Artemis & Angel Co. Ltd.
99/296 President Park, Sukhumvit 24, Klongtoey,
Bangkok 10110, Thailand
Tel.: (President) +66-86-329-6038; (Sales): +66-993377866
E-mail: artemisandangelcoltd@gmail.com **Website:** www.artemisthai.com

How to Grow Onions with Bio-Plant and Pro-Plant

Note: It's tempting to rush ahead, plough the soil, and plant a monoculture of onions. But the interests of the farmers are not served in this way. The guidelines below will help the farmers to regenerate their soil while producing more nutritious onions with a higher yield and without disease.

1. Soil Preparation

1.1 Plant a Cover Crop

- The best way to prepare the soil is to plant a multi-species (5+ species) cover crop that includes legumes and grasses, such as carrots, peas, sorghum, millet, turnips, Sudan grass, cereal rye, annual ryegrass, clovers, buckwheat, oilseed radish, sunflower, sun hemp, and hairy vetch. Consult with your local agronomy department about which cover crops to plant because the choice depends on the climate, the state of the soil, and your goals. Grow diverse microbial life before you plant the onions.
- **Mow (Flatten) the Cover Crop:** Mow the cover crop down (don't plough it) just before it produces seeds and plant through the bio-mass after having left it for 2 weeks on the soil to decay.
- If you prefer you could let your livestock graze on the cover crop and flatten it while they add urine and manure. Don't let them eat all of it because you want the soil to be covered.
- **Don't Till (Plough) the Soil:** Don't till the soil or plough in the bio-mass because then you will kill the fungi networks in the soil that feed the plants, destroy the soil structure, compact the soil, and loose the soil cover, among other harmful effects, such as the oxidization of organic matter, soil erosion, hot soil temperature, etc.
- Plant the onion plants in the rows and leave the bio-mass on the soil. It will keep the soil covered and prevent weeds while providing food for the soil bacteria and fungi that will provide nutrients to the roots.

Planting into a terminated cover crop.

- Spray Bio-Plant on the planting rows (only) as you plant through the bio-mass. Mix 1 litre with 1,000 litres of water per hectare. 500 litres in 500 litres per acre. It is very beneficial to add the microbial life in Bio-Plant to the planting rows.

1.2 Compost and Soil Preparation

- If you prefer you could make a lot of compost mixed with Bio-Plant and spread it over the planting rows. You will need about 2 months to make the compost and a minimum of 5 MT per hectare (2.5 MT per acre).
- **How to Make Compost:** See the file at ***Section 3.2*** called ***How to Make Rich Compost with Bio-Plant – Handouts***. Click here for how to make rich compost with Bio-Plant. Scroll down to ***Section 3.2.*** Soil preparation with a lot of compost made with Bio-Plant will be invaluable in increasing growth. Add compost to the planting rows and spread it generously. Add more compost monthly on Day 30 and Day 60. The minimum amount of compost per acre should be 2.5 MT.
- If you only intend to apply manure, then spray Bio-Plant onto the manure at the rate of 1 litre per 1,000 litres of water. Per acre this would be about 500 cc in 500 litres.
- In a large field the farmer might choose to plant the onion seedlings on both sides of a raised mound the length of the field. Then he would use a furrow hoe to create a furrow down the middle of the mound, and line it with compost. The roots of the onions on both sides of the furrow can receive the benefits in this way.
- **Good soil:** Sandy loam soil is the best for large onions. Compaction in the soil will lead to a pinched onion, and this will reduce the size of the onion. A bulb that will freely expand in the soil will be the biggest.

1.3 Plant a Companion Crop (Intercrop)

- If you don't want to plant a cover crop in spite of the many benefits of doing so, intercrop the rows of onions with a companion plant. You must have diversity of microbial life in the soil.
- Here is a list of crops that make good and bad companions for onions. Click here.

2. Planting Onions From Seeds

- You might like to refer to the file ***How to Prepare Seeds with Bio-Plant***. Click here. The following section comes from there and describes an effective way to soak seeds with Bio-Plant. Don't use GMO seeds. Why? Because you won't get a high enough Brix level in the plants and this means that insect pests will see the plants as food.

