farms have made partial or complete transitions to organic production due to favourable producer pricing and market prospects for organic goods in Europe. Depending on the nation, organically grown grains, vegetables, fruits, dairy products, and eggs are now the most valuable items.There is substantial room for expansion in the European organic market. The switch to organic farming is clearly a positive development where farmers only use minimal quantities of synthetic chemical fertilizers and pesticides.

Promoting organic farming is an effective strategy for governments and foreign donors to increase revenue in rural regions while preserving resources and the environment. Expanding organic output for both the local and international markets create potential to draw more young people into the agriculture industry. This is crucial given the significant youth mobility from rural to urban areas. Young people find organic farming especially attractive since it not only creates fresh prospects for long-term employment but also encourages creative thinking and action. Both result in increased personal happiness at work every day[3], [4].Overall, organic farming is challenging and needs strong governmental structures, including supportive laws and policies. A successful application of organic agriculture by farmers themselves is also crucial.The difficulties on the farm are many. They begin with the best farm and crop rotation planning possible during conversion and go all the way to daily choices that optimise the cost and effort of producing each crop. For boosting yields and profit margins throughout the crop rotation, the latter is crucial. The difficulties with livestock are comparable. In order to close nutrient cycles, organic farms prioritise using resources that are on- or nearby. The most valuable production asset for organic farmers is fertile soil. For excellent yields and farm profitability, it must be built up via balanced crop rotation and organic fertilisation. The fundamentals of organic farming. Natural resource conservation, environmental protection, animal welfare, and social responsibility are all goals of organic farming. Thus, the use of organic fertilisers and other natural inputs, as opposed to the avoidance of synthetic chemical pesticides and mineral nitrogen fertilisers, is referred to as being organic.

DISCUSSION

The term "organic" may also apply to an ecological strategy that abides by the interconnectedness and inherent rules of living things. Therefore, organic farming depends on significant interactions among soil, plants, farm animals, insects, environmental elements like water or climate, and people. The goal of an organic farmer is to apply ecological methods and principles to produce the best harvests possible while preserving the environment. In this regard, organic farming is a wholistic approach to agriculture: in addition to the production of high-quality food, protecting natural resources like fertile soil, pure water, and a diverse range of wildlife is a major objective.The foundation of organic agriculture is built around the four guiding principles of IFOAM, the International Federation of Organic Agriculture Movements. The guiding principles outline the contribution that organic farming and the individuals engaged should make to improving agriculture across the globe. They serve as a roadmap for the expansion of organic agriculture [5], [6].

An economy that respects the environment, animals, and people there are significant differences between conventional and organic agriculture. Organic farming strives to long-term preserve the natural resources while growing crops. High levels of animal wellbeing and lifelong performance are important goals in animal husbandry. In order to maintain the nutritious content of the raw materials, organic processing aims for a gentle transformation. Processors rely on premium raw ingredients to produce organic foods of the highest quality possible. Combining and contaminating of organic with conventional product is prevented by the continuous separation of organic and conventional raw materials and the thorough documentation of all processes from the field to the point of sale.

Legal restrictions apply to organic farming. Achieving certification ensures that all rules are followed, from agriculture production through processing and sale.The specifications for organic production are outlined in national (such as the Swiss organic rules), international such as the EU standards), and private regulations such as Bio Suisse, Bioland, and Demeter. To get organic certification, the relevant conditions must be satisfied.The IFOAM fundamental standards and the Codex Alimentarius collection of standards of the United Nations) recommendatory recommendations have a significant impact on national and international organic legislation. The EC Organic Regulation, which entered into effect in 1993 and has since undergone several revisions and amendments, serves as the legal foundation for organic farming in Europe. As of January 2017, the existing Regulation (EU) 2018/848, issued May 30, 2018, will be in effect. The rule is applicable to all EU members and serves as a primary model for other European nations, particularly those in Eastern Europe.The numerous organic agricultural societies, which also serve as private label bodies, determine the standards under private law. There exist agreements among organic farming organizations that guarantee these requirements are equal in order to ease the reciprocal market access of organic.'Organic' and 'ecological' terminology are protected.The names "organic" and "ecological," including their abbreviations "Bio" and "Eco," are protected by all organic legislation and standards in a variety of dialects and languages. As a result, they can only be applied to goods whose production, processing, and trading practises all adhere to the organic criteria.

Accredited certification bodies monitor compliance with the requirements via planned and unplanned inspections.Differences and equivalence in policy. In general, the national criteria are less stringent than the private organic norms that were created in many nations. They advertise themselves as having greater standards for consumer food quality, animal welfare, and sustainability. In order to more effectively sell their goods, the members of these label organisations depend on this guarantee.The following deviations from the EU organic rule underlie the private label regulations' stronger standards: Organic management of all farm branches and units is part of overall farm management.Stricter rules governing animal husbandry, such as mandatory grazing for ruminants, a cap on the proportion of concentrated feed allowed in the overall feed ration, and limitations on the ingredients that may be used in traditional feed.

Biodiversity

Designating a certain portion of farmland for the promotion of biodiversity; taking production practices that do so.

