


Creating a Dwarf-Tree Orchard

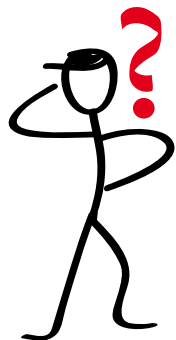
Organic Fruit Growing, Part 1:



Professional production of quality organic fruit is very demanding and requires optimum use of all of the technical and biological means available. In addition organic fruit growing can be an example of environmental soundness.

This technical report describes the various steps involved in the creation of an organic dwarf-tree orchard. It also illustrates how to tap into an orchard's ability to self-regulate by establishing habitats for beneficial fauna. In addition, it offers techniques to encourage tree development and simplify maintenance.

Three main questions before getting started



- **Is there a market for organic fruit and can the farm make a profit that way?**

Marketing possibilities and requirements must be well thought out before planting. Factors such as geographic location, the farmer's goals and available labor can help determine whether the focus should be placed on direct sales or production for large distributors.

- **Is producing fresh market fruit an appropriate activity for the farm?**

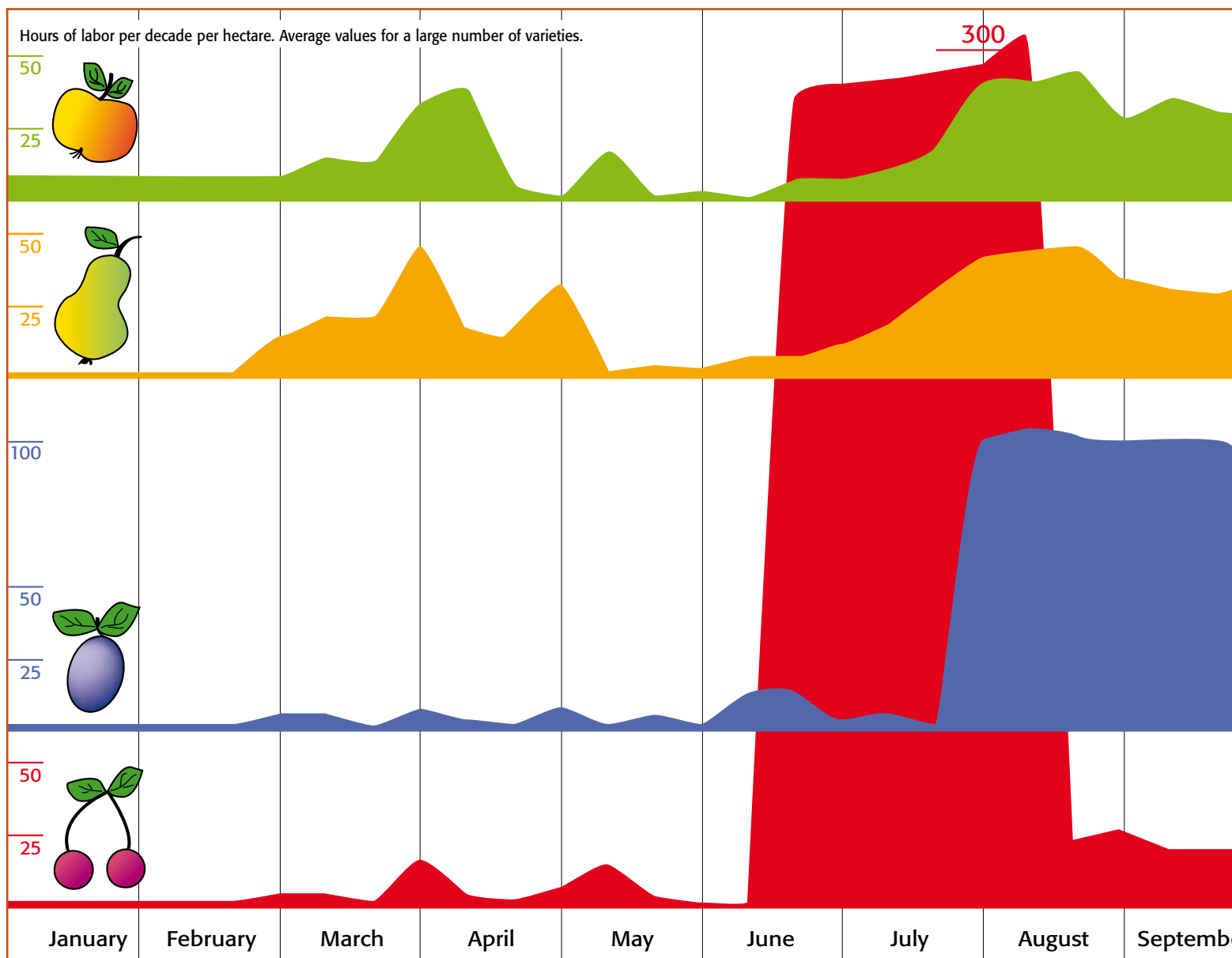
The farm must have the proper soil and climate conditions to be able to produce quality fruit. It must also be determined early on whether the labor issues can be overcome. Also, the farmer must have significant knowledge in the area of fruit tree cultivation.

