

ORGANIC FARMING - THE SCIENTIFICALLY REDEVELOPED TRADITIONAL FARMING – A REVIEW

Hadole Shrikant¹ Namburi Sekhar² Jadhav Shubhangi³ Suryawanshi Milind⁴

¹Junior Research Fellow, ²Research Officer, ³Junior Research Fellow,

⁴Assistant Director, In-charge

Regional Ayurveda Research Institute for Mother and Child Health, Nandanvan, Nagpur 440009, Unit of C.C.R.A.S. New Delhi, Ministry of AYUSH, Govt. of India

ABSTRACT

Civilization since origin has depended on farm products like food and fiber. During ancient days the ratio between demand and agricultural output was equal but the rise in global population led to huge gap in demand and output which turned to be the basic cause of green revolution. Though it increased the output many folds like a miracle but soon it started proving hazardous to the environment and human being. Ultimately humans ‘the masters of ecosystem’ started searching its solution in nature by exploring traditional farming. Organic farming can be said the recent nomenclature for tradition farming as it relies on traditional farming techniques with modern scientific knowledge. Organic farming is based on utilization of natural resources for the benefit of humans and environment. According to the International Federation for Organic Agriculture Movement it depends on principles of Health, ecology, fairness, care and regulated by National Program on Organic Production (NPOP) for export and domestic markets. Today, the organic agriculture is one among the broad spectrum of production methods that are supportive of the environment however; there are certain issues that should be clarified before we go for a large-scale conversion to organic agriculture.

Keywords:-Organic farming, traditional farming, green revolution

INTRODUCTION

The word agriculture is derived from the Latin “*Agricultura*”, meaning ‘cultivation of the field’^[1], which was started around 11500 years ago in modern-day Iran^[2] with the main aim of obtaining food from the land. During ancient days, various traditional techniques were used for maintaining soil health as well as plant protection which were safe for ecosystem. But with the rise in global population and degradation in natural resources agricultural output were not enough to meet the

global food demand hence use of synthetic pesticides accelerated in the 1940s with the discovery of the effects of DDT, BHC, etc.^[3]. The pesticides became the boon for agricultural yield but ecotoxicology began with acute poisoning events in the late 19th century and public concern over the serious adverse effects of chemicals arose in the early 1960s^[4] on human health like Alzheimer’s disease, Asthma, Birth and Fetal defects, several types of Cancer, Developmental and Learning disord-

ers, Endocrine disruption, Parkinson's disease, Diabetes, Reproductive health effects^[5] which are often very subtle and may not be recognized as a clinical effect^[6]. According to International Pesticide Action Network (PAN), Germany research 82 of the 150 pesticides used in Asia, including seven of the ten most used ones, are on the list of highly hazardous pesticides. WHO 1990 estimates the global annual incidence of specific chronic effects of pesticides as around 735,000 cases and 37,000 cases of unspecific health effects such as forms of cancer^[7].

The only solution to this deadly boon is Organic farming which is the combination of best traditional farming methods with modern scientific knowledge^[8]. This review deals in details of decline of traditional farming techniques, chemical farming and its hazards, redevelopment of organic farming, its benefits and techniques.

Background: The Agriculture includes domestication of plants and animals and the development and dissemination of techniques for raising them productively. Agriculture began independently in different parts of the globe and included a diverse range of tax. The wild collection of grains was started around 20,000 BC and first Cultivation was around 9500 BC Levant (modern day Iran)^[9].

The various agricultural techniques used during ancient days are as follows^[10]

- **Raised field agriculture** where raised soil beds were constructed using a network of canals and narrow fields, built up and refreshed from the organic-rich canal muck in wetlands and at the margins of lakes.
- **Mixed cropping** is planting two or more of plants simultaneously in the same field which is also known as inter-cropping or co-cultivation.
- **Slash and burn agriculture** is a traditional method of tending domesticated

crops that involves the rotation of several plots of land in a planting cycle.

- **An agricultural "field system"** is a term that refers to the suite of innovations used by prehistoric and historic farmers to improve crop success and reduce the impact of variable climates.
- **Pastoralism** is the branch of agriculture concerned with the raising of livestock like goats, cattle, horses or camels. It is a successful strategy to support a population on less productive land and adapts well to the environment.
- **Dairy farming** is the next step forward after animal domestication which is a class of agriculture for long-term production of milk.

