



Overview of Natural Farming-A New Environmentally Responsible Production System

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Abstract

The new production system viz., natural farming (NF) parallel to organic farming getting ground rapidly in India due to significant development at policy fronts and need to reduce the over-dependence on purchased inputs which are mostly highly subsidized. The natural farming earlier treated as a type of organic farming defined by *NITI Ayog* as chemical-free traditional farming method and considered as an agroecology based diversified farming system which integrates crops, trees and livestock with functional biodiversity. The objectives of natural farming can be defined by keywords viz., efficient utilization of natural resources, preservation of plant, animal and microbial diversity, restoring soil health and improve economic gain to farmer. The principles of natural farming are based on agroecology, encourage ecological diversity, enhance mutual aid and increase people's control over their lives. The major components involved in natural farming are Beejamrut, Jeevamrut, mulching, whapasa condition and plant protection using different biological inputs (Agniastra, Bramhastra and Neemastra). The major policy intervention at present taking place is promotion of natural farming; while unfolding the different aspects of natural farming is the key area at different forums (academic, research, extension, promotion and policy intervention) all over the India. In nutshell, the natural farming promotion is one of the most important steps towards environmental responsive agricultural development which has multiple positive effects on natural resources, reduction in dependence on purchased inputs, bringing self-dependency and self-reliance in farming communities. Hence its incorporation agriculture with identification of suitable niche is important step for sustainable agro-ecosystem.

Keywords: Organic Farming; Natural Farming; Principles; Objectives; Components

Introduction

The Indian agriculture is becoming more environmental responsive with increase in adoption of different practices and technologies which have positive effect on natural resources as well as precise use of artificial resources. The adoption of conservation agriculture on 1.5 million ha. (m ha.) area [1] (, increase in area under organic farming with 4.72 m ha. under national programme on organic production (NPOP) and 1.18 m ha. area under *Paramparagat Krishi Vikas Yojana* (RKVY) [2] are most highlighted production practices in this regards. Besides that, increasing the availability of technology for enhancing nutrient and water use efficiency have dual responsive due to their capacity of reduce the adverse effect unutilized portion and producing more biomass which going to add for soil and animal health improvement. The total area under micro irrigation in India is 14.49 m ha. with 6.68 m ha under drip and 7.81 m ha under sprinkler irrigation in 2022, determination of

quality of irrigation water, harvesting of rainfall through construction of irrigation project, facilitation for small scale soil and water conservation activities and increase in net (from 55.2 to 75.46 m ha) and gross (from 76.19 to 112.23 m ha) irrigated area since last two decade [2] played a significant role in making irrigation practices environmental responsive. The practices enhancing nutrient use efficiency includes implementation of policy for neem coating for urea [3], nutrient based subsidy, availability of soil nutrient status map at district level [4,5] and availability of several technology for increasing nutrient use efficiency [6]. Other practices addressing environmental responsiveness includes conservation of plant and animal genetic resources and their efficient utilization increase use of resource conservation technology, promotion of crop diversification, availability of low carbon technologies, willingness of pay for environmental friendly technologies and different market interventions. Along with organic and conservation agriculture, the

Government of India through its institution (NITI AYOJ and different other sub-ordinates) taking a big initiative to promote the natural Farming (NF).

Basics of natural farming

The natural farming (NF) as per NITI Ayog is defined as a chemical-free traditional farming method and considered as an agroecology based diversified farming system which integrates crops, trees and livestock with functional biodiversity. The NF earlier treated as one important form of organic farming and defined as form of organic farming with special emphasis on soil health through use of compost and microbial preparations. The word agro-ecology is used in above definition and is defined as the application of ecological concepts and principles to the design and management of sustainable agro-ecosystems or the science of sustainable agriculture [7,8]. The another term 'Natural Ecological Farming' used as one form of organic farming involve principle of ecosystem networking of nature beyond the border concepts of organic and natural farming in both philosophy and practice. The term 'Natural Farming' was first used and practice of natural farming firstly reported from Japan as mentioned in the book 'One Straw Revolution' written by Masanobu Fukuoka. The NF was defined as an environmentally regenerative way of growing food, founded not in technique, but in an equitable relation between farmer and nature. It is the relationship that forms the foundation of the farmers' actions [9]. Other terms used to indicate organic farming (or considered as one form of organic farming) includes biological farming, permaculture, ecofarming, alternative agriculture, integrated intensive farming system, biodynamic farming, rishi farming and *Panchagavya* farming. In broad sense, all these practices are aim towards production practices with harmony and good relation with nature as well as utilizing the different natural phenomenon towards production process. The emphasis on any single of multiple component/components, spatiality in addressing a one or more specific concern/concerns, type of inputs used and practices followed and status in terms of scientific, socio-economic and policy level are the major aspects of differentiating them form one another. In this regards, defining and promoting any one among them, there is need to have firm definition, aims, objectives, components and principles and methodologies.