- **What orchard cultivation intensity would be best?**

If extensive production is preferable (self-sufficiency, direct sales), then a standard orchard may be a good alternative to a dwarf-tree orchard (see technical guide «Organic Cultivation of Standard Orchards»). High intensity cultivation involves increased labor requirements, plus the significant costs of setting up and maintaining a dwarf-tree orchard. With this increase in intensification comes the need to produce consistent, high yields. This represents a considerable economic risk, which then must be accompanied by a high degree of professional support during all stages of production.

Labor requirements throughout the year (in hours)

Due to the peaks in labor requirements, some combinations of varieties and species are not recommended.



Location choice

A good location requires less intervention

Creating an orchard involves steep investment costs and long-term land use. It is thus prudent to choose the location of the orchard carefully as that is one of the main elements that will determine its success.

The species and variety of fruit and the rootstock for each must also be compatible with the site. For example, pear trees are sensitive to low temperatures both during the vegetative period and during the winter. In addition, the rows of trees should be located on a north-south axis for optimum sun exposure.

An appropriate location includes:

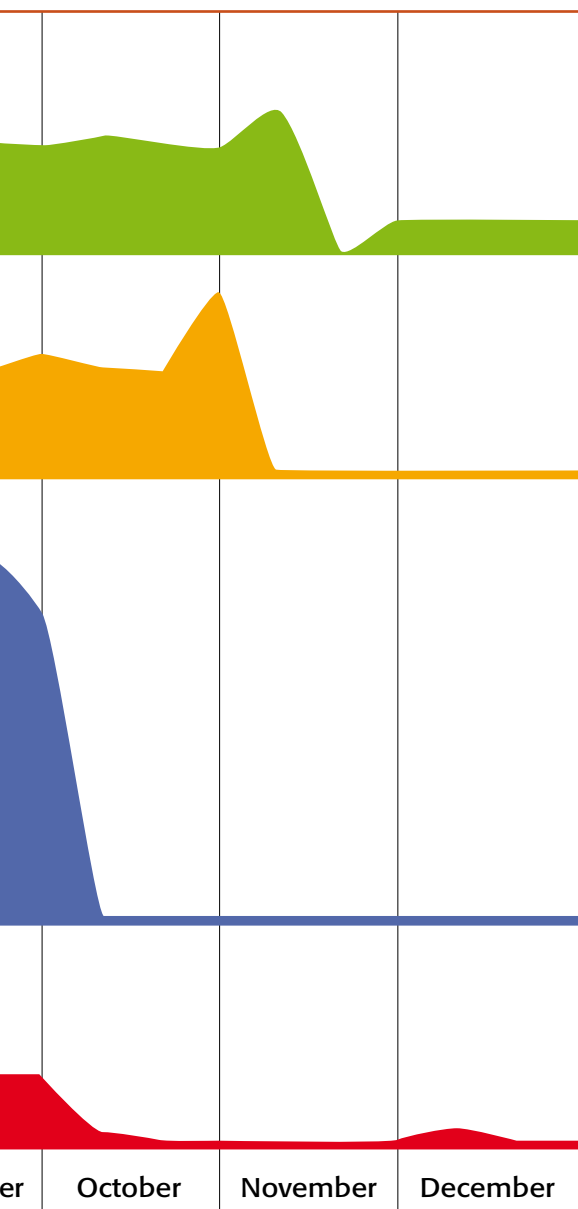
- Sunny, well-aerated land that is not susceptible to late frosts.
- Deep, well-structured soil with good biological activity and without stagnant water (see page 16).
- Topography that is compatible with the usage of machinery.

The more favorable the location, the fewer economically and environmentally taxing operations like phytosanitary treatments and frost damage prevention are needed.



Photo: Andi Schmid

commended.



Five years of planning before the first significant yields

Winter 0/+1

- Collect and study information on varieties and species of fruit.
- Visit farms, attend meetings and take classes.
- Select appropriate plots of land (see page 16).
- Discuss different fruit options and the possibilities for marketing varieties with the buyer.

Spring +1

- Treat problematic plots of land; add a green/mixed fertilizer between rows.

June +1

- Use contracts to place orders with nurseries (see page 15).
- Order stakes, so that they can be stored properly and made more weather resistant.

Summer +1

- Cultivate the subsoil if weather conditions are good.

Spring +2

- Sow inter-row mixture for plots that do not need enriching (see page 17)

Summer +2 or Winter +2/+3

- Put up storm protection nets (see page 14).
- Install the fence. Depending on the region (snow quantity, winds) choose a height between 1.5–2.5 meters.

Autumn +2 (or Spring +3)

- Plant the trees (see page 18)

Summer +3

- Generally no harvest
- Remove blossoms and young fruit from weak trees.