2.1 The Common Approach to Soaking Vegetable Seeds

- If you are soaking a lot of seeds, put the seeds in a container with water. Soak them for up to 24 hours in warm water mixed with Bio-Plant. For small seeds, such as flower seeds, 12 hours or overnight is enough. The container of water only needs to cover the seeds by 2 inches. Place a cloth over the top to increase the warmth during the soaking. Keep the seeds in a warm place out of direct sunlight. Soaking them will speed up germination in the soil.
- Soak the seeds in water that contains 20 cc of Bio-Plant per 20 litres. (The ratio is 10 cc per 10 litres of water.) If the amount of seeds is small, reduce the water to just a few litres. It does not have to be exactly 20 cc of Bio-Plant and more than this is fine, so do not worry.

Seed Planting Tray with Sections.

- After soaking, plant the seeds as soon as possible in a seed potting soil tray where there is potting soil in each small section of the tray. Usually, you would place one seed per small hole or two seeds if the hole is large, but you can easily space 20 seeds in the same 1.5 to 2-inch hole. Cover them over with more soil and water them.
- If you do not have a tray with holes for the individual seeds, place them in a flat tray. Put some newspaper on the bottom and cover the newspaper with potting soil. Use a stick and create a small ditch about 0.5 cms. deep from one side of the tray to the other. Place the seeds in the ditch and then cover them over with a little soil.

Flat Tray with Ditches

- It is beneficial to spray the potting soil before use with water mixed with Bio-Plant (at a ratio of 20 cc of Bio-Plant in 20 litres of water).
- Cover the soil with wet paper or a wet cloth. Leave them for about 5 days until the seedling has penetrated the surface, grown 2-3 inches, and formed some good roots, and will soon be too large for its growing space. Then plant each sprouted seedling in an individual pot or black plastic planting bag.
- Once your seedlings have several leaves you will need to move them to a larger pot to give them more room to grow, especially if you placed many in the same potting hole section. Let the plant grow and become sturdy and leafy before transplanting it into composted furrows in a field.

Seeds, which have germinated.

- Avoid onion sets and start from seed. Onion sets are great if you are a lazy farmer, but just because they are already started and easy, does not mean they will give you the best results.
- Sow seeds densely because of low germination rates for onion seeds about 1/2 inch deep.
- Onions are usually transplanted after 30 to 35 days. When the seedlings are about 4 inches high, transplant them into the field. Cut the tops off before planting them. This trimming encourages strong new growth which will result in robust bulbs when mature. Make planting holes 2 inches deep. Thin the seedlings to 5-6 inches apart. Each row should be 8 inches apart.
- To encourage development of bulbs, soak the seedlings in water mixed with Bio-Plant and Pro-Plant at a ratio of 20 cc of each in 20 litres of water for about 15 minutes before planting.

3. Applying Pro-Plant

- Many people think that onions require lots of phosphorus because they are a root vegetable, however you want growth, so you will need a lot of Nitrogen. Each leaf the onion puts out is a ring on an onion, this means the more leaves, the bigger the onion. Therefore, spray Pro-Plant every 7 days.
- Onions (90-100 days): Days 20, 30, 40, 50, 60, 70, 80 until 10 days before you harvest. Spray every 7 days once the flowers appear.

4. Growth Maintenance

- **Watering:** Water frequently. Onions like lots of water, because the more water, the more plump the onion can get. The soil should never be allowed to get bone dry.
- The growth periods of an onion crop with a growing period of 100 to 134 days in the field are: establishment period (1) from sowing to transplanting 30 to 35 days; (2) vegetative period 25 to 30 days; (3) yield formation - bulb enlargement 50 to 80 days; and (4) ripening period 25 to 30 days. Pro-Plant should be sprayed every 7-10 days.
- The crop is most sensitive to water deficit during the yield formation period (3), particularly during the period of rapid bulb growth which occurs about 60 days after transplanting. - The crop is equally sensitive during transplantation. For a seed crop, the flowering period is very sensitive to water deficit. During the vegetative growth period (1) the crop appears to be relatively less sensitive to water deficits.
- For high yield of good quality the crop needs a controlled and frequent supply of water throughout the total growing period; however, over-irrigation leads to reduced growth.

- **Weeding**. Keep onion beds well-weeded. Onions are shallow rooted. Cultivate often and shallowly. Pull weeds by hand close to bulbs to avoid up-turning plants. Use a sharp hoe only to cut off weeds at soil level. Because onions leaves are thin and strappy they do not block the sun from the soil which, in turn, allows weed germination. Onion beds require more weeding than other vegetable beds.