The ancient agriculture that is Traditional farming was without any synthetic inorganic methods. Pest control till 1940 with was done with the help of inorganic substances, such as Sodium chlorate and Sulphuric acid or organic chemicals derived from natural sources. Sumerians used sulphur compounds as insecticides for the first time about 4500 years ago whilst Chinese were using mercury and arsenical compounds for controlling body lice about 3200 years ago^[11]. Organic agriculture started growing in the 1960s, when negative consequences of chemicals used in crop and animal production, became a major hazard for human health and the environment^[12] at the same time to compete huge food demand Green Revolution in India^[13]; increased the agriculture yields by improved agronomic technology and led to unprecedented pressure on our natural resource base by heavy doses of chemical fertilizers, pesticides, and heavy farm mechanization. Organic farming is a farming technique which works in harmony with nature. It is concerned with entire system used for production and delivers the agricultural product on the contrary chemical farming focuses only on agricultural output ignoring

entire systems' hazardous status. Organic farming relies on natural farming methods and modern scientific ecological knowledge in order to maximize the long-term health and productivity of the ecosystem, enhance the quality of the products and protect the environment. Organic agriculture has its roots in traditional agricultural practices around the world. It is the passed down knowledge of effective practices onto subsequent generations.

Concept of Green Revolution

Green Revolution was a research and development of technology transfer initiatives occurring between the 1930s and the late 1960s which increased agricultural production worldwide^[14]. It was on the basis of the use of High Yielding Varieties (HYVs), heavy doses of chemicals and farm mechanization.

The impacts of the green revolution

Green revolution initially increased the production of mainly two crops wheat and rice, but unfortunately led to destruction of other crops, overexploitation of precious water resources and fertile soils, reduction of on-farm green biomass, thereby changing the mode of traditional agriculture resulting in the disappearance of cattle from the farms, reducing biodiversity, reducing biological productivity, reducing nutrient recycling and thus creating a crisis of non-sustainability Hence the most appreciated revolution ultimately became a **Suicide economy**^[15]. As this damaged the soil structure irreversibly soil productivity graph also declined and the farmers resorted to increase the dosage of chemical fertilizers to sustain farm production.

Prior to the green revolution, diversity in crops was a key factor in agricultural systems of India. This diversity provided stability and resilience to the systems as well as economic security to the farmers. However green revolution methods emphasize upon mono-cropping's and highly mechanized farming focused on single function of single species,

and failed to take, yields of diverse species and diverse functions into account. The reason for advocating mono-cropping was the ease in sowing; weeding, fertilizing, spraying and harvesting a single crop that lead to replacement of traditional practice of growing different types of crops (poly-culture). This resulted in the erosion of genetic diversity base of the agro-ecosystems.

Organic Farming

Organic farming management is an integrated approach, where all aspects of farming systems are interlinked with each other and work for each other. A healthy biologically active soil is the source of crop nutrition, on-farm biodiversity controls pests, crop rotation and multiple cropping maintains the system's health and on-farm resource management with integration of cattle ensure productivity and sustainability. Organic management stresses on optimization of resource use and productivity, rather than maximization of productivity and over exploitation of resources on the cost of resources meant for future generations.

Regulatory mechanism^[16]

The Organic farming is done under internationally acclaimed certification process for export, import and domestic markets. National Program on Organic Production (NPOP) defines the regulatory mechanism and is regulated under two different acts for export and domestic markets.

Principles of Organic Farming^[17]

The International Federation for Organic Agriculture Movement's (IFOAM) definition of Organic agriculture is based on: The principle of health, the principle of ecology, the principle of fairness and the principle of care. Each principle is articulated through a statement followed by an explanation. The principles are to be used as a whole. They are composed as ethical principles to inspire action.

1. **The principle of health** - Organic Agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible.
2. **The principle of ecology** - Organic Agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.
3. **The principle of fairness** - Organic Agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities.
4. **The principle of care** - Organic Agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.

Techniques of Organic farming

Crop nutrition^[18]

Crop nutrition in organic cultivation is an environmentally friendly and effective agronomic system in which all resources are used effectively. In this organic wastes are incorporated into the soil directly after application. This is done to use significant quantities of nitrogen which is otherwise lost to the atmosphere as ammonium and as nitrous oxide which are atmospheric pollutants. The maximum amount of the nitrogen in animal wastes is retained where slurry is placed directly into soil that has a growing green crop such as pasture.