Summer +4

- First harvest

Summer +5

- First significant yields

Developing the Orchard

Make the most of the orchard's self-regulating mechanisms by integrating habitats and natural spaces

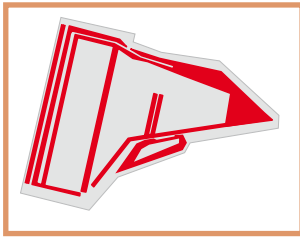
Environmentally sound fruit production is not only evaluated by the types and quantities of pest control products used and the energy required to maintain the orchard, but also on the development of natural spaces on the farm and the choice of materials used. Keeping phytosanitary issues under control is very difficult for the grower as there is no single product that is effective for each problem. It is this very important to take every possible

measure to promote natural regulation of the orchard. The greater the biodiversity, the more stable the orchard ecosystem. In addition, an orchard filled with natural spaces provides an aesthetically pleasing landscape and helps the farm and its products gain customers' acceptance. The habitats and natural spaces listed below encourage biodiversity and can be easily integrated into an orchard or around its outskirts.

Example of orchard development



Extensive grasslands



Extensive grasslands are not treated with fertilizer and are mowed 1 to 2 times per year.



Photo: Andi Schmid

ADVANTAGES

- Encourage the development of pollinating insects.
- Provide pasturelands for livestock.
- Offer an alternative to wildflower beds.

DISADVANTAGE

- Can encourage the development of rodents. However, they are easier to control in extensive grasslands than they are in wildflower strips.

WHERE SHOULD THEY BE LOCATED?

- In areas where mowers can be used.

WHEN SHOULD THEY BE CREATED?

- Existing fields can be converted into extensive grasslands at any time of year.
- If planting is required, it should occur in spring (April).

HOW CAN THEY BE CREATED?

- For existing fields, eliminate fertilization and stop mowing.
- Cultivating sparsely with a tiller, then sowing with local wildflower seeds can help speed the transition.

WHAT MAINTENANCE IS REQUIRED?

- Mow twice yearly and remove cuttings.

NOTE

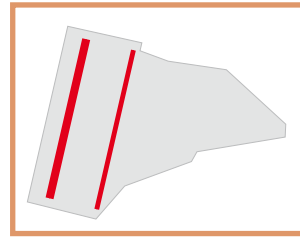
- It will take several years to develop grasslands that are rich in different species.

Be careful with drift !

The development of natural spaces within orchards and on their outskirts increases the number of flowers, and thus the number of pollinating insects. Since even organic insecticides can still cause unintended harm to these organisms,

- Conduct insecticide treatments early in the morning or late at night.
- Use large spectrum insecticides only in isolated areas and when needed.

Wildflower Strips



It has been proven that strips of land sown with wild indigenous plant life encourages the population of pollinators which in turn significantly reduces the aphid population. If rodent activity becomes too high, extensive grasslands are a viable alternative.



Photo: Lukas Pfifner

ADVANTAGES

- Encourage pollinators, such as aphid predators, more than any other habitat due in part to the diverse array of food options they provide. Aphid attacks diminish when a wildflower strip is located within 25 meters of the orchard.

DISADVANTAGE

- Very attractive to rodents, as mowing is infrequent and thus control techniques are ineffective.

WHERE SHOULD THEY BE LOCATED?

- Only in areas that can be accessed by machines.
- In 3–5 meter wide strips, if possible parallel to the tree rows.
- If wildflower strips are preferred over extensive grasslands despite a large population of rodents, an anti-rodent barrier can be established between the wildflower strips and the trees.

WHEN SHOULD THEY BE CREATED?

- Sow the seeds in the spring, before the end of April. Seeds planted in the fall (late-August to late-October) are more easily overwhelmed by noxious weeds than those planted in the spring.

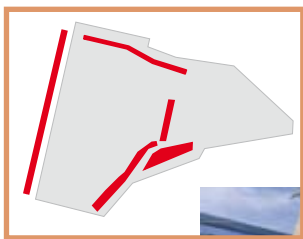
HOW CAN THEY BE CREATED?

- Shallow tilling with a hydraulic seeder or by hand. Mix the seeds well.
- Use proved wildflower blends.

WHAT MAINTENANCE IS REQUIRED?

- Cut the entire strip (preserving the seeded plants as much as possible) if the wildflower seeds sprouted poorly or if the annual weeds completely overran the wildflowers during the first year.
- Mow half of the area lengthwise each year. It is important to remove the cuttings. Mow during the first half of October or until November, or from mid-February to March.
- Implement strict rodent control measures (especially after each mowing).
- Use no fertilizers or other pest control products.
- Pull out weeds that are especially problematic, such as dock. If the wildflower strip is overrun with grasses after 2 to 4 years, use a rotary harrow or a spike tooth harrow to break up the soil.

Hedges



Hedges are barriers consisting of tightly clustered native trees or shrubs and at least one grassy strip larger than three meters wide (two strips are preferable).



Photo: Andi Schmid

ADVANTAGES

- Attract pollinators.
- Offer protection against the wind, phytosanitary by-products and emissions and serve as a barrier between plots of land
- Encourage bird populations (including song birds).
- Provide wild berries (elderberries, wild plum, dogwood).

