Chapter Seven
Managing Other Plants in the Tea Field

7.1 Growing other plants between the tea rows

7.2 Growing shade trees within the tea rows

The present chapter discusses the possibilities of growing other plants in the tea field. The first section (7.1) deals with plants, such as green manure plants and some food crops that can be grown between the tea rows. The second section (7.2) deals with shade trees, which can be grown in the tea rows.

7.1 Growing other plants between the tea rows

While the tea is in seedling and branch-formation stages, it is possible to grow other types of plants between the tea rows. This is usually a good idea, because the plants that are growing between the rows (the so-called “intercrops”) will:

- Provide temporary shade for young tea plants. This is for the seedling and branch-formation stages only. Once tea reaches commercial stage, shade should be provided by shade trees planted within the rows (see Section 7.2).
- Help protect the soil against erosion, and
- Help control weeds.

If you choose to grow a green-manure plant like “cot khi”, you will receive an additional benefit:

- Improve the soil by producing abundant leaves for green manure.

Or, if you already have an established tea field, you can plant green-manure plants between some of the rows of tea. Plant no more than one row of green-manure plants for every four rows of tea.
The disadvantage of green-manure plants is that most cannot be eaten by people or sold (although the leaves of many green-manure plants are excellent food for animals). This is a problem, because the farmer may need food or income every year while he or she is waiting for his or her tea to reach commercial stage. If the farmer needs food or income every year from his or her tea field, he or she may want to plant an intercrop (like peanuts or beans) between the tea rows.

Because most tea soils are somewhat degraded and low in nutrients, we strongly encourage farmers to plant green-manure plants. If the farmer must plant an intercrop that can be eaten or sold, at least he or she should plant an intercrop that fixes nitrogen (like peanuts or beans). Planting intercrops that do not fix nitrogen (like maize or cassava) will extract more nutrients from the soil, and degrade the soil further.

These two possibilities are discussed below:

Section 7.1.1 Planting green-manure plants between rows
Section 7.1.2 Planting an intercrop that can be eaten or sold
7.1.1 Planting green-manure plants between rows

Advantages and disadvantages of green-manure plants

The advantages of green-manure plants are:

- They provide abundant leaves for green manure, and therefore improve the soil. This is very important, because most tea soils are somewhat degraded.
- Most fix nitrogen from the air, so their leaves are rich in nitrogen.
- Provide temporary shade for young tea plants. This is for the seedling and branch-formation stages only. Once tea reaches commercial stage, shade should be provided by shade trees planted within the rows (see Section 7.2).
- Many (but not all) produce leaves that can be eaten by animals. So, if the farmer grows them, he or she will not have to buy so much food for his or her animals.

The main disadvantage is that most green-manure bushes cannot be eaten by people or sold to provide income.

What type of green-manure plant should you grow?

Choose the type of green-manure plant that is best suited to your area (do experiments or ask your neighbors). Some of the more-popular green-manure plants are:

1. “Cot khi” (*Tephrosia candida*).
   - **Advantages:** Fixes nitrogen. Provides temporary shade for young tea plants (grows about 4-5 meters tall). Lives for 3-4 years. Suitable for mountainous areas, can endure acid soil and drought. **Disadvantages:** Susceptible to root-rots, and may be susceptible to nematodes (see Section 11.4). Cannot be used for feed for people or animals. **How to plant:** One hectare requires about 20 kg of seeds.

2. “Stylo” (*Stylosanthes gracilis*).
   - **Advantages:** Fixes nitrogen. Forms a thick green cover that suppresses weeds. Resistant to trampling. Can be used as food for cows, pigs, buffaloes (but this reduces the amount of green manure available). **Disadvantages:** Can be used as food for animals (makes it more difficult to protect the field). Does not provide shade for young tea plants (creeps close to the earth). Not resistant to very cold weather. Tends to twine around tea bushes, so must be cut down frequently. **How to plant:** Planting as cuttings requires a lot of labor.

