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How to Grow Palm Oil Trees with Bio-Plant and Pro-Plant

1. Compost and Soil Preparation

- See the file called ***How to Make Rich Compost with Bio-Plant – Handouts*** for how to make rich compost with Bio-Plant. **Click here** for the file.
- Soil preparation with a lot of compost made with Bio-Plant will be invaluable in increasing growth. Add compost to the planting holes and spread it generously around each tree after planting. Add more compost around each tree monthly.
- If you cannot make any compost, read the file ***How to Prepare the Soil with and Without Compost***. **Click here.**

2. Adding Decanter Cake Compost Made with Bio-Plant

- 5 MT of palm oil mill decanter cake mixed with Bio-Plant (1 litre in about 300 litres of water per 5 MT) will make excellent compost for the trees. Place about 10-12 kgs around each tree. If you plant 140 trees per hectare, this will cover 3 hectares.

3. Applying Bio-Plant to the Soil

- There is a variety of ways to apply Bio-Plant to the trees. For example:
  - If you do not have any compost, then spray the soil in the root zone of the tree about 3 meters from the tree in the case of 3-year-old trees ideally once every month with a mixture of Bio-Plant and water (ratio 1 litre of Bio-Plant in 1,000 litres of water). Spray about 2-3 litres per tree. 1 litre of Bio-Plant will, therefore, be enough for at least 1 hectare as there are 140 trees per hectare. Spraying in this way is necessary to increase and replace the concentration of micro-organisms, and to provide nutrients to the trees.
  - The minimum number of times to spray Bio-Plant would be to apply it four times just before and during the fruiting season. During this period spray the soil in the root zone of the tree about 3 meters from the tree in the case of 3-year old trees once a month four times with a mixture of Bio-Plant and water (ratio 1 litre of Bio-Plant in 1,000 litres of water). Spray about 2-3 litres at the base of each tree.
  - You could mix Bio-Plant to the water that flows down irrigation channels to each tree and apply it this way. (1 litre per 1,000 litres of water.)
  - Because palm oil trees grow for a long time, the farmers should apply Bio-Plant to the soil regularly in order to increase the concentration of micro-organisms. Even if the soil is in good condition, it still needs to receive more micro-organisms regularly.
  - If there are empty fruit bunches or branches around the tree spray the Bio-Plant mixture on the leaves. The micro-organisms will dissolve the leaves and the nutrients will go into the soil together with the micro-organisms.

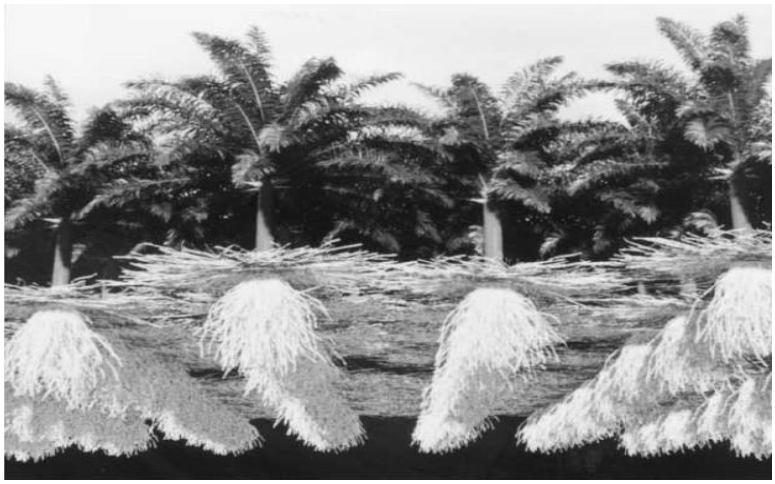
4. Where to Apply Bio-Plant

4.1 Spray on Piled Up Branches: Cut the branches, which are piled up around the trees like in the photograph below, into small pieces with a machete. Then spray Bio-Plant mixed with water on the branches. Bio-Plant will percolate down to the ground more easily, if the branches are cut into small pieces. The micro-organisms will be able to break down the branches more

easily, if the pieces are small. It will just take longer, if the branches are piled up as shown in the photograph below.

4.2 Grind Up the Branches: Ideally, the branches placed around the trees should be ground up with a machine and mixed with Bio-Plant and water. This compost can then be spread around the trees where the branches are shown. The yield of the trees will increase more in this way compared to piling up branches.

4.3 Place the Branches in the Rows: Pile up the cut up branches and place them in the middle of the rows between each pair of trees. Spread out the piles so that the height of the piles is low and the width is wide as opposed to creating tall, narrow piles. Spray Bio-Plant mixed with water on the cut branches. As the diagram below shows, the roots will absorb the nutrients made available by the micro-organisms.



Simulated 8-year-old oil-palm plantation.
Planting density: 143 palms per hectare.

4.4 Use Decanter Cake as Compost: Decanter cake is full of nutrients. Decanter cake mixed with Bio-Plant and water could also be placed in shallow pits between each pair of trees in the middle of each row. The micro-organisms will turn it into excellent compost. The reason for

Decanter Cake

creating shallow pits is because over time the ground will become hard, and digging up the soil will aerate the soil for the roots. Aerating the soil will increase the yield and it should be done 2-3 times a year, if you do not create shallow pits and fill them with organic matter. Placing decanter cake (or even cut up branches) sprayed with Bio-Plant in the pits will increase the amount of micro-organisms and nutrients, which are made available to the roots.