Crop Rotation^[19]

Crop rotation is an art and science of farm management which means changing the type of crop grown on a particular piece of land from year to year. It is both a principle of production and a tool of management as it provides the principal mechanism for building healthy soils, a major way to control pests, and a variety of other benefits.

Composting^[20]

A mass of rotted organic matter made from waste is called compost. The compost

made from farm waste like sugarcane trash, paddy straw, weeds and other plants and other waste is called farm compost. Farm waste is placed in the trenches layer by layer. Each layer is well moistened by sprinkling cow-dung slurry or water. Trenches are filled up to a height of 0.5 m above the ground. The compost is ready for application within five to six months. Compost prepared by traditional method is usually low in nutrients and there is need to improve its quality. Enrichment of compost using low cost N fixing and phosphate solubilizing microbes is one of the possible ways of improving nutrient status of the product.

Mulching^[21]

Mulching is the process of covering the topsoil with plant material such as leaves, grass, twigs, crop residues, straw etc. A mulch cover enhances the activity of soil organisms such as earthworms. They help to create a soil structure with plenty of smaller and larger pores through which rainwater can easily infiltrate into the soil, thus reducing surface runoff. As the mulch material decomposes, it increases the content of organic matter in the soil. Soil organic matter helps to create a good soil with stable crumb structure. Thus the soil particles will not be easily carried away by water. Therefore, mulching plays a crucial role in preventing soil erosion.

Green manures^[22] Green manures, also referred to as fertility building crops, may be broadly defined as crops grown for the benefit of the soil. They have been used in traditional agriculture for thousands of years but conventional farming systems largely rejected them as the use of fertilizers and pesticides became more common. Although they have many roles they are still often under utilized by today's organic farmers. However, recent emphasis on reducing the environmental impact of all farming systems has led to a growing interest from the conventional sector.

Natural pest and disease control^[23]

Various natural techniques for pest and disease management are as follows.

- **Barriers** are physical structures put in place to prevent a pest from reaching a plant. They keep pests away from a plant but do not kill them
- **Bait traps** The use of baits and traps are traditional methods which have become neglected because of the increasing use of chemical pesticides
- **Light traps** Light traps are set up at night and attract a variety of flying insects including moths, mosquitoes, chafer beetles, American bollworms, army worms, cutworms, brown rice plant hopper, green rice leaf hopper, rice black bugs, rice gall midges, rice stem borers and tomato hornworms
- **Biological control** Biological control means using one creature or organism to control a pest. This often involves introducing a creature or organism, which is known to be predatory, to an area with the aim that it will control the population of the pest.
- **Natural pesticides** If pests and diseases cannot be prevented or controlled by cultural and physical means, it may be necessary to use natural pesticides. Many growers have developed their own sprays from plants such as garlic, chilies, marigolds and many others. These are inexpensive and have proved to be very effective

Genetic diversity^[23]

Within a single crop there can be many differences between plants. They may vary in height or ability to resist diseases. These dif-

ferences are genetic. In organic systems, some variation or ‘genetic diversity’ between the plants within a crop is beneficial. Growing a number of different crops rather than relying on one is also very important. This helps to protect against pests and diseases and acts as insurance against crop failure in unusual weather such as drought or flood. It is important to remember this when choosing which crops to grow

Careful use of water

Careful use of water in arid lands is as important as any other technique in Organic farming. In organic farming locally available water should be used, avoiding faster than it is replaced naturally. The other ways of careful use of water are as follows.

- The use of terracing, rain water basins or catchments and careful irrigation
- The addition of organic matter to the soil to improve its ability to hold water
- The use of mulches to hold water in the soil by stopping the soil surface from drying out or becoming too hot.

Animal husbandry

The welfare of the animals is considered very important in an organic system. Animals should not be kept in confined spaces where they cannot carry out their natural behavior such as standing and moving around in an inadequate amount of space. However, care should be taken that animals do not damage crops. Food for animals should be grown organically. Breeds should be chosen to suit local needs and local conditions and resources. These factors help to ensure that livestock are healthier, better able to resist diseases and to provide good yields for the farmer.

