

## **On Farm Generation of Quality Inputs for Organic Production of Vegetable Crops**

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### **SUMMARY**

The green revolution enabled the farmers to harvest more crop from the same limited area. However, indiscriminate use of chemical fertilizers has been resulted in adverse effects on the environment and polluting the soil and ground water resources. Recent soil nutrients survey indicates that, most of the Indian soils are deficient in both macro and micro nutrients. At the same time, most organic farmers are struggling due to rising input costs and limited market. Use of organic liquid preparations has been an age old practice in India. To restore the health of ecosystem new innovations are required to be implemented for the cost effective organic production of horticultural crops. The essential concept of these practices is “back to nature, where the philosophy is to feed the soil rather than the crops to maintain soil health and it is a means of giving back to the nature what has been taken from it”.

### **INTRODUCTION**

The recent surge in the organic production systems reinvented the immediate need for improvement of soil health. India is home to 30 per cent of the total organic producers in the world, but accounts for just 2.59 per cent (1.5 million hectares) of the total organic cultivation area of 57.8 million hectares (World of Organic Agriculture 2018 report). The present system of agriculture which we call 'conventional' and practiced the world over evolved in the western nations as a product of their socio-economic environment which promoted an overriding quest for accumulation of wealth. The Indian agriculture switched over to the conventional system of production on the advent of the green revolution in the 1970s. The change was in the national interest which suffered setbacks because of the country's over dependence on the foreign food sources. The national determination was so intense that all the attention was focused on the increase in agriculture production. The agriculture and allied sectors in India provide employment to 65% of the workers and accounts for 30% of the national income. The growth of population and the increase in income will lead to a rise in demand for food grains as also for the agricultural raw materials for industry in the future. In India, the development of organic agriculture is receiving increasing attention among farmers, producers, processors, traders, exporters and consumers. Growing consciousness of health hazards due to the possible contamination of farm produce from the use of synthetic chemicals have immensely contributed to the revival of this form of farming during the last ten years. In view of growing awareness of health and environment issues, organic farming especially of vegetables is gaining momentum across the world and emerging fast as an attractive source of rural income generation. Organic products are increasingly preferred in developed countries and in major urban centers in India. There is high demand for organic food in domestic and international market which is growing around 20-25 percent annually; as a result the area under organic farming has been increasing consistently. India with its varied climate and variety of soils has an enormous potential for organic vegetable production. The wide product base, high volume of production round the year, strategic geographic location, high international demand, abundant sunlight and availability of labour at comparatively low cost make India an apt location for organic vegetable production.

Modern organic production system is based on outsourced agri-inputs viz; farmyard manure, biofertilizers, bio-pesticides, bio-agents and other bio-formulations. Most of the times, quality of these agri-inputs is questionable and results in to total failure in organic production of horticultural crops. As on today, ecosystem is polluted with over use of agrochemicals for several years and fruits and vegetables are loaded with residues of agrochemicals. Besides above, outsourced agri-inputs are also not cost effective. Recent soil nutrients survey indicates that most of Indian soils are multi-nutrients deficient due to repeated application of NPK for several years. To bring ecosystem health back, new innovations are required to be implemented for cost effective organic production of horticultural crops. There are several organic practices in ancient Indian times in which all the quality agri-inputs were produced at farm for crop production. Some organic farming practices are being practiced by a large number of farmers in different part of the country. Biodynamic agriculture, Natural farming, Homa organic farming, Rishi Krishi, Panchagavya, Natueco farming are organic farming practices emphasizing for on

farm inputs production, crop rotation, mixed farming, mixed cropping, cover crops, inter crops, green manuring, trap crops, high yielding traditional varieties etc. for organic production.

### Basic Concept and Principles of Organic Farming

The concept of organic farming is not clear to many concerns (Palaniappan and Annadurai, 1999). Many people consider that traditional agriculture, sustainable agriculture, Jaivik Krishi etc, as organic farming. Some people are of the idea that the use of organic manures and natural methods of plant protection instead of using synthetic fertilisers/ pesticides is organic farming. But this is not true. Organic farming in real sense envisages comprehensive management approach to improve the health of underlying productivity of the soil..

#### The basic concepts behind Organic farming are:

- It concentrates on building up the biological fertility of the soil so that the crops take the nutrients they need from the steady turnover within the soil nutrients produced in this way are released in harmony with the needs of the plants.
- Control of pests, diseases, and weeds is achieved largely by the development of an ecological balance within the system and by the use of bio-pesticides and various cultural techniques such as crop rotation, mixed cropping, and cultivation.
- Organic farmers recycle all wastes and manures within a farm but the export of the products from the farm results in a steady drain of nutrients.
- In a situation, where conservation of energy and resources is considered to be important, community or country would make every effort to recycle to all urban and industrial wastes back to agriculture and thus the system would be only being small inputs of new resources to “top up” soil fertility.