DISADVANTAGES

- Use a large amount of space, due to the grassy strips' requirement.
- Cause possible reduction in the quality of the microclimate (create shade, slow leaf drying).
- Can increase the population of rodents and other pests.

WHERE CAN THEY BE CREATED?

- In places that are difficult to cultivate such as on slopes or near the anti-hail net anchor points if those are near the edge of the orchard.
- Between two plots that need to be separated (for example, to keep conventional pesticide by-products from contaminating an organic orchard).
- Parallel to tree rows, to avoid casting too much shade and creating pockets of cold air, and to maintain good air circulation in the orchard.
- As fence substitutes (see also vine fences and thorn hedges on page 7)

WHEN SHOULD THEY BE CREATED?

- Spring or fall.

HOW CAN THEY BE CREATED?

- Till the soil and run a cultivator if needed.
- Plant one to two species per sq. meter.
- Water young plants in dry weather.
- Cover the soil with mulch (wood shavings or bark). This will eliminate the need for careful cutting during the development stage.

WHAT MAINTENANCE IS REQUIRED?

- Selective weeding, or by sections in the winter
- Do not burn the material (wastes too much energy). Use the thick branches as firewood and pile up the small branches.

NOTES

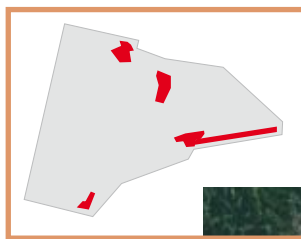
- Use only native species. Commercial nurseries can offer recommendations.
- Choose plants based on the space that is available (for example, select shrubs of an appropriate height; certain types are vigorous, other are small and do not compete well).
- Thorny shrubs should represent at least 30 % of the growth, as they are the best hosts for animal life.
- Some species are natural hosts for damaging organisms. Hosts of fire blight must never be planted, and other hosts should be used only minimally.

Hosts

Damaging Organisms

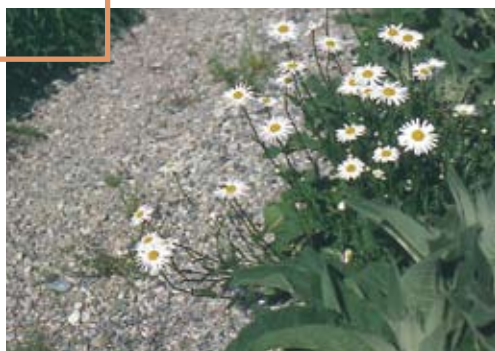
Wild apple and pear trees (<i>Malus sp.</i> , <i>Pyrus sp.</i>), European Mountain Ash (<i>Sorbus sp.</i>) Hawthorn (<i>Crataegus sp.</i>)	→ Fire blight (<i>Erwinia amylovora</i>)
Wild trees, Hawthorn (<i>Crataegus sp.</i>)	→ Apple maggot
Honeysuckle (<i>Lonicera sp.</i>), verschiedene Prunus-Arten	→ Cherry fruit fly (<i>Rhagoletis cerasi</i>)
Fusain (<i>Euonymus europaea</i>)	→ Hyponomeutes (<i>Hyponomeutidae</i>)
Barberry (<i>Berberis sp.</i>)	→ Black rust (<i>Puccinia graminis</i>)
Blackthorn (<i>Prunus spinosa</i>)	→ <i>Cacopsylla pruni</i>

Ruderal Areas



Ruderal areas are gravel pits, rock piles or piles of rubble with few nutrients that have been partially colonized by pioneer plants. Some paths can also be classified as ruderal areas.

Photos: Andi Schmid



ADVANTAGES

- Encourage species that are rare in modern landscapes.
- Improve the carrying capacity of well-traveled areas.

DISADVANTAGES

- Ruderal areas become rapidly recovered with plant species unless more stones are added or there is insufficient traffic on their surfaces.

WHERE CAN THEY BE CREATED?

- In high-traffic areas, such as near entrances or at the ends of rows.
- In areas that are difficult to maintain mechanically and are not suitable for trees, such as around the anti-hail net anchor posts.

WHEN SHOULD THEY BE CREATED?

- Year-round

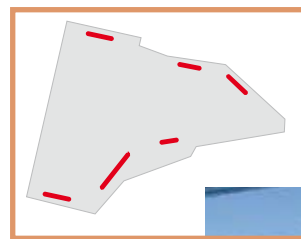
HOW CAN THEY BE CREATED?

- Spread a layer of stones at least 10 cm deep (the thicker the better). Recycled gravel that is free of tar and other synthetics is a more environmentally sound choice than freshly mined gravel.
- Sowing a scattering of native wildflower seeds can add biodiversity.

WHAT MAINTENANCE IS REQUIRED?

- Avoid the accumulation of nutrients: remove cut grasses and do not spread organic mulch.
- If necessary, spread a new layer of gravel.