5. For Extra Yield - Applying Additional Bio-Plant

- Because millet grows for up to about 3 months, additional micro-organisms should be added to the soil around the plants, ideally once a month (every 30 days) on Day 30 and Day 60. Compost made with Bio-Plant would be very effective way to do this. Provide several kgs. per plant.
- If the farmer does not have any compost, he could apply Bio-Plant by spraying it mixed with water at the base of the plants. Do not spray Bio-Plant on the leaves as this will cause them to turn yellow.
  - Hectare: Spray 500 cc of Bio-Plant mixed with 500 litres of water, or better 1 litre of Bio-Plant mixed with 500-1,000 litres of water.
  - Acre: Spray 250 cc of Bio-Plant mixed with 250 litres of water. You could spray 500 cc in 500 litres of water in order to provide more micro-organisms.

6. Mulching

6.1 The Importance of Mulching the Onions

- It is important to mulch the soil between the onion plants or to grow a legume crop there so as to suppress the growth of weeds. Weeds not only steal nutrients and water from the onion, but it will transmit viruses and diseases to the onion.

A straw-mulched onion field.

6.2 What is Mulching?

- Mulching is one of the most important ways to maintain healthy landscape plants and trees. A mulch is any material applied to the soil surface for protection or improvement of the area covered. Mulching is really Nature's idea. Nature produces large quantities of mulch all the time with fallen leaves, needles, twigs, pieces of bark, spent flower blossoms, fallen fruit and other organic material.

6.3 Benefits of Mulching

- When applied correctly, mulching has the following beneficial effects on plants and soil:
  - Mulches prevent loss of water from the soil by evaporation.
  - Mulches reduce the growth of weeds, when the mulch material itself is weed-free and applied deeply enough to prevent weed germination or to smother existing weeds.
  - Mulches keep the soil cooler in the summer and warmer in the winter, thus maintaining a more even soil temperature.
  - Mulches prevent soil splashing, which not only stops erosion but keeps soil-borne diseases from splashing up onto the plants.

- Organic mulches can improve the soil structure. As the mulch decays, the material becomes topsoil. Decaying mulch also adds nutrients to the soil.
- Mulches prevent crusting of the soil surface, thus improving the absorption and movement of water into the soil.
- Mulches prevent the trunks of trees and shrubs from damage by lawn equipment.
- Mulches help prevent soil compaction.
- Mulches can add to the beauty of the landscape by providing a cover of uniform colour and interesting texture to the surface.
- Mulched plants have more roots than plants that are not mulched, because mulched plants will produce additional roots in the mulch that surrounds them.

6.4 How to Apply Mulch

- Before applying any type of mulch to an area, it is best to weed the area. Spread a layer of mulching materials generously around the onion plants. Keep mulch 2 to 3 inches away from the stems of the plants. This will prevent decay caused by wet mulch.
- Use aged compost or chopped leaves around onions. Keep the mulch back from the bulb tops once they start to develop. (To grow large onions, keep both mulch and soil pulled back from the top two-thirds of developing bulbs.)

6.5 How Deep to Mulch

- The amount of mulch to apply depends on the texture and density of the mulch material. Many wood and bark mulches are composed of fine particles and should not be more than 2 to 3 inches deep. Excessive amounts of these fine-textured mulches can suffocate plant roots, resulting in yellowing of the leaves and poor growth.
- Coarse-textured mulches such as straw, allow good air movement through them and can be as deep as 4 inches. A depth of 4 inches will stop weeds growing.
- Mulches composed of shredded leaves should never be deeper than 2 inches because they tend to mat together when wet, thereby restricting the water and air supply to the plant roots.

7. Tips to Increase the Size of the Onions

- When the stalks of the onions are 9 inches long, cut them in half.
- When the stalks of the onions are 12 inches long, cut them in half.
- When the stalks of the onions are 15 inches long, cut them in half.

8. Diseases

- In case the onions get affected by rust, use this homemade remedy: Soak 1kg of pounded pawpaw leaves in a litre of water for six hours. Strain it through a cloth and add two tablespoons of liquid soap. Add five litres of water and spray every three days in the later afternoon.

Fungal Diseases

- Onion thrips might be a problem. The leaves will turn silverish and dry. Boil a cup of chopped rhubarb leaves in six cups of water. Leave to cool, add some liquid soap, strain and spray. But be careful, this concoction is poisonous.
- If mildew or other fungal diseases become a problem, spray with copper. On soils with boron deficiency, a foliar feed with 20g boric acid per acre is necessary. Sulphur or calcium deficiencies also need to be addressed if shown by a soil test. Spraying Pro-Plant should deal with these issues though.

9. Harvest

- Leave the plant until the tops become like paper. Even once the tops die back, the onion will continue to absorb water for up to 2 weeks. So, an onion should be left in the ground till the tops fall over and become like paper.