The major policy intervention at present taking place is promotion of natural farming; while unfolding the different aspects of natural farming is the key area at different forums (academic, research, extension, promotion and policy intervention) all over the India. The starting of Natural farming university in Gujarat (Gujarat

Natural Farming Science University, Anand, Gujarat, India), starting of graduate degree programme of Bachelor of Science in Natural Farming (started in Central Agricultural University, Imphal, Manipur, India), imparting knowledge and training and organization of different gathering of stakeholders related with natural farming (1st International Agriculture Conference on Natural and Organic Farming In Context to Bharatiya Agriculture at Gujarat, India) are taking place at academic level at present. The identification of different components of natural farming, studying the impact (economic and ecological) of organic inputs and natural farming activities, study of indigenous technical knowledge and traditional farming practices, documentation of different practices and programme related with natural farming and identification of suitable niche, crops, cropping system and farming system model for natural farming activities are thrust area at research front. The major area of work in extension includes increase awareness about natural farming among different stake holders, involvement of different non-governmental organization and farmer producer organizations, recognition for works in organic and natural farming (Padma Awards), creation of expertise for NF related activities and increasing promotional activities for natural farming are major area of work in extension. Besides that, scaling up the production of different organic input at commercial level, promotion on entrepreneurship development in production of organic inputs and allocating funds for different activities related with NF are also going on and expected in near future indicates the particular for policy and promotion for NF.

Objectives of natural farming and organic farming

In this overview two sources were used to define the objectives of natural farming and organic farming in order to get overall ideal of objectives. The international federation on organic agricultural movement (IFOAM) is pioneer organization dealing with different aspects of organic farming; for natural farming objectives, national mission on natural farming management and knowledge portal was referred. From the objectives, it is clear that, there is overlapping of the objectives in both concept with slight variations in major emphasis, attention give to production of provisional service, treatment to natural and artificial resources, managerial involvement of human being (including disturbances) and procedure for certification and standards and economy. The objective of organic farming was differing to an extent from natural farming based on more emphasis on economic production, desirable disturbances to natural resource, higher involvement of human activities and commercialization of input-output.

Objectives of natural farming

- Preservation of natural flora and fauna and maintain crop diversity in production system;
- Efficient utilization of natural resources and use of natural/local resources based inputs in production process.
- Promotion of natural beneficial organisms (including soil micro flora and fauna) for nutrient cycling and biological control of biotic stresses.
- Restore soil health, reduce input cost and improve economics of farmers.
- Objectives of organic farming:
- Increase long term fertility through working with natural system and encourage and enhance biological cycles involving all biota.
- Maintain genetic diversity of agricultural system and providing optimum condition for livestock.
- Emphasis on the use of renewable resources and prevention of all form of pollution that may generate from agriculture.
- Provision of sufficient food of superior quality, adequate returns, satisfaction of work and safe drinking water.

Principles of natural farming vis -a- vis organic farming

The principles of natural farming is related with agro-ecology which is based on cultural creativity, encouragement to ecological biodiversity by improving community relations, enhancing mutual aid, increase peoples control over their lives, and also control over all tool used [10]. The NF also utilizes the several principles of zero budget natural farming (ZBNF) given by 'Padma shri Subhash Palekar'. Patel., *et al.* [11] says that, ZBNF depends of principles of no fertilizer, no tillage, no pesticide/weedicide and no weeding. As per the national institute of agricultural extension management (MANAGE), the principles of NF consists of round the year ground cover, use of bio-stimulants as catalysts, use of indigenous seeds, diverse crops and trees, integration of livestock, no use of synthetic herbicide and pesticide, minimal disturbance to soil and pest management through better agronomic practices and botanical extracts. According to national mission on natural farming management and knowledge portal the principles of natural farming should consists of: a) Adoption of diversified cropping system based agriculture, b) Recycling of naturally available nutrients in the field, c) Recycling of on-farm generated biomass, d) use of locally developed and refined practices based on plant, animal and microbial sources as row material and e) Innovative practices continuously evolved on the field of farmers based on the cropping pattern, local climatic condition, altitude, soil quality, severity and variability of insects and pest, etc. The two aspect viz., agroecology and least disturbances is not in up to explain the principles of

natural farming due to involvement of large number of practices with major focus on above mentioned two key words. At the same time, natural farming concept is generating scientific information and still lot more to be evaluated and tested for being a principle of natural farming. The principles of organic farming are defined by four principles viz., health, fairness ecology and care. The term health cover sustenance and enhancement of health of soil, plant, animal, human being and planet as one and individual; while the term fairness emphasizes building a relationship that insure fairness with regards to the common environment and life opportunities. The ecology indicates the agriculture based on living ecological systems, cycles- work and imitates them and helps them to sustain. The principle of care involves managing agriculture in precautionary and responsible manner to protect the health and wellbeing of present and future generations [12].