The International Federation of Organic Agriculture Movements (IFOAM) states that “ Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved.” Organic agriculture relies on a number of farming practices that take full advantage of ecological cycles. According to IFOAM, organic agriculture is guided by following four principles:

- **Principle of health:** Organic agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible. This principle points out that the health of individuals and communities cannot be separated from the health of ecosystems - healthy soils produce healthy crops that foster the health of animals and people.
- **Principle of ecology:** Organic agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them. This principle roots organic agriculture within living ecological systems. It states that production is to be based on ecological processes, and recycling. Nourishment and well-being are achieved through the ecology of the specific production environment.
- **Principle of fairness:** Organic agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities. Fairness is characterized by equity, respect, justice and stewardship of the shared world, both among people and in their relations to other living beings.
- **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. Organic agriculture is a living and dynamic system that responds to internal and external demands and conditions. Practitioners of organic agriculture can enhance efficiency and increase productivity, but this should not be at the risk of jeopardizing health and well-being.

**These principles of organic farming encourage:**

- To work as much as possible within a closed system, and draw upon local resources.
- To maintain the long-term fertility of soils.
- To avoid all forms of pollution that may result from agricultural techniques.
- To produce foodstuffs of high nutritional quality and sufficient quantity.
- To reduce the use of fossil energy in agricultural practice to a minimum.
- To give livestock conditions of life that confirm to their physiological need.
- To make it possible for agricultural producers to earn a living through their work and develop their potentialities as human being.

**Approaches to Produce Organic Vegetables:**

Varieties of concern and problems of modern agriculture gave birth to various new concepts of farming such as organic farming, biodynamic agriculture, natural farming, Vedic krishi, kunapajala, bio-fertilizers, eco-farming, etc. The essential concept of these practices remains the same, *i.e.*, back to nature, where the philosophy is to feed the soil rather than the crops to maintain soil health and it is a means of giving back to the nature what has been taken from it. The organic agriculture is called in different names by different people, however, the basic concept and philosophy remains the same.

**Organic Farming**

It is a holistic production management system that avoids the use of synthetic fertilizers and pesticides, minimizes pollution of air, soil and water, and optimizes the health and productivity of independent communities of life, plants, animals and people. It uses the organic amendments to supply nutrition to the soil and crop.

- Green manure (viz. dhaincha, sunnhemp etc.)
- Bulky organic manures (viz. FYM, vermicopost etc.)
- Concentrated organic manures (viz. groundnut cakes, neem cake etc.).

**Vedic Krishi**

Vedic Krishi is natural agriculture free from all poisonous fertilizers, pesticides and herbicides, grown by farmers enjoying Vedic consciousness. It is higher consciousness spontaneously in harmony with the rhythms and cycles of nature on the local and cosmic levels and utilizing the Vedic sounds - the sounds of natural law to awaken the inner intelligence of the plants, so that their growth and health- giving, nourishing properties are maximized to uplift the consciousness and promote a peaceful, healthy life for all who eat them.

The goal of Vedic Krishi is to re-enliven Natural Law in agriculture, bringing the farmer, the process of farming and the environment in complete harmony with each other. Natural Law is the unseen intelligence of nature that upholds and nourishes all life. Vedic Krishi will produce Vedic food, the purest, most nutritious and most vital food available anywhere. Vedic food is vibrant in the total potential of Natural Law. It brings the intelligence of nature directly into our human physiology to create a mind and body capable of living higher states of consciousness - the full potential of life.

**Different Vedic Krishi Inputs**

**Panchagavya:** It is a blend of 5 product obtained from cow (Cow dung = 1 kg (fresh) Cow dung slurry = 4 kg, Cow urine = 3L, Cow milk = 2L (fresh), Curd = 2 kg, Cow butter oil = 1 kg (ghee). For making Panchagavya thoroughly mix the required quantities of ingredients and allow fermenting for 7 days with twice stirring per day.

**Jeevamrita:** Jeevamrita is prepared by fermenting cow dung, urine, jaggery, pulse flour and virgin soil by simple facilities created in the village with minimum expenditure. Credit for development of recipes for Jeevamrita and its extensive use goes to Palekar (2006).

**Beejamrita:** It is special bio-enhancer prepared with locally available materials (Cow dung = 50 gm Cow urine = 50 ml Cow milk (fresh) = 50 ml Lime stone = 2-3 gm Water = 1L) for seed and seedlings treatment. As preparation is very cheap and cost effective, can easily be prepared and used by small and marginal farmers. It is advisable to prefer earthen/mud pot of suitable size for the preparation.

**Amritpani:** It is a special bio formulation, rich in nutrients and beneficial microbes. Ingredients for preparation of amritpani and its intensive use were advocated by Deshpandey, 2003. It is used to improve seed germination, soil fertility and plant vigour. After application in soil it improves humus content, earthworm activity and thus soil fertility and crop productivity.

