A Thangasamy, Yogesh P Khade and
V Karuppaiah

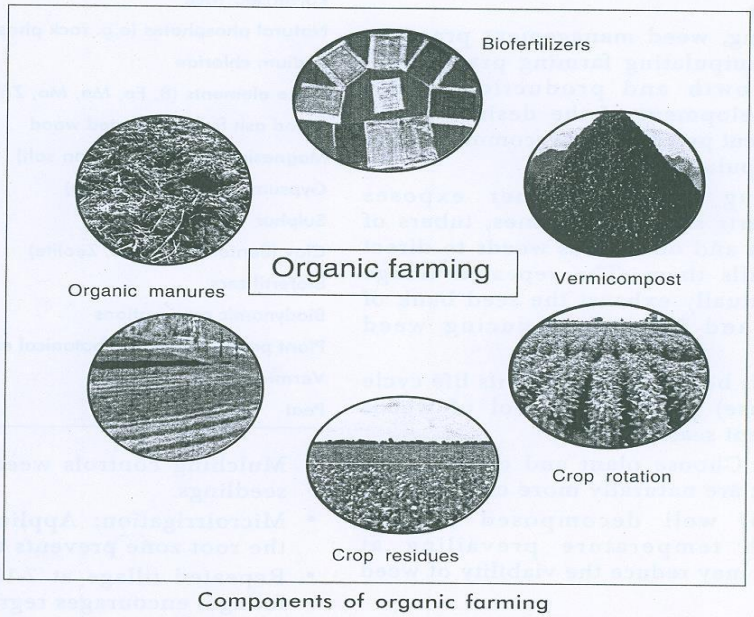
# Organic onion and garlic production

**Organic farming involves the use of organic amendments, biofertilizers, biological pest control, and crop rotation while excluding synthetic pesticides and fertilizers to enhance the quality of the produce and promote environmental safety. Organic farming improves physical, chemical and biological properties of soil and improves the quality of the produce. But, it produces 20-40% lesser yield of onion and garlic compared to conventional farming. However, yield could be compensated with higher premium price available in the market for organic produce. Although organic farming shows 20.0–40.0% reduction in bulb yield compared to conventional farming, it improved physical, chemical and biochemical quality of soil and quality of the produce. The consumption of organic foods having improved biochemical quality may be useful in improving human health. The reduced yield of organic farming can be compensated with a premium price available for the organic produce in the market.**

IN India, onion and garlic are mainly produced conventionally using chemical fertilizers and agrochemicals. Intensive cultivation by adopting improved varieties, application of mineral fertilizers and application of agrochemical for plant protection enhance yield, but deteriorate quality of the produce and soil health. However, organic farming improves soil health and quality of the produce. Hence, organic farming in India has gained importance over recent years because of its quality produce, environmental safety, and profitable livelihood.

## ORGANIC FARMING

Organic farming involves a system that uses a combination of management techniques to maintain soil quality and fertility, and control weeds, pests and diseases. Crop rotation and conservation practices, animal manures, composts/ vermicomposts, concentrated organic manures, recycling of crop residues and use of biofertilizers play a big role in achieving these goals. Conventional chemical fertilizers, herbicides and pesticides are eliminated, although "organic" products are generally allowed, subject to compliance with the organic standards. There are some varieties of onion and garlic, which perform very well under restricted resource availability and are resistant to biotic and abiotic conditions. Such varieties can be grown to reduce the cost of cultivation. Further such varieties can meet the standards of organic farming, as they do not need much of the agrochemicals.




Components of organic farming

### Nutrient Management

Onion and garlic are high-value crops and are heavy feeders. They need a full range of available nutrients. Hence before starting organic production one must get the soil tested to know the native nutrient supply capacity. A pH of 6.8-7.2 is ideal preferably with high organic matter content. Many nutrients are tied up in soils that are more alkaline or more acidic. Application of well-decomposed organic manures such as FYM, poultry manure, vermi-compost, fish meal, bone meal, and compost tea apart from local preparations like

panchakavya, jeevamrith etc. can be applied during last ploughing.