Social responsibility

adherence to minimal social standards for workers' working circumstances. Producers must be certified for a number of organic requirements if they wish to sell their goods in various marketplaces under various labels. As a result, many certification bodies have multiple standards accreditations. As a result, producers may reach various target markets for only a little extra expense.As the foundation for organic production, soil fertility. As a biological organism, the soil in organic farming, weak and deteriorated soils cannot generate good yields. As a result, organic farmers rely on healthy natural soil fertility.Numerous soil processes are dependent on the activity of soil organisms and are very variable depending on the make-up of the organism populations and the soil's environment. Soil organisms mix the soil, encourage the breakdown of agricultural residues into organic fertilisers, and contribute to the development of a healthy soil structure. They control infections in and on the soil by doing this. These procedures release the nutrients and minerals that are necessary for plant development. Stable humus compounds are also being created at the same time. They serve as significant water and nutrient reservoirs and support a stable soil structure[7], [8].

In contrast to conventional agriculture, where "soil fertility" significantly rely on the external supply of plant nutrients in mineral form, organic agriculture views soil fertility as essentially the product of biological processes. In organic farming, the emphasis is not mainly on the soil's levels of nitrogen, phosphorous, and potassium, but rather on the soil's high humus content and high biological activity, which make nutrients available to the plants via spontaneous decomposition of soil organic matter.Natural biological activities in the soil help plants develop in a balanced way and become hardy. A soil that is biologically active and rich in humus is simple to work, good at absorbing precipitation due to its porous structure, and resistant to silting and erosion. An effective carbon dioxide and nutrient storage facility is a productive soil. The eutrophication of water bodies is therefore prevented by healthy soils, which also contributes to the decrease of greenhouse gases and subsequently global warming.

An essential goal of organic farming is the revitalization of the soil. Therefore, it is crucial to use management techniques that encourage a wider variety of soil organism populations. This covers the availability of acceptable "food" sources such catch crops, perennial clovergrass meadows, green manures, and agricultural wastes. Composting or using rotten manure both benefit soil organisms.Without moving, rotating, or compacting the soil, shallow cultivation encourages soil structure and is particularly kind to bigger soil animals like earthworms.There are several tools that may be employed depending on the soil and crop rotation. The following tools and methods have so far shown promise:Disc harrow or skim plough incorporation of crop residues: high area performance stubble cultivation.Mulch sowing follows the seeding of cereals, oilseed rape, and mixed grain-legume crops in dry circumstances. This involves one or two surface stubble cultivations using the cultivator, disc harrow, or skim plough.

Ley termination using a shallow cultivator equipped with goosefoot blades in two passes; this method works best in thick soils and dry weather. The first pass should be 3–4 cm deep, and the second pass should be 6-7 cm deep.The simplest method of mild soil cultivation is the skim plough. Over the last 40 years, intensive tillage has accelerated erosion rates and resulted in the loss of almost 30% of the world's arable soils. Instead, organic farmers strive to work the land as gently as possible, avoiding practises like excessive tilling. Reversible ploughs, tillers, heavy machinery, and tractors are not used to systematically and deeply mix the soil.In order to increase soil fertility, organic tillage ideally turns just the topsoil, preserving the soil's natural stratification to the greatest extent feasible. When soil is compacted, the subsurface is significantly loosened [9], [10].

Construction of humus and soil

For soil fertility, a high humus level in the soil is crucial. A reduction in humus content results in a soil structure that is more prone to compaction, has a lesser ability to absorb water, and has a decreased potential to provide nitrogen.On the other side, a rise in humus content leads to a more crumbly, biologically active soil with a pH that is neutral, generally improved nutrient availability, and a larger nitrogen supply.Usually, it takes many years before the impacts of humus depletion caused by unsustainable management become apparent. Soil humus development takes time, usually years. The addition of green manure or manure compost is the quickest approach to raise the content of hummus. In the medium and long term, perennial leys that are used as a component of a crop rotation that improves humus are very important.

Optimizing shortand long-term objectives via crop rotation

Crop rotations are crucial to organic farming. They need to focus on short-term objectives while ensuring long-term soil health and productivity.

High impact and little impact

Crop rotations provide the following purposes:

Maintain soil fertility

The secret to building healthy soil is a balanced crop rotation. It must include humus-building plants such grain legumes, lucerne, clover grass, and/or green manures.

Supply nutrients to succeeding crops

Pure legume seeds or combinations in main or catch crops, as well as undersown crops, may supply significant nitrogen to succeeding crops.

Weed control

Tall, densely growing crops, particularly perennials like clovergrass, are efficient for suppressing weed growth. They should preferably come before weed-prone crops in the rotation. The more competitive a crop must be against weeds, the more away it must be from clovergrass. With spring or autumn germinators, alternating between summer and winter crops reduces one-sided weeding.

Control of diseases and pests

Conventional crop rotation practises must be adhered to in order to prevent soil-borne illnesses and pests. Even though legumes are the primary source of nitrogen in organic arable farming, their proportion should not be excessive since this increases the danger of legume fatigue (see page 18 for more information).

Protection against erosion

The soil should be planted as constantly as possible, especially on slopes and in silty or sandy soils that are prone to erosion.

Creating long-term profit

Creating revenue requires the cultivation of crops that are site-appropriate, have high yields, and command attractive producer prices at low production costs. Long-term production capacity of the soil may be negatively impacted by an unbalanced crop rotation based on short-term economic objectives.

