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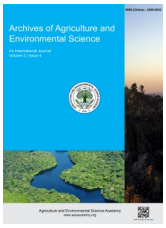

ORIGINAL RESEARCH ARTICLE

Ancient natural farming: Way forward to sustainability in modern agricultural practices

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ABSTRACT

The modern agricultural system is directly associated to the food security to provide food materials to all on the planet earth. In this, the precision agriculture, hydroponics, aquaponics and vertical farming are most prevalent methods of modern agricultural system. It is directly dependent on the use of chemical fertilizers, pesticides, high yield varieties (HYVs), and modern machineries. The excess use of chemical fertilizers and pesticides contaminated and deteriorated the soil and cultivated agricultural crops. Thus, its consequences are soil, water, air pollution, reduction in the soil fertility and loss in the biological diversity, health issues due to the consumption of contaminated food items. The essential components for the sustainability in the agriculture are, fertile land, nutrients input, pest and pathogen repellents, irrigation water sources etc. Therefore, in most of the countries the farmers are looking for the natural farming (Rishi Kheti or Zero budget farming) and organic farming in place of modern agricultural system. The natural farming and organic farming is mostly dependent on the locally available resources such as panchagavya (cow milk, yogurt and ghee, cow manure, cow urine), plans based formulations, green manuring, crop rotation, mulching etc., that are beneficial for maintaining of soil health, water conservation, climate resilience and the produce are also free from contaminants and thus, beneficial for the human consumption and health. In this paper, we have discussed the essential components of ancient natural farming, organic farming and modern farming and have tried to made a comparative analysis of these farming systems.

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INTRODUCTION

Basically, India is an agricultural nation and it is very well recognized that about seventy percent of its population earns their livelihood directly or indirectly from agriculture. As food is the basic need of human being and for which an established agricultural system is most important. In ancient Vedic period priority has been given on the plants cultivation practices (Aithal, 2022; Sharma, 2023). As per Vedas (Yajurveda) land have the capability to germinate and grow the plants that provides food to all creatures. The agriculture (Krishi) practices on various plants have been well documented in many ancient Vedic transcripts like Krishi Parashara, Manusmriti, Artha-shastra, Brhat-Samhita and Vrikshayurveda etc. During the early Vedic period, people have the knowledge of certain crops like wheat, rice, barley, cotton and oilseeds and livelihood was dependent on the agriculture people offer a part of their cultivated products to God (Sharma, 2023). In ancient literature of India like Shri Bhagavad-Gita, Rig Veda and Atharva Veda have descriptions of agriculture, cultivation, manuring, herbs and different varieties of plants. In Vedic natural farming, agriculture was based on the cow and cow products called "Panchakavya" (Panchagavya: cow milk, yogurt and ghee, cow manure, cow urine) was prevalent in cultivation practices (Roy, 2009; Raju *et al.*, 2022). The people were very well familiar about the role of boar, moles, mites, rats, birds, insects, rain and draught in agriculture. Agriculture is the

cultivation of food, fodder crops along with rearing of livestock or animal husbandry (Aithal, 2022; Jones, 2017). It is the main source of economic growth of any nation. Cultivable fertile lands are the prime requirement for the agriculture along with suitable water source for the irrigation of cultivated crops. India is prime agriculture nation and as per the Economic Survey of India 2023-24, agriculture contributed about 18.2% in GDP of the country and provide employment to 50% working manpower directly or indirectly. About 42.3% populations livelihood comes from the agriculture in India (Economic Survey, 2023-24). In Vedic period agriculture was a religious and social activity based practice for the cultivation of crops using animals for the development of granaries (Parmar *et al.*, 2023). Vedic agriculture was purely based on the Vedic principles and it was a symbiotic relationship between human being and the natural world by respecting of all the components of nature. In Vedic farming the cultivation of crops was focused on maintaining the ecological balance on biological diversity in agricultural ecosystems by performing crop rotations, mixed cropping and controlling the pests by natural methods to maintain the soil fertility and soil health. Sustainable use of water in irrigation though rainwater harvesting was most prevalent (Aithal, 2022). The key benefits of the Vedic farming included the maintaining soil health, water conservation, climate resilience, and community empowerment.

METHODOLOGY

The information presented in this chapter was collected from the literatures in the form of research articles, review articles, e-books, magazines have been surveyed/collected from different authenticated offline and online resources such as the University library, e-magazines, newspapers, Newsletters, research journals, reports, Scopus, Web of Science (Core Collection), PubMed, and Google Scholar etc. The literature has been surveyed thoroughly and incorporated in this paper.