Generally, in organic farming, required nutrients are calculated and applied before planting, but the nutrient releases do not synchronize with crop requirement which affects the bulb production. We have to ensure that the nutrient release should synchronize with crop requirement.

In general, organic farming reduced 20-40% yield compared to conventional production system. But, difference was observed between organic and conventional farming system for soil plant nutrients after harvesting. Organic farming improved total soluble solids, total phenol, total flavonoids ascorbic acids and antioxidants. Organic farming improved soil physical and microbial properties. Reduction in bulb yield could be compensated by the increased price of organic onion and garlic.

Bone meal and wood ash can be used to supplement phosphorus and potassium. Humic acid, compost tea, vermi-wash and permitted micronutrient sources may be used to supplement secondary and micronutrients demand of the crops (Table 1). Foliar feeding should be done prior to the 4th or 5th leaf stage to supply nutrients. Onion and garlic production through organic system can be increased by efficient use of both applied nutrients through organic manures and native soil reserves through inoculation of efficient biofertilizers and mycorrhiza.

Crop rotation improves soil fertility because it is allowed to replenish naturally and soil structure improves because of the alternating between deep rooted and fibrous rooted crops. However, weed, pest and disease management is challenging under organic production system.

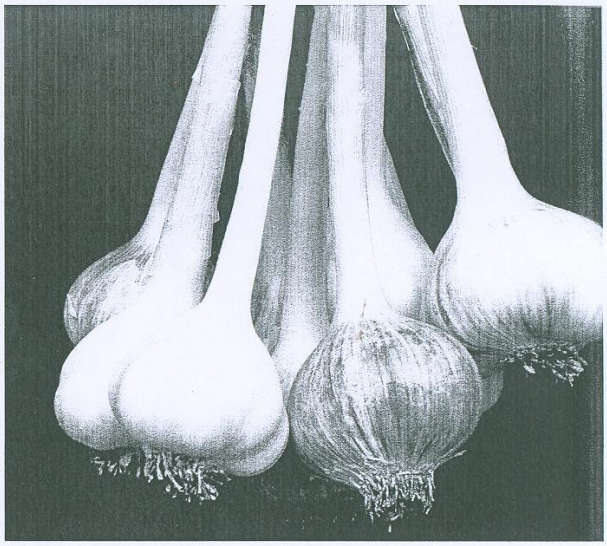
**Table 1.** Potential nutrient sources for certified organic cultivation of onion and garlic

| Substance | Category |
|---|---|
| Farmyard and poultry manure, slurry, urine | Permitted |
| Compost and spent mushroom and vermiculate substances | Restricted |
| Compost from organic household reference | Restricted |
| Compost from plant residues | Permitted |
| Animal charcoal | Restricted |
| Blood meal, meat meal and bone meal without preservatives | Restricted |
| Fish and fish products without preservatives | Restricted |
| Guano | Restricted |
| Human excrement | Not allowed |
| Peat without synthetic additives | Prohibited for soil conditioning |
| Sawdust, wood shaving from untreated wood | Permitted |
| Seaweed and seaweed products from physical process extraction with water or aqueous acid and/or alkaline solution | Restricted |
| Sewage sludge and urban composts | Restricted |
| Sources which are monitored for contamination straw | Restricted |
| Vermicasts | Restricted |
| By products from oil palm, coconut and cocoa (including palmoil mill, effluent (pome), cocoa peat and cocoa pods) | Restricted |
| Calcareous and magnesium rock | Restricted |
| Calcified seaweed | Permitted |
| Calcium chloride | Permitted |
| Calcium carbonate of network origin (chalk, limestone, gypsum and phosphate chalk) | Permitted |
| Pulverised rock | Restricted |
| Natural phosphates (e.g. rock phosphates) | Restricted |
| Sodium chloride | Restricted |
| Trace elements (B, Fe, Mn, Mo, Zn) | Restricted |
| Wood ash from untreated wood | Restricted |
| Magnesium sulphate (Epson salt) | Permitted |
| Gypsum (Calcium sulphate) | Permitted |
| Sulphur | Restricted |
| Clay (Bentonite, Perlite, Zeolite) | Permitted |
| Biofertilizers | Permitted |
| Biodynamic preparations | Permitted |
| Plant preparations and botanical extracts | Permitted |
| Vermiculate | Permitted |
| Peat | Permitted |