On-farm fodder production

Livestock farms should make as much high-quality, self-produced fodder as they can. At least one-sixth of the crop rotation should be dedicated to the production of field fodder. Mixtures made of lucerne or clover are good. Mixtures of grains, legumes, and cereals may be used to make concentrated feed [11], [12].

Legumes play a major part in crop rotations increase soil fertility. Legumegrass combinations are necessary for constructing humus, particularly those including perennial clover and lucerne grass. These crops allow the earth to relax. Green plants with legumes in them also help the soil's structure. The value of the previous crop for the subsequent crop increases with the length of the growing season for the legume-grass combinations.Compared to legume-grass mixes, grain legumes have a weaker humus-building effect and provide less nitrogen.Dense stands of a legume-grass combination are particularly good at stifling weed seeds and roots. Three-year-old, robust legume-grass combinations are also helpful at controlling thistles.

In particular, short-term green manures decrease seed weeds. Binding atmospheric nitrogen Legume crops have the ability to enrich the soil with more than 100 kilogramme of atmospheric nitrogen per hectare per year. The succeeding crop receives various quantities of nitrogen from the legumes, however. While clover-grass meadows accumulate significant quantities of nitrogen in the soil, making it accessible in the short and medium term, crop legumes like soybean utilise the fixed atmospheric nitrogen primarily for their own development and grain production. The composition, age, timing of incorporation, biological activity of the soil, soil characteristics, and climate all affect how much nitrogen is accessible to the next crop. The mineralization of nitrogen is particularly sluggish at soil temperatures below 10 °C; it is greatest around 22 °C.

CONCLUSION

The development of organic farming in Europe reflects the complexity of contemporary agriculture via a duality of opportunity and struggle. The advantages it provides, which include less chemical inputs, more biodiversity, better soil health, and maybe healthier goods, are in line with society's rising need for sustainable practises. The focus on agroecological concepts and the diversity of farm buildings also fit with Europe's long history of agriculture.Organic farming does not, however, come without its difficulties. Farmers must maintain their resolve as they work through certification complexities and production volatility throughout the shift to organic practises. Competition in the market, where organic goods often fetch higher costs but also suffer supply issues, highlights the need of supporting legislation and infrastructure.The development of organic farming in Europe calls for a comprehensive strategy. It is essential to have regulatory frameworks that support organic practises, provide financial incentives, and ease market access. Precision agriculture and better organic inputs are two examples of technological innovation that may help overcome productivity and efficiency problems. Additionally, information interaction between the conventional and organic agricultural groups may promote idea sharing. In conclusion, Europe's organic agricultural industry is at a turning point between opportunity and difficulty. It represents a vision of agriculture that is sustainable and is in line with both conventional thinking and modern desires. Europe can maximise its capacity to feed its people, lands, and future generations by tackling problems with creative solutions and strengthening organic farming's place within the larger agricultural landscape.

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CHAPTER 11
BALANCED NUTRIENT SUPPLY FROM ORGANIC SOURCES

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ABSTRACT:

For supporting healthy plant development and guaranteeing optimum agricultural yields, a balanced nutrient supply is essential. Organic farming encourages the use of a variety of organic resources to provide necessary nutrients while preserving soil fertility and ecosystem integrity. The notion of a balanced nutrient supply from organic sources is examined in this research, which also highlights the range of natural inputs that are readily accessible, including as compost, cover crops, animal manures, and biofertilizers. The study assesses the efficacy of organic nutrient sources in satisfying plant nutritional needs via an extensive analysis of scientific literature and practical applications. It also discusses the wider effects of implementing such practises, such as less environmental impact and improved soil health. This research provides important insights into sustainable agriculture practises that combine productivity with ecological care by analysing the foundations and results of balanced nutrient supply from organic sources.

KEYWORDS:

Crops,Farming, Nutrients, Organic, Soil.

INTRODUCTION

Instead of synthetic mineral fertilizers, use organic sources of nutrients. Growing crops with a sufficient supply of nutrients is crucial in both organic and conventional farming. However, there are significant differences in the nutrient supply in conventional and organic farming. As seen in crop residues, farmyard manures, composts, and green manures, organic farming delivers nutrients mostly in a natural, organically bonded form, as opposed to conventional agriculture, which primarily supplies plant-available minerals in a mineral form. As a result, organic farming provides nutrients via the soil, which encourages a more balanced delivery of nutrients depending on the demands of the plants. Small nutrient balance deficiencies, which are prevalent on organic farms, are often filled up by soil nutrient stocks, thus extra fertilizer applications are not necessary[1], [2].

For nutrients that are organically bonded to be absorbed by plants, they must first be mineralized. The mineralization process is mostly caused by soil microorganisms. However, they also dissolve nutrients from the parent rock and, under certain circumstances, bind nitrogen from the air in addition to mineral- using organically bound nutrients. Plants, on the other hand, encourage microbial activity in the root sphere by vigorously excreting substances that are rich in energy.In contrast, soil organisms are disregarded when crops are fertilized using mineral fertilizers. They become fewer and less diverse as a consequence, which has an adverse impact on soil structure and the control of hazardous species in the soil. Maximizing the usage of nutrient sources on the farm. Depending on their C/N ratio (see Box 7), farm manure, compost, and other organic fertilizers give nitrogen and other nutrients to crop rotation during the short, medium, and long terms.As net sources of nitrogen in organic farming, legumes are at least as important as farm and commercial fertilizers. In order to provide crops with nitrogen, tillage and mechanical weed control encourage the mineralization of nutrients in the soil. However, estimating the nutrients available to crops in organic farming is more challenging than in conventional agriculture because of the many nutrient sources and the intricate biological conversion processes[3], [4].