Vine fences and thorn hedges



Climbing plants make even the most imposing fence more attractive to both humans and bees. Also replacing costly metal fences that require large amounts of valuable raw materials with dense thorn bushes is a better environmental choice.



ADVANTAGES

- Vine-covered fences: increase the number of flowers, which then attract more pollinating insects.
- Thorn hedges can in some cases replace metal fences, which are expensive and tie up valuable raw materials.

DISADVANTAGES

- Require a large amount of maintenance.
- The thorns can puncture tires.
- No method has yet been suggested to control rodent populations if thorn hedges are implemented.

HOW CAN THEY BE CREATED?

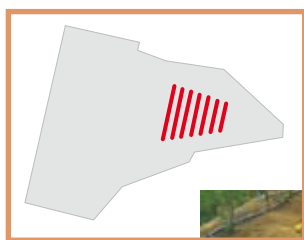
Select appropriate native plants:

- Vine fences: ivy, clematis, or honeysuckle
- Thorn hedges: blackthorn, buckthorn, various species of wild rose or bayberry

WHAT MAINTENANCE IS REQUIRED?

- Depending on the amount of space available, prune the hedges annually or allow them to grow freely.

Species-rich Inter-rows



Mixtures of grasses and other plants, alternately mowed to form rows, can increase plant and pollinator diversity. This strategy is primarily suited for low-traffic orchards (stone fruit or small fruit).



ADVANTAGE

- Encourage the development of pollinators.

DISADVANTAGES

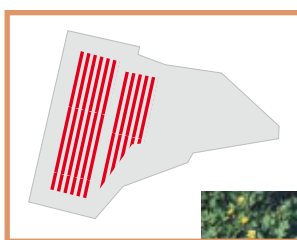
- Treatment of the trees with pesticides can be harmful to the pollinators and other fauna.

NOTE

- In high traffic orchards, like pome fruit orchards, varied flora is also desirable. However, good soil structure takes priority over all other factors, especially when the soil is heavy, and it requires dense vegetation that generally incorporates fewer species.

Sandwich System

See also Technical Guide «Maintaining a Dwarf-Tree Orchard»



On both sides of the tree, the soil is cultivated and remains open. However, the middle strip is covered in small plants or grasses. The early blooming flowers there draw pollinating insects right under the fruit trees.



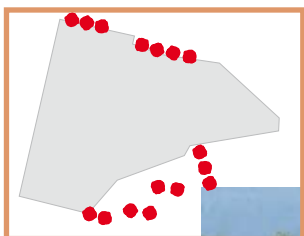
ADVANTAGES

- Insects like ladybugs, hoverflies and lacewings are attracted right near the trees.
- The small plants used do not need to be mowed.

DISADVANTAGES

- Treatment of the trees with pesticides can harm the insects. If the middle strips contain grasses, they have to be regularly trimmed and are not generally attractive to pollinating insects.
- Important note: The sandwich system is still in the experimental stages of development.

Standard Trees



Standard trees and isolated trees enrich both the environment and the landscape.



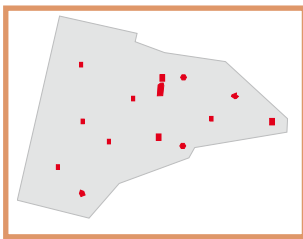
WHERE TO PLANT?

- Standard trees should be placed such that they do not interfere with the dwarf-tree orchard by shadowing it or competing with it for water and nutrients.

NOTE

- Do not plant standard pome fruit trees near an intensive pome fruit orchard, as the larger trees could be fire blight hosts.

Artificial Shelters



These artificial shelters are inexpensive structures designed to attract particularly rare or useful animals to the orchard.

Heaps of branches and stones



Pruned limbs from fruit trees and hedges are the ideal raw materials for building branch shelters. These offer protection and nesting sites to a wide range of birds. In addition, they provided a home base for small mammals like hedgehogs and shrews when they return from the hunt.



Different sized rocks piled in a loose heap and dry rock walls also provide shelter for many beneficial animals, including weasels, which are known for preying on rodents.

Birdhouses



It has been proven that installing birdhouses in orchards increases the population of certain birds like the great tit, which is a major insect consumer. The birdhouses must be systematically emptied and cleaned each fall.

HOW TO INSTALL THEM

- Special birdhouses for owls, falcons and bats.
- Birdhouses with 25–45 mm openings are commonly used in orchards.
- Up to 12 birdhouses can be installed per hectare, with a minimum of 25 meters between them.
- Attach the boxes at eye level and face the openings south/south-east in the same direction as the tree rows.

Perches for birds of prey



Perches make orchards more attractive hunting grounds for birds of prey. Cross-shaped perches seem to be more popular than standard ones, as the birds seem to be able to adjust to the wind more effectively and thus can conserve energy.

HOW TO INSTALL THEM

- Materials: 4–5 meter high perches of solid material with 2 round dowels crossed at the top, each 30–50 cm long and 3–5 cm wide.
- Install 1–3 perches per hectare based on how much visibility the terrain provides.