COMPONENTS OF AGRICULTURE

The main components of the agriculture included crops cultivation, animal husbandry, aquaculture and fisheries, horticulture and forestry, fertile land, manure, and irrigation sources for watering the crops (IndoFarm, 2022 and Sharma, 2023). All these components are very essential for sustainability in agriculture.

ANCIENT VEDIC AGRICULTURAL SYSTEM

Agriculture is notified as the best profession among all professions in Yajurveda. The agriculture practices included ploughing of land, selection of seeds, sowing season, watering, manuring, harvesting of crops, rotation of crops were clearly mentioned in Rigveda. In the ancient Vedic period the people have the knowledge of crops cultivation and it is well documented in Vedic transcripts like Krishi Parashara, Manusmriti, Artha-shastra, Brhat-Samhita and Vrikshayurveda etc. During the early Vedic period, people have the knowledge of certain crops like wheat, rice, barley, cotton and oilseeds and livelihood was dependent on the agriculture people offer a part of their cultivated products to God. In ancient literature of India like Shri Bhagavad-Gita, Rig Veda and Atharva Veda have descriptions of agriculture, cultivation, manuring, herbs and different varieties of plants (Aithal, 2022). In Vedic agricultural system, agriculture was based on the cow and cow products called "Panchakavya" (Panchagavya: cow milk, yogurt and ghee, cow manure, cow urine) was prevalent in cultivation practices. The people were very well familiar about the role of boar, moles, mites, rats, birds, insects, rain and draught in agriculture (Aithal, 2022). The values of *Pnachmahabhoota* (Prithvi: land/soil; Jal: water; Vayu: air, Jal: water; Agni: fire; Aakash: space) is very well documented and all these components are very essential for the agriculture. Rain was the main source of water for irrigation of crops, rainwater was stored in *Johad/talab/tadaga* (ponds) and used for the irrigation of crops. People were dedicated to worship the nature and their components, there was no overexploitation of resources in that time. River water has also been used to irrigate the crops.

MODERN AGRICULTURAL SYSTEM

There are four modern agricultural systems are most prevalent under the modern agricultural system these includes precision farming, hydroponics farming, aquaponics and vertical farming (IndoFarm, 2022).

Precision farming: The precision farming, also well recognized as satellite farming, it is a modern farming technique that uses technology to achieve crop production. This technique uses data analysis, satellite imagery, and sensors to understand crop health, soil moisture, and nutrient levels. Farmers are using this information to create custom farming plans that optimise crop yield and reduce waste. Precision farming also ensures your farming equipment is put to the best use for maximum yield. The advantages of precision farming are that it reduces the use of pesticides and fertilisers, which can harm the environment. This method also reduces water usage by using sensors to monitor soil moisture levels. Overall, precision farming has revolutionised the agricultural industry by providing farmers with data-driven insights to improve crop production (IndoFarm, 2022).

Hydroponics: The hydroponics is a farming system that grows plants in a nutrient-rich water or solution instead of soil. This scheme allows for year-round crop production and can be used in urban areas where space is limited. Hydroponics also reduces water usage compared to traditional farming methods because the water is recycled throughout the system. The key benefits of hydroponics are that it allows farmers to control the nutrient levels of the plants, resulting in higher yields and better-tasting crops. This method also eliminates the need for pesticides and herbicides since the plants are grown in a controlled environment (IndoFarm, 2022).

Aquaponics: Aquaponics is a farming method that combines aquaculture (fish farming) with hydroponics. This method uses fish waste to fertilise the plants, and the plants purify the water for the fish. This creates a closed-loop system that reduces waste and provides both fish and crops for consumption. Aquaponics is a sustainable farming method that requires less water and land than traditional farming methods. It also produces two products, fish and crops, making it more profitable for farmers. This technique is gaining popularity in urban areas where space is limited and access to fresh produce is limited (IndoFarm, 2022).

Vertical farming: Vertical farming is a modern farming process that grows crops vertically in stacked layers. This method allows for year-round crop production and can be used in urban areas where space is limited. Vertical farming also reduces water usage compared to traditional farming methods because the water is recycled throughout the system. One of the benefits of vertical farming is that it allows farmers to control the environment in which the plants are grown, resulting in higher yields and better-tasting crops. This method also eliminates the need for pesticides and herbicides since the plants are grown in a controlled environment. Vertical farming is also energy-efficient since LED lights can be used to provide light instead of sunlight (IndoFarm, 2022).