Components of natural farming and organic farming

The NF is based on five major components viz., Beejamruta, Jeevamruta, mulching, whapasa condition and plant protection. The beneficial microorganisms present in beejamruta (nitrogen fixer, phosphorus solubalizer), IAA and GA production and suppression of *Sclerotium* have positive effect on plant growth and development. The microbes present are known to protect the crop from harmful soil-borne and seed-borne pathogens. Inoculation of bacterial isolates from beejamrutha also improve seed germination, seedling length and seedling vigour index. The ingredients of beejamruta are cow dung (5 kg), cow urine (5 litres), 50 g lime, 20 litre water and handful of soil. The beejamruta also reported to have accountable macro and micro nutrients. The richness of Beejamrut with micro-organisms including bacteria (15.4×10^5 cfu/ml), fungi (10.5×10^3 cfu/ml), actinomycetes (6.8×10^3 cfu/ml), phosphorus solubilizing microbes (2.7×10^2 cfu/ml) and nitrogen fixer (3.1×10^2 cfu/ml) was reported by [13]. The Jeevamruta is prepared using cow dung (10 kg), cow urine (10 litres), Jaggery (2 kg), 2 kg gram or any pulse flour, handful of soil and 200 litre water. The Jeevamruta contains nitrogen fixers, phosphorus solubalizers and other bacteria, fungi and actinomycetes. These microbes have both positive effects on soil biological process thereby positively influence the plant growth. It is used as soil application either by sprinkling or by applying through irrigation water. At the same time changes is proportion of material used leads to showed slight change in nutritional content and impact on the germination and early shoot growth [14]. Significant increase in length of fruit length, number of fruit per plant, weight of 100 dry chilli fruit and dry chilli yield with application of Beejamruta (seedling treatment at the time of transplanting) + Jeevamruta (soil application) was reported in Madhya Pradesh one season study [15]. In another study at Maharashtra,

increase in grain yield (2.03 t ha^{-1}) of soybean by 19.2 % with application of jeevamruta @ 500 lit. ha^{-1} at branching and flowering stage over control (absolute) was reported in one season study [16]; similarly, increase of 18.9 % in grain yield (2.025 t ha^{-1}) with application varmiwash at branching and flowering @ 500 lit. ha^{-1} was reported in same study. The significant increase in green cob yield and green fodder yield of sweet sorghum (SUGAR-75) with application of Jeevamruta @ 600 lit/ha was found in one season study in south Gujarat; while nutrient content (nitrogen, phosphorus, potassium zinc and iron) in cod and fodder remain unaffected [17].

The mulching involves covering the soil mostly with organic residues or live plant cover which have wide array of positive affect on soil, water and plant. The mulching leads to increase water holding capacity, improve porosity, maintain soil temperature, reduce soil erosion losses, increase infiltration of rainfall water, reduce runoff and add nutrients to soil. The whapasa condition indicates that status of soil moisture content at which 50 % soil pores are filled with water and 50 % soil pores are air filled. This moisture level of soil leads to higher growth activities of root and also considered as suitable moisture regimes for all types of microbial activities.

Different biological inputs such as *Agniastra*, *Bramhastra*, *Neemastra*, *Dasagavya*, etc. were used for management of different pest and diseases. The *Agniastra* is prepared from cow urine, tobacco leaf, green chilli, garlic and neem leaves; while brahmastra is prepared from cow urine, neem leaf, pulp of clustered apple, pulp of papaya leaf, pulp of pomegranate leaf, Lantana leaf and white dhatura leaf pulp (*Datura stramonium*) (<https://zbnf.org.in/pest-control/>). The *Neemastra* is prepared from cow dung, cow urine and neem leaves and insecticidal property of neem was widely reported [18-20]. The *Dasagavya* is prepared using different plants such as *Azadirachta indica*, *Calotrophis spp.*, *Tephrosia purpurea*, *Vitex negundo*, *Datura metel*, *Jatropha curcas*, *Adathoda vasica* and *Pongamia pinnata*. The chemicals compounds present in different plants leaf extract used in preparation of *Dasagavya* have anti-insect or anti-pathogen properties. Hence, it helps in reducing the infestation of different insect-pest (aphids, thrips, mites and other sucking pest) and infection of diseases (leaf spot, leaf blight and powdery mildew). As it is mixed with Panchagavya, it has nutrient content (N, P and K) along various amino acid, growth promoters (Auxin, Gibberellins) and beneficial microorganisms. This all helps in enhances seed germination and root development. The use of neem seed extract and dasagavya for reducing damage due to diamondback moth was reported in [21]. The potential of dashparni

ark in managing *Agrotis ipsilon* was reported in [22]; while use of *Agniastra*, *Bramhastra*, *Neemastra* for pest management in castor was reported by [23].