Plant development and high yields are fuelled by nutrients that are stored in the soil. The levels of nutrients available to feed crops are often insufficient on many organic farms. The availability of nitrogen in particular restricts the yields on many farms.Avoiding nutrient losses due to erosion, leaching, and gaseous losses is the first step in good nutrient management. Nitrogen losses are especially important since it is necessary for both soil organisms and plant development, and as a result, for the general biological activity of the soil.Important steps to stop the loss of nutrients Keeping a constant soil cover throughout the winter.Sowing cover crops underneath crops.Low-loss farming manures and waste fertilisers storage, preparation, and application.Properly timed fertilisation and tillage. Proper control of nitrogen. The most important plant nutrient driving growth is nitrogen. Crops' access to nitrogen from humus is significantly influenced by the soil's composition, temperature, moisture, aeration, and, especially, the C/N ratio of the organic nutrient sources [5], [6].

For soil microorganisms to effectively mineralize nitrogen, warm, well- aerated soils with enough moisture are required. Low temperatures, a dry spell, soil compaction, or waterlogging on the other hand, prevent the mineralization of biologically fixed nitrogen.Irrigation may encourage mineralization in dry situations. When the soil is dry and the subsoil is compacted, mechanical deep loosening may increase soil aeration. However, planting permanent deep-rooting plant species like lucerne as a supplement to loosening is recommended.

DISCUSSION

When circumstances are right, harrowing or hoeing the topsoil helps the soil's mineralization process. Per hoeing pass, mineralization of 15–25 kg N per acre is possible. Thus, hoeing may provide results similar to those of a single application of fertiliser.In order to guarantee long-term production, farms with nutrient-poor soils or arable and vegetable table farms with significant nutrient exports often depend on additional nutrients. Farm manures are often used in agribusiness. When animal manures are not available, farmers that grow vegetables and grains without keeping livestock utilise commercial fertilisers. Commercial fertilisers are primarily used to deliver nitrogen, while basic phosphorus and potassium needs may be satisfied by agricultural manures and compost[7], [8].

Compost and manure are the main sources of organic matter and basic fertilisers for phosphate and potassium. Some of the nitrogen in slurry is more quickly accessible to plants than it is in manure. Slurry is therefore a good choice for top dressing or short-term nitrogen fertilisation in crops with extended growth seasons. The new EU organic regulation 2018/848, which takes effect on January 1, 2017, stipulates that farmyard manure must come from organic production and should preferably be composted. This is in contrast to the current EU organic regulation, which permits the supply of manure, slurry, and dung from conventional livestock farming as long as these do not originate from industrial livestock farming (maximum 2.5 LU per hectare, no poultry farming in cages, no pig farming predominantly on slats).

Farm fertilisers from locally accessible sources are supplemented or replaced with commercial fertilisers. The standards governing organic agriculture must be followed, and any commercial fertilisers used in organic cultivation must be recorded in the relevant input lists essential organic fertilisersThe most significant organic fertilisers in organic farming are manure and slurry from livestock farming as well as composts and green manure chippings from crop production. Fermentation substrates from biogas plants are also becoming more popular in certain nations.Different properties of the soil are impacted by the organic fertilisers.

Slurry's amounts of nitrogen vary greatly depending on its source animal species, housing arrangement for cows, for example, tie stall or loose housing, and dilution. The nitrogen included might also be quite differently available. Urea manure should be diluted with water at a ratio of 1: 3 since it has the highest amount of readily accessible nitrogen (a little bit more than full manure). Slurry works especially effectively for applying tailored nitrogen to pasture and arable crops. However, slurry doesn't do anything to help humus accumulate.The quality of manure may vary substantially depending on the kind of animal and how it is stored. Fresh or heaped manure is obviously inferior than decayed and composted manure in terms of improving soil structure and production. Manures are briefly kept at the edge of a field or on the manure slab and rotated a few times in order to increase plant tolerance to manures via (partial) decomposition[9], [10].

Of all the organic fertilisers, compost has the most impact on soil structure. However, since they have a high C/N ratio, young composts with a lot of lignin might cause a blockage of nitrogen in the soil. Manure or any easily accessible organic nitrogen source as supplemental fertiliser may lower this danger.Ammonium (NH4), which is present in large quantities in digestate or liquid manure, rapidly evaporates as ammonia (NH3) when it dries. As a result, liquid manure should only be sprayed to porous soil during periods of chilly, moist weather with little to no wind and swiftly integrated into the soil. Post-rotation may transform solid digestate into superior compost. However, only organic farming is allowed to fertilise with digestate under certain conditions.