4.5 **Use the Empty Fruit Bunches as Compost:** Empty fruit bunches from the palm oil mills can also be placed one bunch deep between the trees as compost. Ideally, break the bunches into small pieces or grind them up in a machine. There is no need to spray Bio-Plant on them, if you are applying Bio-Plant in other ways. But if you are not, then cut up the fruit bunches into small pieces (or grind them up) and spray Bio-Plant mixed with water on them. Applying about 40 MT of empty fruit bunches per hectare will supplement a lot of extra Nitrogen, Phosphorus, Potassium, and Magnesium. Apply them within 4 days of leaving the palm oil mill because the nutrients tend to leach quickly.

5. Grind-up Palm Oil Tree Waste

- A lot of organic waste is created by palm oil trees, such as the branches which are cut down, and the waste produced at the palm oil mills. If the organic matter from the plantation as well as the decanter cake is ground up, laid in long piles about 1.5 metres high, sprayed with Bio-Plant in water (ratio 1 litre in 1,000 litres of water), turned over, and left for 2 weeks or more, you would produce very good compost, which could be placed around the trees or in the middle of the rows between the trees

6. Spraying the Leaves with Pro-Plant

- Pro-Plant provides all the nutrients required by palm oil trees. *(See section 7 below.)* Consequently, spraying it regularly on the leaves is very beneficial to the health of the trees and to the crop yield.
- Mix Pro-Plant (1 litre) in water (1,000 litres). This should be enough for 2 hectares, if you spray Pro-Plant with a misty spray.
- Spray the leaves monthly once the leaves have appeared until the Flowering Stage. 2-3 weeks before the flowers appear, start to spray the buds and leaves every 14 days. During the Flowering Stage and Fruiting Stage the frequency of spraying should increase. The more nutrients the tree receives, the bigger the yield. We recommend that you spray every 10 days during the Flowering Stage and every 7-10 days when the avocado fruit start to appear. You might experiment by spraying some trees more frequently than others during the Flowering Stage and Fruiting Stage in order to compare the effects.
- Spray the leaves with a misty spray. It is best to spray before about 9:30 a.m. when the stomata are open the widest. Be generous when you spray a tree. You do not have to spray every branch, though.
- Spray 1-2 litres of the Pro-Plant mixture per tree. Depending on the spacing of your tree and the mistiness of the spray head, you will most probably use only half a litre of Pro-Plant per hectare per time.

7. Nutrients Required by Palm Oil Trees

- Palm oil trees have the following nutrient requirements. Pro-Plant provides these nutrients whereas chemical fertilisers only provide a few of them. Bio-Plant will make the 80% of chemical NPK available to the roots as well as make available other soil nutrients through microbial action.
- Pro-Plant provides a large range of other nutrients, which are very beneficial.
- **Macronutrients**: Nitrogen, Phosphorous, and Potassium.
- **Mesonutrients:** Sulphur, Calcium, and Magnesium. They are required in substantial amounts.

- **Micronutrients:** Iron, Zinc, Copper, Manganese, Aluminium, Boron, Molybdenum, and Chlorine.

8. Amount of Bio-fertilisers Used (per hectare over 3 years)

- **Bio-Plant:** 1 litre in 5 MT of compost will make enough compost for 2-3 hectares depending on how much you want to use each application. Total: 0.4 litre per hectare on average.
- Apply compost at the soil preparation stage and every 1-2 months as you prefer. Total: 6 litres per year each on average in Year 1 and Year 2. In Year 3 apply compost 4+ times before Fruiting and 4+ times during Fruiting. Total: 0.4 litres x 8 = 3.2 litres.
- If you do not apply compost in years 1-2, which is not advisable, then apply it 4+ times in Year 3 before Fruiting and 4+ times during Fruiting. Total: 0.4 litres x 8 = 3.2 litres.
- **Pro-Plant:** Spray 0.5 litres every 1-2 months as you prefer. Total: 3-6 litres per year in Year 1 and Year 2.
- If you do not apply Pro-Plant in years 1-2, which is not advisable, then apply it 4+ times in Year 3 before Fruiting and 4+ times during Fruiting. Total: 0.5 litres x 8 = 4 litres.

Note: The more often you apply compost made with Bio-Plant and provide nutrients with Pro-Plant, the greater will be the protection from pests and the higher the yield.

9. Spraying Pesticides

- When you spray Pro-Plant the leaves get coated with micro-organisms that protect the trees from disease. The Bio-Plant strengthens the immune system so that the trees are less susceptible to disease. Chemical sprays kill the micro-organisms, which will be multiplying in the soil and being sprayed onto the leaves, so please do not spray them.

10. Disease and Pest Prevention

- The main ways to deter pests are the techniques in sections **4** and **5** above. Chemicals are not effective and the more they are used, more they destroy the soil's microbial life, and the worse the pest problem becomes. The solution is to restore the soil food web by applying compost and the organic farming techniques in sections **4** and **5**.
- Healthy soil creates healthy trees with a high energy vibration that signals to pests that the tree (or plant) is not food. As a general rule, and although exceptions occur, sucking insects will not tolerate 8 Brix or higher. Chewing insects that eat the roots or leaves directly, such as caterpillars, grasshoppers, and beetles, will start to lose interest in eating a plant once the plant reaches 10 or 11 Brix. Virtually no insects will attack a plant or tree with a Brix level of 12+ **Click here** for more information about this.
- Lastly, biomass waste from the trees should not be dumped around the trees as this attracts pests. The biomass should be turned into compost as described in sections **4** and **5**.