In case of organic farming use of organic manure (include large array of raw, processed and enriched manures), non-chemical weed control and biological pest management were considered as main components. The availability of large array of organic sources for crop nutrition and development of different processes for preparation and enrichment of organic manures leads to development of strong base of organic nutrition. The nutrient sources such as green manuring, brown manuring, vermicomposting, etc. are getting attention duo to their positive effect on crop productivity, soil health, compatibility with inorganic sources of crop nutrition and capacity for recycling of plant and animal residues. The increasing demand of organic nutrient sources also leads to development of entrepreneurship in supply of these manures. The use of mechanical method of weed management is most important option for weed management in organic farming and development of different hand tools and implements (different types of weeders) make this method time and cost effective than hand weeding using khurpi/weeding hook. The cultural methods and preventive method stand next to mechanical method; while use of biological method is constrained by composite weed flora. The development of different bio-pesticides is another area of work in organic farming. In organic farming finite standards, certification procedure and product tagging and marketing are also considered as an important components.

Extent of natural farming and organic farming in India

The number of state reported to have area under natural farming are eleven; while in case of organic farming, all most all states and union territories (except Ladakh and Andaman and Nicobar Islands) have reported to have area under certified organic farming. The major states following natural farming includes Andhra Pradesh, Gujarat, Chhattisgarh, Kerala, Himachal Pradesh, Jharkhand, Odisha, Madhya Pradesh, Rajasthan, Uttar Pradesh and Tamil Nadu. In case of organic farming, Madhya Pradesh have highest area under organic farming followed by Maharashtra, Gujarat, Rajasthan, Odisha, Karnataka, Uttarakhand, Sikkim, Chhattisgarh, Uttar Pradesh and Jharkhand. Total area covered by natural farming was 0.65 million ha; while it was 10.17 million ha (5.39 million ha cultivated area and 4.78 million ha wild forest collection) for organic farming. Regarding crops grown in natural farming, it is more of crops, tree and animal based interventions rather than focusing only on crops. The crops such as vegetables, leafy greens, cucumber, cauliflower, beans, tomato, cauliflower, pea and radish

were reported to be grown with cereals crops in Himachal Pradesh [24]. The major crops/group of crop grown under organic farming includes cereals and millet, oilseed crops, pulses, sugarcane, cotton, tea, coffee, aromatic and medicinal plants, dry fruits, spices, vegetables. There is no firm information about the produce of natural farming at national and state level; while in case of organic farming 2.9 million tonnes of produce in India was reported. The marketing of natural farming is still in initial phase; while organic farming both domestic and international market exposure is available with export of 312800.51 metric tonnes worth rupees 5525.18 crore in 2023 from India.

Concerns of natural farming in India

- Client (crop, region/location, pest, disease, weed, post-harvest practices, mechanization) specific information on practices for crop cultivation;
- Distinguishing natural farming and its practices from organic farming (as several organic input used and practices followed was from same knowledge base);
- Still developing post-harvesting and value addition practices, marketing and economical aspects.
- Establishment of standards for crops and animal products to be entitled for products of natural farming.
- Certification and accreditation agency and procedure for the same.
- Lack of international recognition in terms of institutional support.
- Awareness about natural farming as a concept among stakeholders (input supplier and consumers).
- Lack of market information at domestic and international markets (separated from organic product market).
- It is promoted under various departments along with agricultural departments.
- Lack of information on seed and planting material to be used (Is it same as that of organic seeds or separate seeds are required).
- Concerns of organic farming in India:
- Restriction on the sources of crop nutrition, lack of availability of cost effective processed organic manures.
- Non-availability of most effective procedure for pest and disease management and need more attention in preventive and prophylactic measures.
- Certification process is time taking, knowledge intensive and requiring reoccurring cost.
- Need gestation period of 2-3 years during which crop yield is lowered as well as lower crop yield compared to conventional agrochemical based production system.

- Difficulty in getting premium prices and access to domestic and international markets due to small crop produce and lack of awareness about certification procedure.

Conclusion

The organic farming is promoted and sustained by strong demands of organic products in domestic and international market; while natural farming at present is strongly supported by policy interventions and promotion besides the people's movement who voluntarily followed natural farming as well as dedicated personalities for its promotion in welfare of farming communities. Considering the multi-sectorial positive effect and involvement of crops, trees and animal, natural farming is expected to get attention from different sectors along with agriculture. The objectives, principles and components of natural farming are in harmony with nature and ecosystem. Being an emerging environmentally responsible production system research, extension and development activities will be more intensive in days to come which will form a strong base for Natural Farming as a Production system.

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