With the development of human civilization, the agriculture practices have also been changed due to the evolution of new techniques and technologies, innovation of machines. The modern agriculture system is completely dependent on application of machines, chemical fertilizers for providing the nutrients and use of pesticides for controlling the different kind of pests in the agriculture (Skowrońska *et al.*, 2020). All the agricultural activities like ploughing, sowing, irrigation and harvesting are totally machines based that are significantly damaging the soil structure and its health. Uses of excess chemical fertilizers and chemical pesticides disrupting the ecological balance through destroying the soil fertility. Biological diversity of beneficial plants, microorganisms and insects are also going to decrease globally (Kumar, 2015). Use of wastewater and industrial effluent like paper mill effluent irrigation in the cultivation of *Vigna radiata* (Kumar & Chopra, 2012), distillery effluent in cultivation of *Abelmoschus esculentus* (Chopra *et al.*, 2013), sugar mill effluent in the cultivation of *Vigna unguiculata* (Srivastava *et al.*, 2015 and 2017) has also gain interest among the farmers to reduce the cost of irrigation water and chemical fertilizers. Use of wastewater, sewage sludge and industrial sludge (Al-Huqail *et al.*, 2022; Širić *et al.*, 2023) has also been increased in the soil amendment and crops cultivation (Kumar *et al.*, 2017; Banerjee *et al.*, 2022), whereas the use of biochar (Širić *et al.*, 2022) and the approach of integrated nutrient management (Kumar, 2016; Chopra *et al.*, 2017) has also been increased due to the nutrients deficiency of the agricultural soils (Chopra *et al.*, 2017). On the other hand, excess use of chemical fertilizers and pesticides are causing environmental pollution due to changing the quality of the air, water and soil in many countries including India (Urbaniak *et al.*, 2017). The ever-increasing human population has creating a pressure on the agriculture and other natural resources for the continuous supply of the food, and other basic life supporting commodities. Native (Desi/local) varieties of the seeds are mostly replaced by the hybrid varieties that requires some specific fertilizers and pesticides for cultivation and due to this there is no any single crop that can be grown without the use of chemical fertilizers and pesticides (Buta *et al.*, 2021). Consequently, the whole agroecosystem become poisonous and toxic (Kumar, 2016). The residuals of different pesticides have been regularly detected in each and every item of different foods like grains, pulses, vegetables, fruits, milk, fishes, meat, eggs etc. Therefore, the modern agricultural system deteriorated the quality of the soil as well as the growing foods and causing many health

problems in animals and human beings (Kumar, 2015; Kumar & Kumar, 2019; Rani *et al.*, 2024).

NATIONAL MISSION ON NATURAL FARMING

Natural farming (Rishi Kheti or Zero budget farming) is basically environment friendly farming based on the use of minimum disturbance of the soil structure and retaining of soil moisture for the cultivation of crops. It generally uses the locally available material for the cultivation practices like using local seeds, treatment of seeds using microbial inoculants, using the cover crops, mixing of crops, mulching, uses of integrative trees and livestock, and uses of botanical extracts for controlling the pest (NMNFMKP, 2019). The natural farming must be focused on improving the yield of crops using conventional farming system, minimize the cost of farming, increasing the income of farmers, ensuring better health of peoples, generating the employments, reducing the input of chemicals (fertilizers and pesticides) in cultivation of crops, conserving the environment, reducing the

Figure 1. *States of India participating in Natural farming (Source: NITI Ayog, 2019-20).*

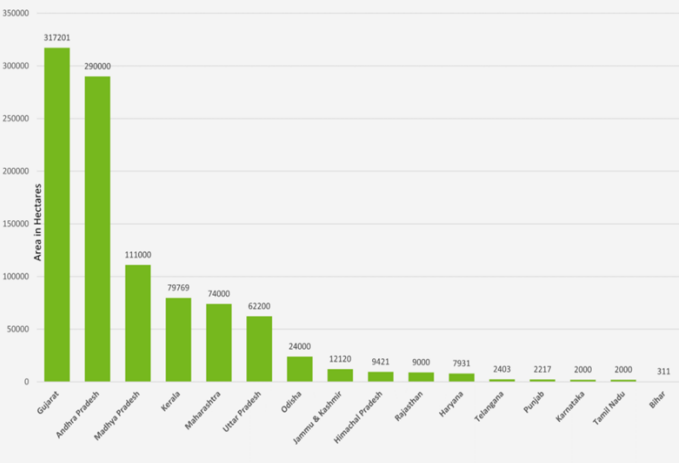

Figure 2. *Area under natural farming in different states in India (Source: NMNFMKP, 2019).*

water requirement, rejuvenating the soil health, and sustainability of livestock (NITI Ayog, 2019-20). Currently, 16 states of the country (Figure 1) are participating in the natural farming and covering about 10.05 lakh ha land under natural farming in India (Figure 2).