3. “_____” (*Tithonia diversifolia*). Wild sunflower.
   - **Advantages:** Provides shade (grows 2-3 meters tall). Produces large amounts of green foliage. Resistant to insects and diseases. Can endure acid soil and drought. **Disadvantages:** Does not fix nitrogen. Cannot be used as food for people or animals. **How to plant:** Seeds are sown in March and branches are cut and transplanted in May or June.

A more complete list of green manure plants can be found on the following page.

Important note: If the field you are planting was previously planted to tea bushes, and those tea bushes had problems with root-rots or nematodes (see Section 11.4), then do not plant any type of green-manure bushes. The reason is, many green-manure bushes are susceptible to root-rots and nematodes. Instead, plant grass for 18 months or more (see Section 5.6 for details).
### List of green manure plants:

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<td>wild sunflower</td>
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### Planting and care of green-manure plants

If you are planting a new tea field, plant the green-manure plants about one year before planting tea. This allows the green-manure plant time to grow tall enough to provide shade and start improving the soil. If your soil is very acid (pH less than 4.5), the green manure plants will grow better if you add lime before planting (2-3 tons of powdered slaked lime per hectare).

Or, if you already have an established tea field, you can plant green-manure plants between some of the rows of tea. Plant no more than one row of green-manure plants for every four rows of tea.

Plant green-manure plants either as seeds or transplants. For Tephrosia, the seeding rate is about 20 kg of seed per hectare. To produce transplants of green-manure plants, use a nursery similar to what was described in Chapter Five. Plant into moist soil, if possible when the rainy season is starting (March-May).

Lop the branches or stems of the green-manure plants every few months so that the plants do not produce too much shade. Leave the lopped branches in the field as green manure, or use some as food for animals if the type of plant is suitable for animal food. Do not let green-manure plants flower. They will not produce nitrogen during flowering, but instead will consume nitrogen from the soil. Therefore, if you want to produce your own seeds, it is better to plant some green-manure plants in a separate place just for that purpose.

Some farmers apply some nitrogen fertilizer when they plant green-manure trees. However, too much nitrogen, especially urea, in the soil will reduce the activity of the nitrogen-fixing bacteria on the roots of the green-manure plants. The result will be a very low amount of nitrogen taken up by the green-manure plants from the soil.

Once the tea reaches commercial stage, the farmer must clear out some or all of the green-manure plants, so that the pluckers and other workers can walk easily through the field. Leave
no more than one row of green-manure plants for every four rows of tea. Continue to lop the green-manure plants regularly to prevent them from making too much shade. Or, remove all the green-manure plants, and use shade trees planted within the tea rows as a source of green manure (see Section 7.2).

7.1.2 Intercrops that can be eaten or sold (cassava, beans, etc.)

Any crop (beans, cassava, etc.) can be grown between tea rows to provide a bit of shade, protect the soil, and provide some food or income for the farmer. The disadvantage is that most crops that can be eaten or sold do not help improve the soil. One good compromise is to plant a crop that fixes nitrogen and therefore helps a little bit to improve the soil. Three popular hill crops that fix nitrogen are:

1. “Do dua” (*Vigna sesquipedalis*). Yard-long bean. This is one of the best compromises between food production and soil improvement. **Advantages:** Fixes nitrogen. Does not provide much shade, but produces large amounts of green matter. Grows rapidly. Leaves and seeds can be used as food for people or animals. Has deep and extensive root system.

2. “Do du” (*Phaseolus* spp.) Bean. **Advantages:** Fixes nitrogen. Green pods and seeds can be used for food. **Disadvantages:** Only lives 120-150 days. Tends to vine around tea bushes, which can interfere with plucking and pruning. Does not provide much shade (grows less than 1 meter tall). Requires fairly good soil (especially, requires phosphorous) to grow well. **How to plant:** Plant as seeds in May, harvesting by September-October.

3. “Lac” (*Arachis hypogea*). Peanuts. **Advantages:** Fixes nitrogen. The “nuts” can be used for food, but when growing on hills the productivity is low. **Disadvantages:** Although peanut is somewhat popular, it has many disadvantages as an intercrop in tea. Peanut increases the population of tea green planthopper, an important tea pest (see Section 9.2.1). Does not provide shade (grows less than 30 cm tall). Does not produce much green matter. Requires fairly good soil (especially, requires phosphorous) to grow well. Seeds are expensive. **How to plant:** If you decide to grow, plant as seeds in March.