Habitats for Hymenoptera

The Hymenoptera order includes both wild bees and bumblebees. Aside from domesticated bees, these two are the most effective pollinators, especially at low temperatures.



A pile of wood with holes drilled into it makes an ideal nest for wild bees. Some species of wild bees prefer sticks with abundant pith in which to build their nests, elder and wild rose are well suited for this purpose. Bundles of these sticks can be placed between the logs to provide this habitat.

HOW TO INSTALL THEM

- Make a pile of non-impregnated wood, preferably hardwood.
- Face it toward the south.
- Protect it from rain with a roof made of boards.
- Drill 3–10 mm holes 10 cm into the logs, at least 2 cm apart.



Nests for bumblebees can be made by burying clay pots upside down in the soil.

HOW TO INSTALL THEM

- Fill clay pots with moss and bury them upside down in the soil such that just the bottom edge protrudes. They should have a 15 mm hole in the top to serve as an entrance.



Some types of Hymenoptera make their nests in porous clay walls.

HOW TO INSTALL IT

- Build a structure with a roof made of boards, facing south.
- Weave willow branches into the structure.
- Cover the whole structure with a mixture of clay, sand and chopped hay (spread the mixture at least 20 cm thick over both walls)



Sand pits can also be good habitats.

HOW TO INSTALL THEM

- Dig a hole 30 cm deep and partially fill it with sand.
- Cover part of the surface for rain protection.

Orchard Systems

Not all the systems are appropriate for organic fruit growing

Orchard systems with a good flow of air and light are less susceptible to disease and are easier to treat with pest control products. They are thus particularly well suited for organic orchards.

Two level or multiple level systems and those with low fruiting branches are not recommended as they tend to provide less light and ventilation and make maintenance work under the trees more difficult. The Marchand system for stone fruit and pears and the Solaxe system for apples are both effective choices.

The distance between the tree rows depends on soil and climate conditions, the vigor of the varieties and rootstocks and the machinery that will be used.

Calculating ideal tree height:

A) $L = H \times \text{tg } \vartheta$ in which L = distance between the rows
H = height of the trees
 ϑ = degrees latitude of the region

or

B) Northern regions: half of the distance between the rows + 1.00 m
Southern regions: half of the distance between the rows + 1.50 m

Pruning and training guidelines for each system are included in the Technical Guide «Maintenance of a Dwarf-Tree Orchard».

French axe and Solaxe



Distance between the rows,
Distance between the trees:

- 3.50–4.00 meters, 0.80–1.70 meters
(1,470–3,571 trees per hectare)

Goal:

- All of the maintenance can be carried out from the ground

Advantages:

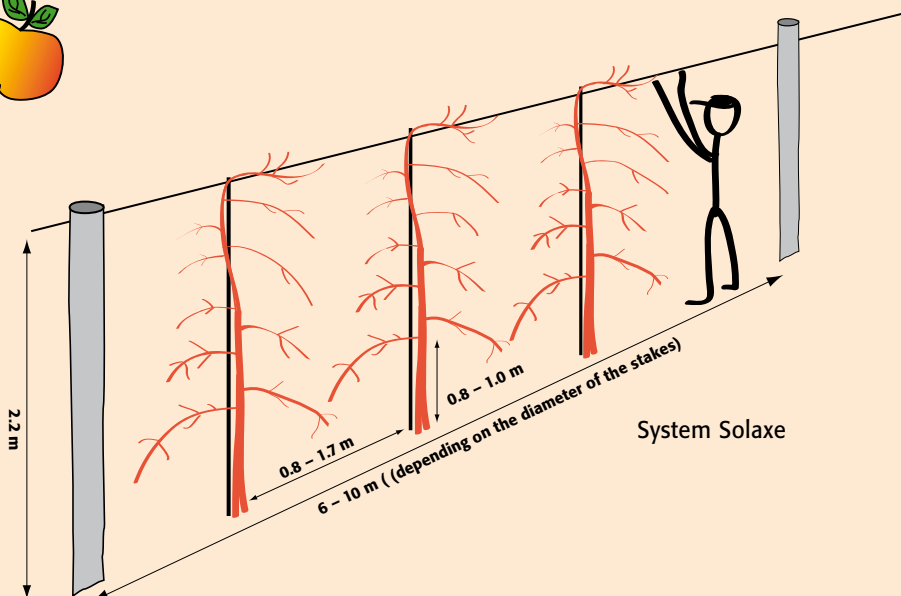
- Training trees and installing supports is fairly simple
- Fruit production begins early
- The tree canopy is easy to access

Disadvantage:

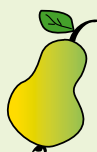
- The expected results are often not attained, if the orchard is extensively cultivated.

Note:

- Solaxe is becoming the more dominant system.



Drilling



Distance between the rows,
Distance between the trees:

- 4.00–4.50 meters, 1.40–1.80 meters
(1,235–1,786 trees per hectare)

Goals:

- All of the maintenance can be carried out from the ground.
- The three scaffold branches have been trained to promote short fruiting branches.