The government of India have launched several schemes to promote the natural farming in the country (NMNFMKP, 2019; NITI Ayog, 2019-20). The five basic principles of the natural farming are: no tillage, no fertilizer, no pesticides, no weeding and no pruning. There will be no tillage and tillage disturb the soil structure and destroy the beneficial microbes in the soil. It also reduces the moisture content of the soil. There is no any addition of fertilizers as the plants/weeds cut and spread over the soil to restore its nutrients. No any ploughing the soil for retaining the soil moisture and no any disturbance in soil structure. Weeds and insects are not the enemies of farming they can be controlled naturally without using any kind of pesticides and plant extracts can be used for this purposes (Sharma, 2023). In the ancient period the people were healthy and live long for 100 years due to the consumption of healthy and pure foods. But in the modern age due the pollution and adulterated and contaminated food material, there are so many health issues like acidity, asthma, blood pressure, sugar, cancer and stress are very common among the people. All these are due to the excess use of chemical fertilizers, pesticides, imbalance of nutrition in the soil, intensive farming and mono-cropping (Rigby *et al.*, 2016). Consequently, the soil health is disturbed and it contained less than 1 percent organic carbon. Therefore, there is urgent need to improve the organic matter in the soil, increase the microbial biota of the soil, increase in in moisture of the agricultural soils, and increase in the soil animal diversity that will improve the soil structure and its composition. The most significant way to improves the soils are natural farming.

Natural farming is basically a chemical free agricultural system, in which farm waste, Panchagavya as cow dung, cow urine, cow milk, cow ghee, curd (Raju *et al.*, 2022) and other biological resources are used as a bio-input to provide the nutrition in the soil for growing of crops. In India, it is not a new system, in our ancient literature there are so many examples of the natural farming are well documented. Natural farming is mainly based on the five components (Figure 3) as described by Sharma (2023):

- Minimum soil disturbance
- Multi-cropping
- Biological diversity
- Plants and animals based bio inputs
- Mulching and cultural practices

Minimum soil disturbance: It can be achieved by reducing the ploughing, harrowing and other soil preparation processes before the sowing of the seeds in the agricultural fields. For sowing of seeds direct seeding and application of bio-inputs must be adopted. This will increase the soil stability and improve the soil structure. It will also increase the soil organic matter, soil water infiltration, soil moisture, soil air, and finally soil fertility.

Multi-cropping: Growing of two or more crops together is multi-cropping and it is very beneficial activity as it increases crop yield of the agricultural farm, improve soil fertility as the waste or residue of one crop act as nutrients provider to the other crop and vice versa. It also increases the fodder for cattle and reduce the competition for nutrients in the soil.

Biological diversity: Increasing number of plants and animals are beneficial for the health of agro-ecosystem. More biological diversity means more organic matter in the soil that leads more nutrition and enhance the fertility of the soil. More insects mean more pollinators and more prey for the predators that maintain the ecological balance of the agroecosystem. The natural farming increase organic matter in the soil by increasing the biological diversity that enhance the earthworms and microbial population in the soil. Crop diversification increase the varied nutrients level in the soil and overall improve all physical, chemical and biological properties of the soils.

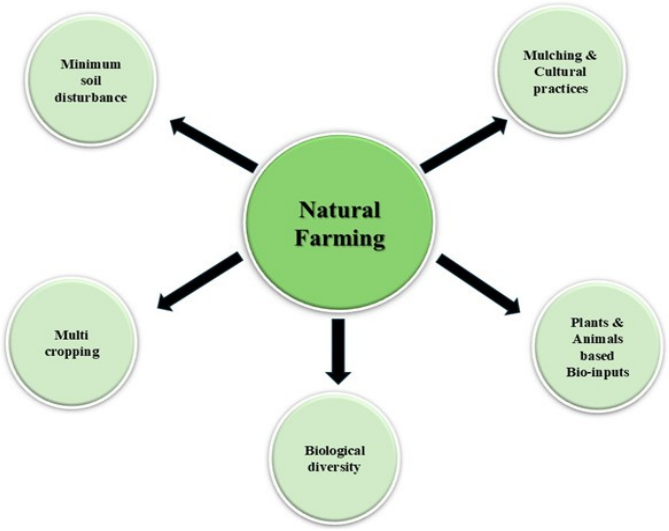

Figure 3. *Five key components of natural farming.*

Plants and animals based bio inputs: Different types of plants and animals based bio-inputs can be used in natural farming (Sharma, 2023) and these are:

- Beejamrit
- Jeevamrit
- Ghanajeevamrit
- Neemastra
- Bramhastra
- Agniastra
- Dashparni

Beejamrit: It can be used for the seeds treatments. It can be prepared by mixing cow dung (5 kg), cow urine (5 L) of desi cow, lime (50 g) and rhizosphere soil (100g) in water (20 L). It is used for the coating the seeds by hand mixing or dipping roots of plants in its suspension that increase seeds viability and prevent seed borne diseases.