Table 1.1 Benefits of Organic Farming ^[24]

Parameter	Potential benefits
Agriculture	Agriculture Increased diversity, long-term soil fertility, high food quality, reduced pest/disease, self-reliant production system, stable production
Environment	Reduced pollution, reduced dependence on non-renewable resources, negligible soil erosion, wildlife protection, resilient agro-ecosystem, compatibility of production with environment
Social conditions	Improved health, better education, stronger community, reduced rural migration, gender equality, increase employment, good quality work
Economic conditions	Stronger local economy, self-reliant economy, income security, increase returns, reduced cash investment, low risk
Organizational/institutional	Cohesiveness, stability, democratic organizations, enhanced capacity

Challenges in organic farming ^[25]

Organic farming has attracted considerable attention from all around the world still following challenges are yet to be overcome.

1. Maintaining flexible organic standards and certification processes to address issues such as
 - Nature conservation and regeneration
 - Responsible labor relations and land tenure arrangements
 - Animal welfare
 - New inputs such as ‘natural’ biocides, soil amendments
 - Incomplete or unscientific basis for including/excluding materials from organic standards.
2. Pursuing international harmonization of standards and certification
3. Developing locally applicable agronomic solutions to production constraints, such as weeds, animal health and soil fertility
4. Expanding research activities in many disciplines and fosters the integration of knowledge.
5. Preserving food quality while trying to increase productivity
6. Educating and training at all levels to build capacity, infrastructure and networks

7. Inadequacies in regulatory and marketing structures (e.g. labelling)
8. Excessive consumer prices and inconsistent quality and availability

DISCUSSION

Farming started around 11500 years back with the primary aim of obtaining food. During ancient days various traditional techniques like Raised field agriculture, Mixed cropping, Slash and burn agriculture, Pastoralism, etc. were used for farming but with the rise in population and increased food demand the agricultural techniques evolved accordingly. The disproportion in food demand and supply was very high after Second World War. To meet the global food demand Green revolution during 1930 to 1960 was proved to be the boon to agricultural science with the discovery of High Yielding varieties, chemical pesticides and farm mechanization but soon this boon turned into a suicide economy due to irreversible soil productivity damage and the farmers resorted to increase the dosage of chemical fertilizers to sustain farm production. This loss ingrained the seeds of traditional farming i.e. Organic farming which stresses upon optimization of resource use and productivity, rather than maximization of productivi-

ty and over exploitation of resources on the cost of resources meant for future generations. The International Federation for Organic Agriculture Movement's (IFOAM) defines the Organic agriculture on the basis of four principles namely- The principle of health, the principle of ecology, the principle of fairness and the principle of care. These principles lead to healthy and biologically active soil which maintains the entire system's health and ensure productivity and sustainability without damaging the ecosystem.

CONCLUSION

Organic farming is becoming more popular as it requires less financial input and places. It relies on the available natural and human resources to provide healthy food without adversely affecting the soil's health and the environment. Organic agriculture offers comparative advantage in areas with less rainfall and relatively low natural and soil fertility levels. This will provide ample opportunity for employment and bring prosperity and peace in the region. Possibly, the greatest impact of organic agriculture is on the mindset of people. This leads to an increased engagement in farming which can trigger greater opportunities for rural employment and economic upliftment. Thus through greater emphasis on use of local resources and self-reliance, conversion to organic agriculture definitely contributes to the empowerment of farmers and local communities. Further evaluation of newer plants for its pesticide activity should be done.