Advantages:

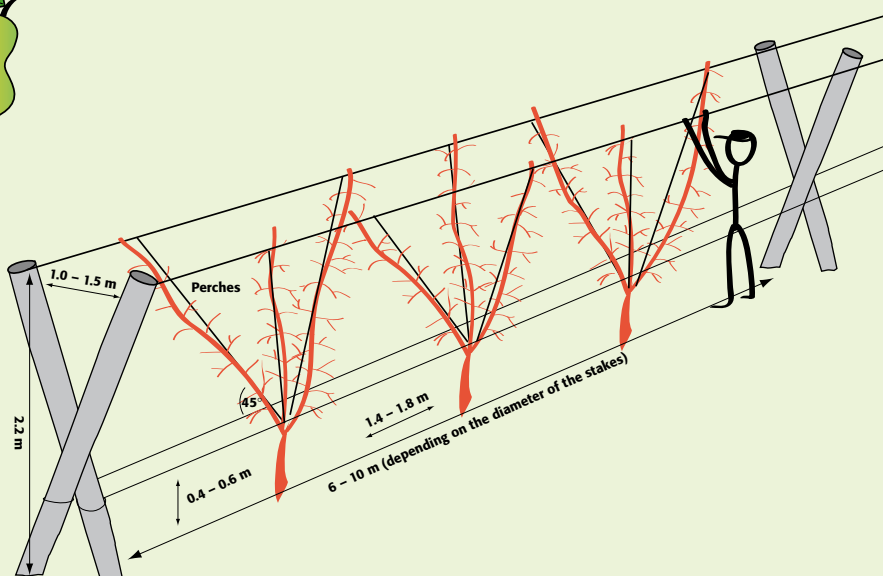
- High yields, good quality and good sun exposure.

Disadvantage:

- Significant training requirements for the first three years.

Note:

- The spindle-shape is difficult for pear trees as the central leader is often too dominant.



Before deciding on an orchard system:

1. Visit old and new organic orchards and discuss the advantages and disadvantages of different systems with growers.
2. It is better to have a good handle on a simple system than to be confused by a complex system.
3. Systems that provide good air movement and light interception improve tree health and fruit quality.

Trellised Hedgerow

**Distance between the rows,
Distance between the trees:**

- 4.50–5.0 meters, 3.0–4.0 meters
(500–740 trees per hectare)

Goals:

- All of the maintenance can be carried out from the ground (including thinning).
- The bottom branches slow the growth of the central leader.

Advantage:

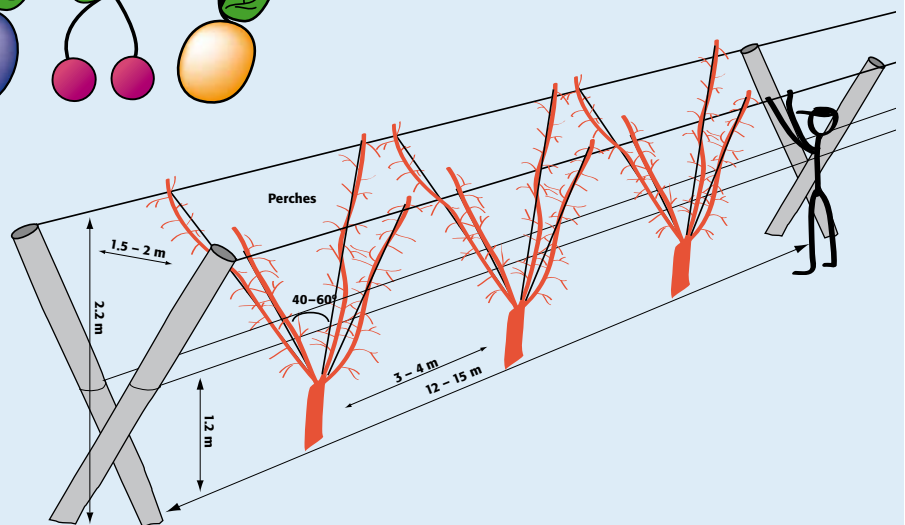
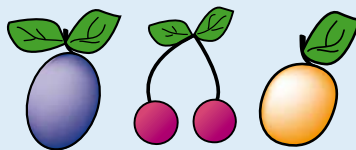
- Rational cultivation

Disadvantage:

- Installation costs are high compared with orchards without a support system.

Note:

- Plums and apricots are also often cultivated without a support system.



Marchand system

**Distance between the rows,
Distance between the trees**

- 4.0 meters, 2.5 meters
(1000 trees per hectare)

Goals:

- All of the maintenance can be carried out from the ground.
- The bottom branches slow the growth of the central leader.