Jeevamrit: It is known as soil fertility enhancer (when used with irrigation water) as it promotes the plants growth and flowering. It is prepared by dissolving the desi cow dung (10 kg), cow urine (10 L), jiggery (2 kg), and pulse floor (2 kg) and rhizosphere soil (100 g) in water (200 L). Its suspension in water can be sprayed over the crops and can also be used along with irrigation water.

Ghanajeevamrit: It increase the availability of nutrients in the soil by boosting the microbial activities in the soil, it also rapidly decomposes the organic manure in the soil. It dried content @100 kg per hectare can be used at the time of seed sowing. It is prepared by mixing desi cow dung (100 kg), cow urine (as needed), jiggery (1 kg), and pulse floor (2 kg) and rhizosphere soil (handful).

Neemastra: Neemastra is very beneficial to control the pest attack, it can be prepared by mixing the 5 kg paste (chutney) of neem leaves and 5 kg neem fruits (nimboli), 1 kg desi cow dung, and 5 L cow urine in 100 L of water. Spray @2-3% with water over the sap sucking insects and caterpillars to control the pests in the fields.

Bramhastra: Bramhastra is prepared by mixing the 3 kg neem leaves, 2 kg Karanj leaves, 2 kg custard apple leaves, 2 kg papaya leaves and 2 kg guava leaves paste (chutney) in 10 L of desi cow urine and boil them 3 to 4 times, cool and filter through the cloth and then used in spray (@2-3%) over the crops to control the sucking, fruits and pods borer insects.

Agniastra: For preparing agniastra 5 kg neem leaves, 0.5 kg green chili, 0.5 kg garlic paste is boiled in 20 L desi cow urine 3 to 4 times, cool and filter using cloth and then used in spray (@2-3%) to control the insects of tree trunks, stalks, bollworms and caterpillars attack in crops.

Dashparni: As named it prepared by using the leaves paste of ten plants named 5 kg neem leaves, 2 kg *Vitex negundo* leaves, 2 kg Aristolochia leaves, 2 kg papaya leaves, 2 kg *Tinospora cardifolia* leaves, 2 kg custard apple leaves, 2 kg Karanj leaves, 2 kg Castor leaves, 2 kg *Narium indicum* leaves, 2 kg *Calotropis procera* leaves, 2 kg green chilies paste, 250g garlic paste, 3 kg cow dung and 5 L cow urine. Mix all ingredients in 200L water and allow to ferment for one month and then filter it using cloth. Its 2-3% spray with water is able to control almost all type of pests of crops.

Mulching and cultural practices: Mulching is covering the soil surface using the crop residues, straw, live plants or weeds biomass to retain the soil moisture, gradually it decomposes and enhance the nutrients level of the soils. It prevents the soil from direct sunlight and retain the moisture in the soil, it prevents the soil from cold rains, and save the seeds form seed eating birds, insects and animals. Mulching reduce the water irrigation requirements of the crops also. Some leguminous crops urd, moong, lobia, sunai, dhiancha can be used as mulching crops.

PROCESS OF NATURAL FARMING

In natural farming system, during the farming land preparation, 100kg farmyard manure and 100kg Ghanajeevamrit per acre must be applied before sowing the seeds. Seed treatment should be done using Beejamrit to reduce the pathogens attack during the seeds germination and to increase the viability of the seeds. Some essential crops like pulses, millets, oilseeds, leafy vegetables must be grown before pre monsoon season to maintain the green cover and fertility of the farming land. After sowing of seeds, 200 L Jeevamrit per acre should be applied along with irrigation water at each 15 days' interval. First spray of Jeevamrit or Saptdhanyankur @ 5 L in 100 L water should be done after one month of plantation. Second spray after 21 days of first spray 7.5 L Jeevamrit in 120 L water, third spray after 21 days of second spray 10 L Jeevamrit in 150 L water, fourth spray after 21 days of third spray 15 L Jeevamrit in 150 L water, fifth spray of 3 L sour buttermilk (*Khatti Chhachh*) in 100 L of water and sixth spry of 15 L Jeevamrit in 150 L of water should be done after it. 4 L Panchagavya in 100 L of water per acre for one time at the flowering stage should be done and Saptdhanyankur tonic must be applied during the pods formation @ of 700g in 200 L of water. After sowing of seeds mulching should be done and must be maintained continuously throughout the framing using wanted weeds, crop residues, straw etc. as suggested by Sharma (2023) and Parmar *et al.* (2023).