### Weed Management

In organic farming, weed management practices largely involves manipulating farming practices to suppress weed growth and production, while promoting the development of the desired plant. Following management practices are recommended to control the weed population:

- Deep ploughing during summer exposes underground parts such as rhizomes, tubers of perennial weeds and obnoxious weeds to direct sunlight and kills them. The repeated tillage operations eventually exhaust the seed bank of weed species and helps in reducing weed population.
- Removing weeds before completing its life cycle (vegetative phase) provides control of weeds during subsequent seasons.
- Crop Rotation: Choose plant and crop species or cultivars that are naturally more competitive.
- Application of well decomposed organic manures- high temperature prevailing at composting pits may reduce the viability of weed seeds.
- Mulching controls weed growth by smothering seedlings.
- Microirrigation: Application of irrigation near the root zone prevents the weed growth.
- Repeated tillage at 7-10 days interval removes foliage, encourages regrowth and depletes root's



carbohydrate stores. Risks include damage to soil structure, increased compaction or erosion risk, organic matter oxidation and loss as well as the decreased nutrient-holding capacity and water penetration. Other considerations are the high cost of labour and fuel.

- Annual and biennial weeds and non-creeping perennials can be destroyed by simply pulling them out.
- The entire surface soil dug to a shallow depth with the help of hand hoes which helps in uprooting and removal of weeds. After hand hoeing, the field is subjected to drying to avoid re-establishing of uprooted weeds.
- Soil solarisation helps in controlling weeds.

**Pest and Disease Management**

The general approach in organic agriculture is to deal with the causes of a problem rather than treating the symptoms also applies for pest and diseases. Therefore, management is of a much higher priority than control. This document describes preventive practices, as well as control practices using biological, mechanical control and natural pesticides.

- Follow crop rotation with non-host crops (corn and millets), remove plant debris and crop residues to break pest and disease cycle and destroy alternate host of weed species.
- Avoid successive planting of onion and garlic or other preferred host.
- Selecting pest and disease tolerant varieties.
- Go advance planting of onion and garlic planting by 15 days than normal to avoid population peaks (January to February). Timely managing onion thrips could avoid disease spread.
- Growing onion on raised bed helps to avoid water stagnation in the field reduce the incidence of diseases.
- Plant two rows of maize or outer row of maize and inner row of wheat at least 7-10 days before planting around field border to block adult thrips movement.
- Soil application of *Triderma harzianum*, *T. viride* and neem cake found effective against *Anthracnose*, purple blotch diseases and thrips.
- Bio-agents such as *Bacillus subtilis* at $10^8$ cfu/ml and *Saccharomyces cerevisiae* at $10^4$ cfu/ml can effectively control *Stemphyllium* blight.
- Install yellow and blue sticky traps @ 12/ha for mass trapping as well for monitoring of adult thrips population.
- Installation of pheromone traps (12/ha) for cut worm (*Spodoptera litura*).
- Foliar application of *P. fluorescens* (5 g/l) + *Beauveria bassiana* (10 g/l) on 30 days after transplanting.
- Spray application of Azadairachtin 1% (2 ml/l) on 40 days after transplanting.
- Sprinkler irrigation substantially reduces thrips population considerably. However, avoid sprinkler irrigation at bulb development and enlargement stages to stay away the spore dispersal.

Apply insecticide Spinosad @ 56 a.i/ha whenever thrips population level crosses ETL.

**Advantages of Organic Farming**

- Organic farming improves soil physical, chemical and biological properties, health and quality of the produce.
- Organic manures are considered as complete plant food. Organically grown crop are believed to provide more healthy and nutritionally superior food compared to conventionally produced food.
- Organic produces are free from pesticide residues.
- Organic farming helps to prevent environment degradation and can be used to regenerate degraded areas.

*For further interaction, please write to:*
Drs A Thangasamy, Yogesh P Khade and Dr V Karuppaiah, ICAR-Directorate of Onion and Garlic Research, Rajgurunagar 410 505, Pune, Maharashtra.