Commercial fertilisers are often used, particularly in the organic vegetable industry, to supply the nutritional requirements of crops with high nutrient requirements. Commercial fertilisers were first only allowed to be used in organic arable crops for crops that produced a high yield. However, commercial biofertilizers are now more affordable in industrialised nations, making their usage interesting as a complement to farm fertilisers and green manures for conventional market crops including maize, potatoes, cereals and field vegetables.Commercial fertilisers make it simple to get extra yields of 10 to 30 percent while growing potatoes. Additionally, compared to fertilising with manure and slurry, the use of commercial fertilisers causes a decrease in potato scab and dry core, leading to a greater product quality. Commercial fertilisers may also be administered affordably and have a variety of uses. The most common organic nitrogen fertilisers are employed because nitrogen deficiency is widespread. However, the concept of a closed nutrient cycle is disregarded in organic farming when commercial fertilisers are used.There are three categories of nitrogen-rich commercial fertilisers used in organic farming:Commercial organic fertilisers made from animal products such as meat bone meal, feather meal, and pellets made from hair meal.

Vinasse, potato fruit water and concentrates, leftovers from the processing of maize, mashes, and malt culms (Maltaflor) are examples of organic commercial fertilisers of plant origin.Other organic fertilisers, such as hydrolysates, bio-sol, and fertilisers for legumes.The fertilisers and soil conditioners that are permitted in organic farming in Europe. Private organic standards, however, impose further limitations on fertiliser usage. National legislation also governs the usage of fertilisers.On the website inputs.eu, FiBL's European Input List provides details on all goods that adhere to the regulations for organic manufacturing.Intercrops, perennial legume- grass combinations, and green manures all aid in nutrient conservation and supply for the next major crop. When planted soon after the major crop harvest, they also aid in stabilising the soil structure, fixing atmospheric nitrogen, and preventing soil erosion. Pure seeds or various mixtures are utilised, depending on the intended usage. Mixtures have a reduced failure rate, provide greater soil coverage and stabilisation, and make better use of the nitrogen from available legumes[11], [12].

The best intercrops for soil fertility are legume-grass combinations with at least two major crop years.Legume-grass combinations need to have their clippings frequently removed and clipped. This encourages soil development and plant growth.Due to their deep soil roots and relatively slow decomposition, grasses, such as clover or lucerne, are more effective in promoting humus buildup than legumes on stockless farms.Winter-hardy clover-grass combinations, ryegrass (including vetch) or winter turnip (Chinese turnip) after cereals or forage rye (including maize) or potatoes provide effective erosion management.Fast-growing plants like turnip, mustard, forage rye, and oats are especially good at storing nitrogen for the next harvest.Summer vetch and Alexandrian clover are suitable for seasonally occurring short-term revegetation lasting around three months.

On locations with limited rainfall, Sudan grass, bristle oats, or ramtil (Guizotia), which sprout fast, control weeds efficiently, and are sometimes exceptionally drought tolerant, are particularly ideal.Oil radish, perennial lucerne, lupines, and grain beans are suitable for deep loosening when soil is compacted. However, using a cultivator, the soil must first be thoroughly loosened.If turned early enough in the spring, overwintering green manures like winter peas and vetches might assist reduce some stress on crop rotations by preventing the proliferation of root gall nematodes.

Crop output is significantly reduced and harvest is hampered by severe weed infestation. Herbicides are not used in organic farming to control weeds. Instead, organic farmers depend on cultural preventative measures and the use of sometimes complex mechanical tools like harrows, hoes, and brushes. It's also possible to utilise flaming apparatus.Organic farmers heavily depend on preventative measures for weed management since direct regulation of weeds, particularly regulation of problematic weeds like ragweed, thistles, couch grass, and dock, has its limits. Weed pressure and consequent crop danger are maintained low by routinely using preventative cultural interventions. The goal in arable farming is to completely eliminate physical work, with the exception of sugar beetroot and soybeans and for the removal of certain root weeds, in order to increase profitability.

A weed-suppressive crop rotation and situation-appropriate tillage are used to preventively reduce seed and root weeds in order to minimise weed pressure and, therefore, the need for mechanical weed management. Another crucial preventative step is the use of weed-free seed. Furthermore, controlling weeds also entails stopping their spread by sowing or carryover using machinery, agricultural fertilisers, and seed. It's also important to prevent rhizome fragmentation from helping weeds spread from the roots up.In general, organic farming aims to prevent weed competition at crucial periods of crop growth rather than achieve total weed control. Problem weeds, in contrast to'simple' weeds, are often subject to zero tolerance in order to stop their germination from the start.

The best weed prevention strategy is a flexible, well-planned crop rotation. So, in addition to taking into account factors relating to the crop and the market, crop rotation planning must take into account the weed condition in the fields.Pressure from weeds on a plot: Crop fields may have quite different levels of weed pressure. A poorly competitive crop may need to be avoided due to soil compaction, weed seed stock in the soil, or problematic weeds. In these cases, a "crop break" by planting perennial clover or lucernegrass is necessary.Competitiveness of crops in great part, an arable crop's early development, growth height, and growth duration determine how competitive it is against weeds. The most competitive crops are those with swift early development, quick canopy closure, tall growth, and wide leaves. The length of maturation is particularly crucial since many crops enable light to penetrate the soil just before to maturity. This encourages the germination of weed seeds and could even let them set seed. Cereales are seen as competitive crops in this way, particularly rye, spelt, triticale, and tall-growing wheat types. Until canopy closure is accomplished, maize, oilseed rape and field beans are less competitive due to their early sluggish growth. Sugar beets and field vegetables like carrots and onions, which never completely cover the ground, are crops with low competitiveness.