ORGANIC FARMING

Organic farming is a sustainable way of cultivation that avoid the application of chemical fertilizers, pesticides and GMOs (Gamage *et al.*, 2023). It is totally based on maintaining the soil health through crop rotation, cover cropping and composting practices to enhance the crop yield. It encourages the biological diversity or natural ecological balance that are essential for

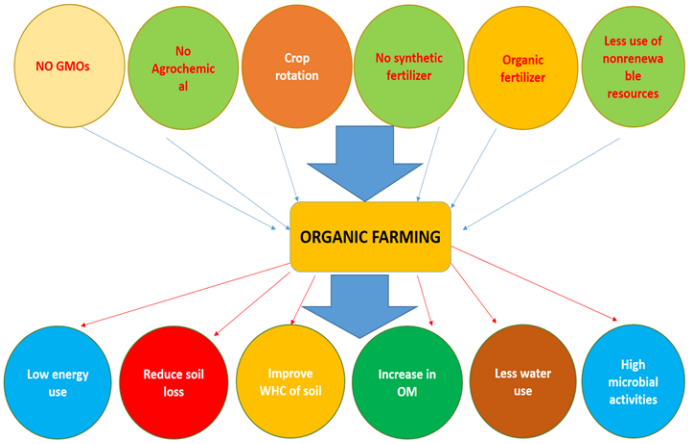

Figure 4. *Key components of organic farming (Source: Gamage et al., 2023).*

natural pest control. Uses of GMOs is completely avoided in the organic farming, and it support the uses of local seeds/varieties. The key practices of organic farming include crop rotation, composting, cover cropping, biological pest control, uses of crop residues, mulching, animal manuring and green manuring (Figure 4). The organic farming is beneficial for environmental sustainability, growing the healthy food, maintaining the soil health, improved livestock and mitigating the impacts of climate change. There are certain challenges for the organic farming included: lower crop yield, it needs higher labour cost, higher initial cost and marketing and certification issues for the organic products (Gamage *et al.*, 2023; Rani *et al.*, 2024; Iberdrola, 2025).

Conclusion and recommendation

Natural farming (Rishi Kheti or Zero budget farming) is very well documented in ancient Vedic literature. It is completely based on the input of resources that are locally available. No use of chemicals fertilizers and pesticides are allowed in natural farming. It is mostly beneficial for the health of soils and to maintain the ecological balance. Whereas in modern farming system, use of chemicals fertilizers and pesticides to obtain more yield is very high and that is very harmful for the soil health, plants, animals and human being. Thus, we should adopt ancient natural farming or organic farming system along with modern agriculture to reduce its harmful consequences of modern agricultural practices for maintaining sustainable productivity of agricultural crops.

DECLARATIONS

Author contribution statement: Conceptualization: V.K. and S., Methodology: S.R., R.G. and S., Software and Validation: S.R. and R.G., Original draft preparation: S., S.R. and A.R., Review and Editing: V.K. and S.; Supervision and advising: V.K. All the authors have read and approved the final manuscript.

Conflicts of interest: The author declare that there is no conflict of interest regarding the publication of this manuscript.

Ethics approval: This study did not involve any animal or human participant and thus ethical approval was not applicable.

Consent for publication: All authors gave their consent to publish this paper in AAES.

Data availability: The data that support the findings of this study are available on request from the corresponding author.

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REFERENCES

Aithal, P. K. (2022). Vedic Literature and Agriculture. National Journal of Hindi & Sanskrit Research, *1*(45), 130-133. https://sanskritarticle.com/wp-content/uploads/36-45-Dr.Prasanna.Kumar_.pdf

Al-Huqail, A.A., Kumar, P., Eid, E.M., Adelodun, B., Abou Fayssal, S., Singh, J., Arya, A.K., Goala, M., Kumar, V., & Širić, I. (2022). Risk assessment of heavy metals contamination in soil and two rice (*Oryza sativa* L.) varieties irrigated with paper mill effluent. *Agriculture*, *12*, 1864. https://doi.org/10.3390/agriculture12111864

Banerjee, D.S., Balkrishna, A., Arya, V., Ghosh, S., & Sing, S.K., (2022). Reuse of sewage sludge as organic agricultural products: an efficient technology-based initiative. Authorea. https://doi.org/10.22541/au.164899210.06660033/v1