Because most tea soils are somewhat degraded and low in nutrients, we strongly encourage farmers to plant green-manure plants. If the farmer must plant an intercrop that can be eaten or sold, at least he or she should plant an intercrop that fixes nitrogen. Planting intercrops that do not fix nitrogen (like maize or cassava) will extract more nutrients from the soil, and degrade the soil further.

As always, however, each farmer must make up his or her own mind, based on his or her own situation. If a farmer decides to plant an intercrop that does not fix nitrogen, perhaps he or she would consider mixing it with a green-manure crop. This idea (planting a mixture of crops that provides some income but also protects the soil) has been useful in convincing farmers to plant soil-protecting crops in Thanh Hoa Province (see the box on the following page).
Can we combine intercrops and green-manure bushes while waiting for tea to reach commercial stage? (An example from luong)

Researchers say that farmers should plant cover crops to improve their soil. But, farmers say they need to get income and food now. Does this sound like a situation from a tea plantation? In fact, this same problem arises when farmers are considering planting “luong” bamboo on the hills in Thanh Hoa Province.

Luong protects the soil, but it takes several years to grow large enough to be marketable. For this reason, some farmers are reluctant to plant luong, because they can’t afford to wait several years. They need food and income every year. So, they plant maize, sweet potato, or cassava instead of luong.

But: it is possible to make a compromise that protects both the farmer and his or her soil. The compromise is to plant luong, but also to plant an intercrop of maize, cassava, or sweet potato. The farmer can harvest a few crops of the intercrop while the luong is growing larger. Eventually, the luong grows so large that the farmer must remove the intercrop. But soon, the luong itself is big enough to sell.

Would it be possible to make a similar compromise with tea? Green-manure crops improve the soil, but they don’t put anything in the cooking pot (or the wallet) of the farmer. So, why not plant both a green-manure plant like “cot khi” and an intercrop like maize or cassava between the tea rows? That way, while the farmer is waiting for the tea to reach commercial stage, he or she would get both some soil improvement and some food or income. Has anyone experimented with this? Write us a letter!

7.2 Growing shade trees within the tea rows

7.2.1 Advantages of shade trees

- Often increases tea yields (see box, below).
- Shade trees pull up nutrients from deep soil, where tea roots cannot reach. When the leaves from shade trees drop and rot, they release their nutrients, and the shallow tea roots can absorb the nutrients.
- Leguminous trees pull nitrogen from the air and “fix” it into the soil. However, not all shade trees can fix nitrogen.
- Decrease problems with some pests, especially mites, thrips, and tea leafhopper.
- During droughts, can help conserve water and increase soil water content. The reason is, even though trees use water, they provide shade, which cools the entire field. Also, their fallen leaves act like mulch to reduce evaporation from the soil.
- Can help suppress weeds (shade, and “mulch” of fallen leaves).
7.2.2 Disadvantages of shade trees

- Can increase problems with a few pests (especially mosquito bug and blister blight disease, which can be much worse under shade). However, these problems are worst under trees that provide too much shade (bad choice of the type of tree, or farmer is not doing enough lopping of the branches).

- May decrease some aspects of tea quality (briskness, and the color of the infused leaf). However, shade improves the color and strength of the liquor. And, most experts agree that the increase in yield more than repays the slight decrease in quality.

Why does tea need shade?

To keep its leaves cool. For the tea plant, the optimum temperature for photosynthesis is 30°C. The rate of photosynthesis declines rapidly as temperatures rise above 35°C. During the summer growing season, the temperature of the leaves of unshaded tea plants is very high (much higher than the optimum temperature of 30°C). Without shade trees, yield of tea is limited by high leaf temperature. Thus to increase tea yields, a canopy of moderate shade is essential under the conditions of Viet Nam. The beneficial effect of shade on growth and productivity of tea has been proven by experiments. [from a consultancy report by S.N. Banerjee]

7.2.3 What type of shade tree should you grow?

No type of tree will be suitable for every farm. When deciding what type of tree to plant, consider:

1. Suitable to soil and climate of your area.
2. Seeds or cuttings easily available.
3. Size and shape of canopy. You do not want a very thick canopy, especially if the leaflet size is also big. The shade should be only dense enough to reduce the temperature of the tea leaves during the hottest time of day. Therefore, the best choice is a tree that provides light to medium shade. A less-efficient alternative is to use a species of tree that gives dense shade, but plant it at a very low density.
4. Ability to fix nitrogen. One of the biggest contributions of shade trees should be their nitrogen-rich leaves (green manure).
5. Months during which tree has leaves (a tree is not efficient if it remains leafless for long periods, especially when the tea most needs shade). The best is few or no leaves during winter, and many leaves in summer.
6. Years of economic life; you want a long-lived tree.
7. Root depth and drought resistance (must have deeper roots than tea)
8. Effect on tea diseases and pests. Note that the presence of certain legume trees including Acacia spp., Sesbania spp. and Tephrosia vogelii can increase the abundance of nematodes that cause root diseases in tea (see Chapter Eleven). Also, many shade trees with the scientific name Albizia (such as “bo ket tay”) or Tephrosia are susceptible to stem cankers and are highly parasitized by root-rot fungi that attack tea (see Chapter Eleven).
Some popular shade trees include:

1. “muong la nhon” also known as “cay keo la cham” (Indigofera zollingeriana). This is one of the best shade trees, and meets most of the criteria listed above. This tree grows wild in Viet Nam, and so it is adapted to local conditions. It has fairly deep roots and is fairly drought-resistant (though its roots are not deep enough to find water during extended or severe droughts). It grows quickly and is easy to propagate from seeds or cuttings. One of its few disadvantages is that it cannot tolerate very cold weather, and therefore is not suitable for elevations above 500 meters.

2. “dai loan tuong tu” or “dai loan tuong tu dai” (Acacia confusa or Acacia heterophylla). There are many other species of Acacia; choose a species that gives light to medium shade (not heavy shade) and does not grow too tall.

3. “bo ket tay” (Albizia lebbeck). Trees with the scientific name Albizia are popular in many Asian countries, including Viet Nam. Most species grow 12-15 meters tall and have a moderately-spreading, feathery crown. Their main disadvantage is that they are susceptible to stem cankers and root-rot diseases. For this reason, they only live for about 15-20 years.

4. “muong den” (Cassia siamea). One advantage is a deep root system that allows this tree to resist even long droughts. One disadvantage is that it has too much foliage and therefore makes too dense a shade. Imported from India. There are many other species of Cassia available.

A more complete list includes:

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7.2.4 Planting and care of shade trees

Once you have chosen the type of tree, produce seedlings in a nursery, using procedures similar to those of a tea nursery (see Chapter Five). Plant the seedlings into the field at the same time as planting the tea. The best density will depend on the type of tree you plant and conditions in your farm. For “muong la nhon”, a density of 200-300 trees per hectare is often recommended.

Shade trees require careful lopping so that they do not produce too much shade. Lop the branches a few times each year. Especially, be sure to lop any overlapping branches (branches that are shading other branches). Leave the lopped branches in the field as green manure.

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What about Eucalyptus as shade trees for tea?

Eucalyptus grow quickly, and are often easy to obtain because they are used for re-forestation programs. But, they have 3 important disadvantages as shade trees for tea.

1. The leaves of Eucalyptus contain high concentrations of a chemical (called “eucalyptol”) that is toxic to plants. This chemical leaches from the fallen Eucalyptus leaves and gradually poisons the soil. This helps Eucalyptus compete against weeds when it is growing in the forest. But in a tea plantation, the chemical can slow the growth of the tea near the Eucalyptus tree.

2. Eucalyptus cannot fix nitrogen. Many other trees share this disadvantage, but why not choose a tree that helps improve your soil?

3. During the dry season, Eucalyptus can catch fire easily and burns with a very hot fire.

Even with these disadvantages, Eucalyptus may be the best choice for some tea fields. But, carefully consider other tree species before choosing Eucalyptus.