**Vermi Wash:** Vermi wash is a liquid leachate obtained by excess water to saturate the vermi composting substrate. It is collection of excretory products and mucus recreations of earthworm along with nutrients from the soil organic molecules. Vermiwash was found to contain enzyme cocktail of proteases, amylases, urease and phosphatase.

**Biosol;** A special bio formulation developed by Gloria and named as “Gloria Biosol” from Peru (Weir, 2009). Biosol is superior to vermi wash as it contains high numbers of beneficial microorganisms and energy from Homa atmosphere (Yadav, 2009). Using Homa methods, it is possible to provide complete nutrition to the plants, which contains optimum concentration nutrients as macro elements, oligo elements and others. Biosol provides plant special medicinal and nutritional qualities. It is powerful bio food and bio fertilizer for the plants with high level of macro and micronutrients. It is powerful restorative and directly assailable through the membrane of the root cells of the plants. It is rich in enzymes, beneficial microorganisms, phyto hormones and other special useful components for the plant and improves fertility and health of the soil.

### **Biodynamic Agriculture**

Biodynamic agriculture, conceptualized by Rudolf Steiner in 1924, is a super organic farming system in which all the inputs required for crop production are produced at the farm and is being practiced on 161,074 hectares in 60 countries (Paul, 2016). Steiner (1997) emphasized that one must nourish Earth in such a way that the cosmic influences could continue to flow in freely. The more biologically active Earth, the more beneficial forces can work through plant and animal (Procter, 2008).

### **Biodynamic preparations:**

Two basic types of biodynamic preparations are known. These are biodynamic compost preparations (BD-502-507), biodynamic field sprays (BD-500-501) and field preparations. Biodynamic compost preparations (BD 502-507) are special herbal preparation that fixes and mineralizes trace nutrients required for plant growth, facilitates in harnessing the abundant, unused cosmic forces for crop productivity and replenishes/rectify the macro and micronutrient deficiencies.

All these preparations are prepared during the descending period of moon, except the BD-507, which is prepared in the air/light day. These were fermented for a specific period and stored at dark place with optimum moisture. 1 g compost of each and 10 ml of BD-507 were added in compost heap, cow pat pit and biodynamic liquid pesticides to catalyse the fermentation process (Koeppf *et al.*, 1990; Steiner, 1993).

### **Bio-Fertilizers**

A new class of fertilizers known as ‘biological fertilizers’ or ‘bio-fertilizers’ has come to forefront as a means of supplying nutrients to the crops. They neither refer to synthetic source of nutrient (inorganic chemical fertilizers) nor to organic sources of nutrients (manures, residues, etc.). Biofertilizers either refer to a culture of microorganism applied to the soil/seed in order to encourage fixation of N or release of P or they include biomass of certain plants which contain large quantities of N as a result of their association with N fixing organism. Thus, bio-fertilizers are cultures of appropriate species of microbes that have the capability of fixing atmospheric

nitrogen such as *Rhizobium* species in leguminous crops and *Azotobacter* and *Azospirillum* in non-leguminous crops.

### The Bio-Organic Inputs:

- Lactic Acid Bacteria Serum (LABS)
- Fermented Amino Acid (FAA)
- Vermitea (VCT)
- Oriental Herbal Nutrients (OHN)
- Fermented Plant Juice (FPJ)
- Fermented Fruit Juice (FFJ)
- Indigenous Microorganism (IMO)

### CONCLUSION

It is estimated that by the year 2021, the global population will reach the above the 8 billion marks. The galloping explosion of population made during last 5-6 decades requires not only food security but also nutritional security. Food and nutritional security is therefore a serious global concern. The role of vegetables in nutritional security is immense, hence the production of vegetables need to be increased. Organic farming, especially of vegetables is gaining momentum worldwide due to increasing awareness and concern on adverse effects of indiscriminate use of chemical fertilizers and pesticides and machinery on food quality, soil health, human health and environment. Studies revealed that organic agriculture system has strong potential for building resilient food system in the face of uncertainties through farm diversification and building soil fertility with organic residues. Certified organic vegetable products offer high income options for farmers and therefore can serve as promoters for eco-friendly farming practice worldwide. The future success of organic vegetable production would largely depend upon size of the farm and supplies of non-chemical inputs, which have to be thoroughly backed up by well proven package of practices addressing to the objectives of producing vegetable organically. These organic farming practices have to be turn to change in traditional concept of farming. The use of different local formulation proved beneficial in different crops and produced better growth of plants and ultimately final product i.e. yield of the crop. All these traditional agricultural inputs hold good promise for use in agriculture and production of safe and healthy food. The need for technology varies among farmers according to their natural resource base, land quality and connections to local and regional markets. Developing best practices in crop cultivation based on scientific methods, including applying organic inputs based on soil testing and optimizing water use with micro-irrigation systems, can help increase productivity. There is a huge potential for small farmers to increase sustainable productivity. An integrated approach is necessary to promote the highly valuable virtues and wide applications of these inputs.

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