Buta, M., Hubeny, J., Zieli´nski, W., Harnisz, M., & Korzeniewska, E. (2021). Sewage sludge in agriculture – the effects of selected chemical pollutants and emerging genetic resistance determinants on the quality of soil and crops – a review. *Ecotoxicology and Environmental Safety*, *214*, 112070. https://doi.org/10.1016/j.ecoenv.2021.112070

Chopra, A. K., Srivastava, S., Kumar, V., & Pathak, C. (2013). Agro-potentiality of distillery effluent on soil and agronomical characteristics of *Abelmoschus esculentus* L. (Okra). *Environmental Monitoring and Assessment*, *185*, 6635-6644. https://doi.org/10.1007/s10661-012-3052-8

Chopra, A. K., Payum, T., Srivastava, S., & Kumar, V. (2017). Effects of integrated nutrient management on agronomical attributes of tomato (*Lycopersicon esculentum* L.) under field conditions. *Archives of Agriculture and Environmental Science*, 2(2), 86-91. https://journals.aesacademy.org/index.php/aaes/article/view/02-02-05

Economic Survey (2023-24). Agriculture sector has registered an average annual growth rate of 4.18 per cent over the last five years. https://pib.gov.in/PressReleasePage.aspx?PRID=2034943#:~:text=Economic%20Survey%20says%20that%20the,country's%20GDP%20at%20current%20prices

Gamage, A., Gangahagedara, R., Gamage, J., Jayasinghe, N., Kodikara, N., Suraweera, P., & Merah, O. (2023). Role of organic farming for achieving sustainability in agriculture. *Farming System*, *1*(1), 100005. https://doi.org/10.1016/j.farsys.2023.100005

Iberdrola (2025). Organic farming: Organic farming, what is it and why is it good for the planet? Accessed from: https://www.iberdrola.com/sustainability/organic-farming

IndoFarm, (2022). Four popular modern farming methods. Accessed from: https://www.indofarm.in/4-popular-modern-farming-methods/

Jones, M. B. (2017). Agriculture and Religion in Ancient India. PhD dissertation of The University of Texas at Austin. https://repositories.lib.utexas.edu/server/api/core/bitstreams/76a148f6-c432-4128-953f-0596d4856d01/content

Kumar, V., & Chopra, A. K. (2012). Effects of paper mill effluent irrigation on a gronomical characteristics of *Vigna radiata* (L.) in two different seasons. *Communications in Soil Science and Plant Analysis*, *43*(16), 2142-2166. https://doi.org/10.1080/00103624.2012.697236

Kumar, V., & Chopra, A.K. (2013). Reduction of weeds and improvement of soil quality and yield of wheat by tillage in Northern Great Plains of Ganga River in India. *International Journal of Agricultural Science Research*, 2(8): 249-257.

Kumar, V. (2015). A review on efficacy of biopesticides to control the agricultural insect's pest. *International Journal of Agricultural Science Research*, *4*(9), 168-179. https://academeresearchjournals.org/print.php?id=561182ea5512a

Kumar, V., & A. K. Chopra (2016). Influence of summer tillage on soil characteristics, weeds diversity and crop yield of certain vegetable crops grown in Tarai region of Ganga River, India. *International Journal of Agricultural Science Research*, 5(3), 040-050. https://www.academeresearchjournals.org/download.php?id=383525713724979670.pdf&type=application/pdf&op=1=

Kumar, V. (2016). Use of integrated nutrient management to enhance soil fertility and crop yield of hybrid cultivar of brinjal (*Solanum melongena* L.) under field conditions. *Advances in Plants & Agriculture Research*, *4*(2), 00130. http://medcraveonline.com/APAR/APAR-04-00130.php

Kumar, V., Chopra, A.K., & Kumar, A. (2017). A review on sewage sludge (Biosolids) a resource for sustainable agriculture. *Archives of Agriculture and Environmental Science*, *2*(4), 340-347. https://www.aesacademy.org/journal/volume2/issue4/AAES-02-04-017.pdf

Kumar, V., & Kumar, P. (2019). Pesticides in Agriculture and Environment: Impacts on Human Health. In: Contaminants in Agriculture and Environment: Health Risks and Remediation, Volume 1, Kumar, V., Kumar, R., Singh, J. and Kumar, P. (eds.), Agro Environ Media, Haridwar, India, pp. 76-95, https://doi.org/10.26832/AESA-2019-CAE-0160- 07