REFERENCES

1. Ramharacksingh Ronald 2011 Agricultural Science for CSEC® Examinations, A division of Macmillan Publishers Limited, page no 2 ISBN: 978-1-4050-6576-4
2. Balter (Space)Michael, 2013, Farming Was So Nice, It Was Invented at Least Twice available from
3. <http://www.sciencemag.org/news/2013/07/farming-was-so-nice-it-was-invented-least-twice>
4. Unsworth John, 10th May 2010, The International Union of Pure and Applied Chemistry (IUPAC), available from http://agrochemicals.iupac.org/index.php?option=com_sobi2&sobi2Task=sobi2Details&catid=3&sobi2Id=31
5. Wikipedia contributors, 2016, November 23, Environmental impact of pesticides, In Wikipedia, The Free Encyclopedia. Retrieved 10:38, November 23, 2016, from https://en.wikipedia.org/wiki/Environmental_impact_of_pesticides#cite_note-sustaining-1
6. Owens Kagan, Feldman Jay, Kepne John, 2010, Wide Range of Diseases Linked to Pesticides Vol. 30, No. 2
7. Lah Katarina, May 06, 2011, Effects of Pesticides on Human Health available, Toxipedia a free toxicology encyclopedia from <http://www.toxipedia.org/display/toxipedia/Effects+of+Pesticides+on+Human+Health>
8. PAN Germany, 2012 Pesticides and health hazards Facts and figures
9. HDRA - the organic organization 1998 Organic farming page 2
10. Wikipedia contributors, 2016, November 22. History of agriculture. In Wikipedia, the Free Encyclopedia. Retrieved 04:09, November 22, 2016, from https://en.wikipedia.org/wiki/History_of_agriculture
11. Hirst K, 23 November 2016, The Secret Innovations and Inventions of Ancient Farmers Available from:

- http://archaeology.about.com/od/neolithic/tp/ancient_farming.htm
12. Aromatica 2016 Pyrethrum available from <http://web.archive.org/web/20100324061424/http://www.aromatica.hr/eng/page.asp?id=buhac&sub=buhac3>
 13. Morgera Elisa, Bullon Carmen, Gracia Caro, Duran Marin, 2012, Organic agriculture and the law by Food and Agriculture Organization of the United Nations, Rome, Page 5-10 ISBN 978-92-5-107220-2
 14. Wikipedia contributors, 2016, November 24. Green Revolution in India, In Wikipedia, the Free Encyclopedia. Retrieved 13:56, November 24, 2016, available from https://en.wikipedia.org/wiki/Green_Revolution_in_India
 15. Wikipedia contributors, 2016, November 18, Green Revolution, In Wikipedia, The Free Encyclopedia. Retrieved 06:03, November 18, 2016, from https://en.wikipedia.org/wiki/Green_Revolution
 16. Shiva Vandana, Pande Poonam, Singh Jitendra 2004, Principles of Organic Farming Renewing the Earth's Harvest, Part I, Chapter 1, Page 1
 17. Department of Commerce, Ministry of Commerce and Industry, New Delhi, 2005, September 09, National Programme for Organic Production
 18. Yadav A. K. Organic Agriculture (Concept, Scenario, Principals and Practices), National Centre of Organic Farming Department of Agriculture and Cooperation, Ministry of Agriculture, Govt of India
 19. MacKerron et al. (6) 1999 Organic farming: Science and Belief
 20. Mohler, Johnson (ed.), 2009 July Crop Rotation on Organic Farms A Planning Manual Page 1, Natural Resource, Agriculture, and Engineering Service, ISBN 978-1-933395-21-0
 21. Rana SS 2011 Organic Farming. Department of Agronomy, College of Agriculture, CSK Himachal Pradesh Krishi Vishwavidyalaya
 22. Technologies and practices for small agricultural producers 2016 *Mulching in Organic Agriculture* available from <http://teca.fao.org/read/8365>
 23. Rayns, Rosenfeld Green Manures HDC Project FV 299, 2008 available from <https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwiawafcxubPAhWLO48KHetHBuwQFggdMAA&url=http%3A%2F%2Fwww.researchgate.net%2Ffile.PostFileLoader.html%3Fid%3D572707a2f7b67ee5c9460d61%26assetKey%3DAS%253A357204721979393%25401462175650589&usg=AFQjCNEKUUEQDB-HnE5nsbN7BQp-CdQCzg>
 24. HDRA the organic organization 2008 Natural Pest and Disease Control
 25. Kumara, Biswas 2010 September Organic Input Production and Marketing in India – Efficiency, Issues and Policies CMA Publication No – 239 Page 10 Table 1.1
 26. Kristiansen Paul, Taji Acram, Reganold John, Organic agriculture: a global perspective Chapter 18 page 425

CORRESPONDING AUTHOR

Dr. Shrikant Hadole

Regional Ayurveda Research Institute
for Mother and Child Health,

Nandanvan, Nagpur 440009

Unit of C.C.R.A.S.

New Delhi, Ministry of AYUSH,

Govt. of India

Email: drsphadole@gmail.com

Source of Support: Nil

Conflict of Interest: None Declared