Unique function of legume-grass combinations: Due to their effective weed control, legume-grass mixtures play a unique role in crop rotation. Annual seedings primarily control weed seeds, but tall, dense combinations of 2 to 3 year legume grasses efficiently control all sorts of weeds. Fast-growing legume mixtures, such those containing Persian and Alexandrian clover, have worked well for annual sowing. At least 20% of the crop rotation should consist of legume-grass mixtures for the preventive management of root weeds.

Summer and winter crops alternated often prevents weeds from growing unchecked over many years and accumulating a significant seed bank. For example, winter wheat would be planted before potatoes or maize.Both permanent crops and arable crops have the potential for undersowing. In less competitive crops (such as ground clover undersown in oilseed rape), undersowing covers the soil and limits weed growth. Undersowing is often only beneficial if the cover crop lasts longer, up until winter or, better yet, into the next spring. For effective undersowing, timing is crucial; seeds are planted shortly before the crop's canopy shuts. A crop that is under-sown may not mature enough if it is seeded too late or too early, which results in competition with the main crop. The finest clover kinds for under-sowing are white, red, crimson, Alexandrian, underground, and yellow clover. Quick-growing summer intercrops rapidly cover the soil following a major crop and control weed seed and root germination. Couch grass may be controlled by cruciferous plants like mustard, oilseed rape, or oil radish.

CONCLUSION

Sustainable and regenerative agriculture is embodied by the idea of a balanced supply of nutrients from organic sources. This strategy acknowledges that ecosystem health and soil fertility are closely related, and that nutrient management should be carried out in a way that respects and utilises natural processes. The wide range of organic inputs available, including compost loaded with organic matter, cover crops that fix nitrogen, and nutrient-rich animal manures, highlight how adaptable organic agriculture is when it comes to supplying plant nourishment.A balanced nutrient supply from organic sources is prioritised in agricultural systems, and this has several advantages. First, the danger of nutrient imbalances or leaching is reduced since the progressive release of nutrients from organic materials matches plant requirement. A robust soil ecosystem capable of nutrient cycling and water retention is fostered by the absorption of organic matter, which also improves soil structure and microbial diversity. Furthermore, the environmental costs of their manufacture and use are reduced by lowering reliance on synthetic fertilisers. The switch to nutrient supply that is balanced and derived from organic sources shows a dedication to agricultural sustainability over the long run. Despite potential difficulties with fertiliser availability and unpredictability, cutting-edge techniques like companion planting and integrated nutrient management may successfully handle these issues. In conclusion, adopting a balanced nutrient supply from organic sources not only improves crop yields and soil fertility, but also demonstrates how ecological principles and human inventiveness may coexist together.

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CHAPTER 12
EXPLORING THE ORGANIC PLANT PROTECTION: PREVENTION AND PROTECTION

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ABSTRACT:

Organic plant protection has grown significantly in popularity as a sustainable and eco-friendly way to maintain agricultural output and reduce the negative effects of synthetic chemical inputs. In the context of organic plant protection techniques, this essay explores the ideas of prevention and protection. It looks at several precautions that serve as defences against pest and disease infestations, including crop rotation, intercropping, and the adoption of resistant plant cultivars. The report also examines preventative methods including the use of biological pesticides, natural predators, and cultural practises that improve ecosystem resilience. In addition to ensuring healthy crop yields, the combination of preventative and protection techniques supports the long-term sustainability of agricultural systems and the preservation of biodiversity. This research provides insights into the all-encompassing potential of organic plant protection in tackling current agricultural difficulties by thoroughly examining various methods.

KEYWORDS:

Animals, Farming, Organic, Plants, Protection.

INTRODUCTION

In organic farming, the use of synthetic chemical pesticides is prohibited. The efficacy of the majority of natural plant protection solutions is limited, making it even more important to take preventative steps to avoid diseases and pests in organic agriculture. The most effective use of safeguards like the development of robust, healthy plants and the natural control of pests by natural enemies should be the results of choosing appropriate sites, resistant cultivars, appropriate cultivation techniques, and cultural approaches. Only when preventative (or indirect) plant protection methods are insufficient are biological plant protection products utilize. A healthy soil is the first step in preventive plant protection. The foundation for optimal crop growth in a biologically varied, almost natural environment that encourages beneficial insects is a biologically active soil. Natural plant pest foes have been proven to flourish in highly organised environments with interconnected semi-natural habitats, such as blooming borders, hedgerows, and strips of native wild plants. These helpful insects include ladybirds, chalcid and braconid wasps, hoverflies, and chalcids[1], [2].

The choosing of resilient and strong cultivars to avoid illnesses (and, to some degree, pests) is of vital significance in organic farming, along with species selection and adherence to advised growth intervals. All crops fall under this, but particularly enduring ones like orchards and vines. Consistent preventative measures are often adequate in most arable crops to keep disease and insect infestation below the damage threshold. To avoid production losses and quality flaws in the harvested crop caused by pests and diseases, the cultivation of potatoes, vegetables, fruits, and grapes often rely on the application of biological plant protection products.The employment of direct plant protection measures is always based on the pressure of an existing or anticipated infestation. To apply crop protection agents on time, forecasting models and weather predictions are checked when they are available. Effective pest and disease management in organic farming requires regular monitoring. A light biological plant defence For monitoring infestations, preventing them from happening, and directly controlling pests, biological plant protection uses living beneficial organisms and biotechnological measures. By planting pollinator- and nectar-producing flowering plants in flower strips, one might encourage pests' natural enemies, such as predators, parasites, parasitoids, and pathogens (ento- mopathogens). There are also commercially accessible versions of several natural enemies, such as helpful insects, mites, nematodes, bacteria, viruses, and fungus. Common applications include spraying bacterial solutions like Bacillus thuringiensis on pest caterpillars or releasing parasitoids selectively on certain insect pests in greenhouse crops.