NITI Ayog (2019-20). Natural Farming. https://naturalfarming.niti.gov.in/

NMNFMKP (2019) Natural Farming: A Sustainable Way of Farming! National Mission On Natural Farming Management and Knowledge Portal. https://naturalfarming.dac.gov.in/

Parmar, D., Verma, P., Sharma, M.K. and Solanki, A. (2023). Vedic agriculture. *The Pharma Innovation Journal*, *12*(5), 4254-4258. https://www.thepharmajournal.com/archives/2023/vol12issue5/PartAX/12-5-561-638.pdf

Raju, G.S.K., Nawabpet, P., & Kumar, A. (2022). Panchagavya as soil conditioner: Ancient traditional knowledge for sustainable agriculture. *Journal of Experimental Agriculture International*, *44*(11),181-86. https://doi.org/10.9734/jeai/2022/v44i112065

Rani, S., Shweta, Gandhi, R., Rana, A., & Kumar, V. (2024). A review on co-composting of biosolids and its use in crops cultivation for agriculture sustainability. *Archives of Agriculture and Environmental Science*, *9*(4), 840-846. https://doi.org/10.26832/24566632.2024.0904029

Rigby, H., Clarke, B. O., Pritchard, D. L., Meehan, B., Beshah, F., Smith, S. R., & Porter, N. A. (2016). A critical review of nitrogen mineralization in biosolids-amended soil, the associated fertilizer value for crop production and potential for emissions to the environment. *Science of the Total Environment*, *541*, 1310–1338. http://dx.doi.org/10.1016/j.scitotenv.2015.08.089

Roy, M. (2009). Agriculture in the Vedic period. *Indian Journal of History of Science*, *44*(4), 497-520. https://cahc.jainuniversity.ac.in/assets/ijhs/Vol44_4_2_MRoy.pdf

Širić, I., Eid, E. M., Taher, M. A., El-Morsy, M. H. E., Osman, H. E. M., Kumar, P., Adelodun, B., Abou Fayssal, S., Mioč, B., Andabaka, Ž., Goala, M., Kumari, S., Bachheti, A., Choi, K. S., & Kumar, V. (2022). Combined use of spent mushroom substrate biochar and PGPR improves growth, yield, and biochemical response of cauliflower (*Brassica oleracea* var. *botrytis*): A preliminary study on greenhouse cultivation. *Horticulturae*, *8*, 830. https://doi.org/10.3390/horticulturae8090830

Širić, I., AL-Huqail, A. A., Kumar, P., Goala, M., Abou Fayssal, S., Adelodun, B., Ajibade, F. O., Alrumman, S. A., Alamri, S. A. M., Taher, M. A., Singh, J.., Kumar, V., & Eid, E.M. (2023). Sustainable management of sewage sludge using Dhaincha (*Sesbania bispinosa* (Jacq.) W. Wight) cultivation: Studies on heavy metal uptake and characterization of fibers. *Agronomy*, *13*, 1066. https://doi.org/10.3390/agronomy13041066

Sharma, G. (2023). Awareness Module on Natural Farming for Krishi Sakhis: National Centre for Organic & Natural Farming, Ghaziabad, India. https://www.jaivikkheti.in/DMS/Awareness_Module_for_Krishi_Sakhis.pdf

Skowrońska, M., Bielińska, E. J., Szymański, K., Antonkiewicz, B. F. J., & Kołodziej, B. (2020). An integrated assessment of the long-term impact of municipal sewage sludge on the chemical and biological properties of soil. *Catena*, *189*, 104484. https://doi.org/10.1016/j.catena.2020.104484

Srivastava, S., Chopra, A.K., Kumar, V., & Sehgal, D. (2015). Agro Fertigational response of sugar mill effluent and synthetic fertilizer (DAP) on the agronomy of crop *Vigna unguiculata* L. Walp in two seasons. *Research Journal of Agricultural and Environmental Science*, *2*(3), 5-17. https://worldveg.tind.io/record/55029?ln=en

Srivastava, S., Chopra, A. K., Sharma, P., & Kumar, V. (2017). Amendment of sugar mill wastewater irrigation on soil biohydrological properties and yield of *Vigna unguiculata* L. Walp in two seasons. *Communication in Soil Science and Plant Analysis*, *48*(5), 511-523. https://doi.org/10.1080/00103624.2016.1254788

Urbaniak, M., Wyrwicka, A., Tołoczko, W., Serwecińska, L., & Zieliński, M. (2017). The effect of sewage sludge application on soil properties and willow (*Salix* sp.) cultivation. *Science of the Total Environment*, *586*, 66–75. http://dx.doi.org/10.1016/j.scitotenv.2017.02.012