Fine-mesh nets against insects in the production of vegetables and fruits or glue rings around fruit trunks to catch female frost moths, blood lice, and other pests travelling up the trunk are examples of biotechnological crop protection techniques.Monitoring infestations largely involves using insect traps with frass attractants like juice or vinegar and colours that are appealing to the appropriate pest (yellow panels, white panels). The evaluation of the requirement for plant protection measures and suitable treatment periods is made possible by the frequent recording of insect captures.To deceive the males of many moth species, dispensers with female sex pheromones are also employed in organic fruit, grapevine, and vegetable production. This may be used to stop them from mating and lessen the amount of eggs they deposit on the crop[3], [4].

DISCUSSION

Pheromone traps can only do so much to manage infestations since a lot of them are needed and there must be little of a flow of mated females from other areas. Therefore, controlling moth flight is the main application for the usage of pheromone traps.Plant or mineral-based natural substances serve as the basis for plant protection solutions that are permitted in organic farming. They safeguard the environment and seldom ever leave any residue on the gathered goods. However, both from an ecological and consumer standpoint, the usage of plant protection agents might be problematic. Natural insecticides that function just in some areas might be harmful to the beneficial fauna. Additionally, using a tractor to apply the chemicals uses energy and may compress the soil.Different plant extracts, oils, and soaps are used in plant protection solutions to combat insect pests. Sulphur, copper, alumina preparations, and certain plant extracts are used to treat fungi-related disorders[5], [6].

The use of copper in organic farming is controversial since the heavy metal builds up in the soil and harms soil organisms at increasing input levels. Natural replacements for copper are being developed and will soon be authorised. It is crucial to apply as little material as possible while copper is still in use. Recognised input lists include a list of all plant protection items that have been certified for organic farming. Agricultural production and animal husbandry are related. Animal husbandry is crucial to organic farming since the animals helps to complete the farm's nutrient cycle:Ruminants and other grazers effectively convert feed from grassland into value-added products, providing extremely useful organic fertilisers to renew the soil and nourish crops. Grassland is necessary to maintain humus and control weeds throughout crop rotations. Straw harvested on the farm may be used as bedding for animals. The straw binds nutrients from urine and excrement from animals. The resultant manure is an effective long-term fertiliser and soil conditioner.

A key aspect of organic farming is the care of farm animals in accordance with their species. The animals should be in good physical and mental condition and be allowed to engage in their normal behaviours to the fullest extent feasible. In contrast to traditional animal husbandry, organic animal husbandry aims to produce animals with good lifetime performance and cost-effectiveness rather than maximising performance via high stocking densities, high daily gains, and high milk and laying outputs. By doing this, the stress on the animals and harmful effects on the ecosystem are reduced[7], [8].This method necessitates that organic farmers be aware of and take into account the species-specific demands of their farm animals. The design of the stables is thus based on the farm animals' natural behaviours. This offers enough room to roam about, chances for activities, social interaction, shelter, and food options. The goal of stable construction is to strike a balance between the best circumstances for the animal and workable solutions for the animal keeper. For the health of the animals, frequent grazing and outside environment stimuli are crucial. As a result, runout and/or pasture are required for all animal species under the EU organic law and the organic associations.

The meals need to be adjusted for each animal species' digestive system. Performance in ruminants is mostly derived from premium forage. As a result, several organic standards have placed a limit on the amount of concentrates that may be used in ruminant diets.For three months, calves are fed full milk in bottles. The minimum nursing period for piglets is 40 days. This assures the availability of antibodies and the young animals' normal development. This also implies that raising young animals on organic farms requires much more time than it does on conventional farms.The prophylactic use of chemotherapy and antibiotics to cattle is forbidden under organic legislation. In organic farming, hormones and genetically modified feeds are not allowed. Instead, to reduce illness, organic farming depends on raising strong animals that are suited to their environment, species-appropriate husbandry settings, and nutrient-specific food.On organic farms, animals are allowed enough room to relax and eat. The animals' well-being and health are promoted by a comfortable, stable environment with fresh air that isn't draughty, dry, littered sleeping places, daylight, frequent access to an outside run and pasture, and interaction with other species[9], [10].

Natural treatments for sickness, such homoeopathy and phytotherapy, are favoured. Natural cures also aid in halting the development of bacterial resistance. Synthetic chemical remedies are also permitted in an emergency to restore an animal's health and prevent pain.The demand for organic goods is rising continuously, organic production technology is advancing, and organic agriculture is becoming more and more supported politically. These are exciting times to think about switching to organic manufacturing. The following important considerations come up while considering potential conversion.

What adjustments to labour, production technology, and economics does the switch to organic production entail?Market accessibility as a prerequisite for conversion. Although there is generally more demand for items in many marketplaces, this demand may change significantly over time and for various commodities. There are sometimes insufficient sales prospects on the home market, particularly in nations where domestic consumption of organic goods is still limited. In these circumstances, the export market must be the primary market for manufacturing. However, overseas importers are often exclusively drawn to high-quality organic food coming from certified farms. Because organically generated conversion commodities must be sold at conventional pricing unless a unique "conversion price" was negotiated, this makes conversion more challenging[11], [12].

A crucial need for a financially stable transition to organic farming is transparent and equitable purchasing agreements for conversion and organic goods. The items that are accepted under what circumstances (quantity, quality, price), and with what certification, are governed by good contracts. These agreements may also serve as statements of intent. For comprehensive conversion planning, it is essential to define the new production and marketing scenario.For farms near to cities, creating their own sales structures to sell directly to local customers may be appealing. However, such a strategy could need a lot of effort, patience, and time. Additionally, it might be difficult logistically and in terms of production to provide a large variety of fresh produce, including meat, eggs, vegetables, fruits, and perhaps dairy products. In order to be able to provide customers with a larger selection of goods, farmers that use such a business model sometimes collaborate with other farmers who grow other organic items. Effective planning of the conversion in terms of output and finances. A successful conversion needs careful planning and consideration of a number of interrelated factors, including:Based on site variables including soil fertility, weed pressure, and climate, it is important to thoroughly assess a piece of land's appropriateness for organic agriculture for various crops.

It is essential to arrange an optimal crop rotation based on crop appropriateness and market demand.It is important to identify and reflect properly the equipment needed for weed management in vegetable and arable crops.Management plans and procedures for pests and diseases in crops must be established.The appropriateness of cultivars and cropping strategies for orchards and vineyards has to be made clear.

Livestock farms must determine if the current run-out facilities and stables adhere to the criteria deemed organic.In accordance with the requirements for feeding, the amount and quality of the animal feed produced on the farm must be evaluated.It is important to look at how animal manure is processed and used in crop production.For farms without animals, it can be worthwhile to explore working together with neighbouring farms that do have livestock (for example, taking over agricultural waste in return for the provision of roughage. Alternatives, like as movable layer management, might be explored for incorporating animals into the farm. To make sure that there is enough labour available, the extra labour for crop maintenance measurements, the care of animals, and marketing must be carefully assessed.

In some cases, new barn construction may be necessary for livestock to meet organic requirements. For tillage and mechanical weed control, it may be necessary to purchase appropriate equipment, if it cannot be rented. Adjustments to meet welfare requirements may be needed in barns, as well as for animals to have access to an outdoor run and/or pasture.Sound conversion planning requires a strong economic analysis. It is important to take into account any factor that might affect the farm's bottom line:It is reasonable to anticipate a drop in yields in the first years after conversion.

However, production stability and yield levels may grow once again in the medium to long term by methodically increasing soil fertility.Because of decreased nutrient levels and ineffective crop protection, organic crops often yield levels that are 20% lower than crops cultivated conventionally. Depending on the conventional farming method's level of production intensity, the variations change from crop to crop.The yield risk may be exacerbated by inexperience with organic farming, particularly in the initial years when harvests might be difficult.

When agriculture is converted to organic farming, fixed expenses, such as those for equipment and labour, often replace variable costs such as fertiliser, feed, and pesticides. To provide a true overall picture of the cost changes, the adjustments must be approximated as precisely as possible for the different production regions. Compared to conventional ones, organic seeds and seedlings might be much more costly. The cost of mechanical weed management must be very carefully evaluated for certain arable and vegetable crops, particularly if it must be carried out by hand. Costs associated with organic certification are incurred at the beginning of conversion, unless they are reimbursed by the government or the purchaser.

In general, organic products may fetch greater prices than conventional produce. Furthermore, costs for conventional food will probably be lower over time than those for goods with an organic certification. Organic agriculture incurs higher expenses and poorer yields, which must be made up for by higher selling prices. Conversion farms without direct sales opportunities are often "price takers," meaning they must adhere to the prices set by the purchasers. The level of selling prices must be predictable, or even better, contractually regulated, for economic security. To have a more advantageous economic situation throughout the conversion periodwhich is 2 years for annual crops and 3 years for permanent cropsit should be attempted to negotiate a surplus price for organically produced inconversion products.

CONCLUSION

With its focus on prevention and protection, organic plant protection presents itself as a possible route for sustainable agriculture. It is impossible to exaggerate the importance of preventative actions, which might range from crop rotation for crop diversity to genetic selection for plant resilience. Such actions reduce the need for reactive treatments while also reducing the spread of illnesses and pests. In addition, natural pest management methods that harness the force of nature, including using beneficial insects and biopesticides made from plants, illustrate how it is possible to cohabit with the environment rather than trying to dominate it.The interdependence of preventive and protection tactics highlights a comprehensive strategy that is in line with ecological principles. Organic plant protection promotes biodiversity and preserves natural balances, which not only increase crop yields but also build robust ecosystems that can tolerate a variety of stresses. Additionally, the need of shifting towards such methods is underscored by the reduced environmental effect and health hazards linked to organic practises. In conclusion, organic plant protection's dynamic interaction between prevention and protection offers a ray of hope for sustainable agriculture. Agricultural systems may reduce hazards, increase production, and contribute to the overarching objective of achieving a peaceful coexistence between human needs and the demands of nature by adopting these concepts.

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