Advantages:

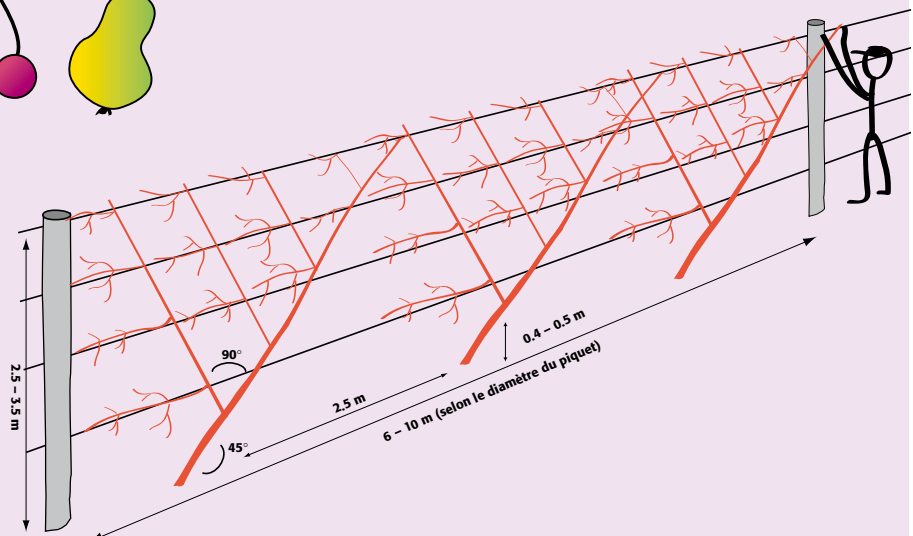
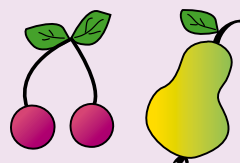
- Rational harvest
- Coverage (storm protection)
- Early fruit production
- Little risk of harvest accidents

Disadvantage:

- Little long-term experience with the low vigor rootstock that are necessary for this system.

Notes:

- Adapt the Marchand storm protection mechanism to any other orchard system.
- Based on the root stock vigor (M14) the trellised hedgerow system is advantageous.



Materials







Select natural materials whenever possible

Support systems, weather protection, irrigation systems creating a dwarf-tree orchard requires a lot of materials. It is thus important to select them carefully. Currently, plans are underway to cultivate apples on M9 rootstock without support. From an environmental standpoint, this is an ideal solution. However, there is currently still a lack of experience with low input systems, and particularly in areas where there is a high risk of hail. In hail-prone areas in particular, materials are still an important part of cultivation.

From an environmental standpoint, the metal stakes are the most problematic. The heavy metals that leach out of them can cause damage to earthworms, thus slowing the decomposition process for the tree's leaves. This in turn increases the risk of scab. In addition, heavy metals can slow the microbial mineralization of nitrogen.



A dwarf tree without support: the ideal environmentally sound solution.

	Problematic Material	Why?
	Stakes impregnated with chrome copper and boron (CCB)	<ul style="list-style-type: none"> Immission of chrome, copper and boron into the soil <i>Immissions over 20 years (3,000 trees with CCB-impregnated training stakes and hail-net support stakes):</i> <i>Chrome: 5.7–7.2 kg/ha</i> <i>Copper, 7.5–10.8 kg/ha</i> <i>Boron: 6.5 kg/ha</i> These materials should be eliminated in an incineration facility for household waste or in a crematorium.
	Stakes impregnated with tar (the tar accounts for approximately 20 % of the stake's weight)	<ul style="list-style-type: none"> Poor public image due to the odors that are released. Mixed opinions on whether they are carcinogenic. Tar accelerates the disintegration of other materials such as the plastics used for weather protection. Tar can burn plants (see photo, left). Disposal: Same as for CCB stakes
	Non-impregnated tropical wood stakes	<ul style="list-style-type: none"> If they do not bear the FSC (Forest Stewardship Council) seal then there is no guarantee that they actually came from a sustainable production facility. This wood often comes from slash and burn plantations, which are environmentally suspect. There is excessive transportations involved.
	Concrete posts	<ul style="list-style-type: none"> For environmental impact analyses conducted on aerial electric lines, concrete posts were evaluated less favorably than wood (other studies currently underway).
	Zinc-covered metal (tree stakes, metal wire, fences and weather protection devices)	<ul style="list-style-type: none"> Immission of zinc into the soil. <i>Immissions over 20 years (3,000 zinc-coated tree stakes (Unistock) and a metal adjuster: 48.6 kg/ha (which equals 2.4 kg/ha/year at the root level).</i>
	Synthetic materials (Anti-hail nets, weather protection, plastics, tie material, irrigation hoses)	<ul style="list-style-type: none"> Anti-hail nets and weather protection devices alter the landscape. Significant resources and energy are required to make them. From both an environmental (lengthy washing) and economic (disposal fees), recycling is not ideal.

Alternatives

Non-impregnated stakes of false acacia, or chestnut, though the latter is slightly less durable. Oak is generally not durable enough unless it is impregnated.

Notes:

- Round wood is generally more durable than wood that has been sawed.
- Use only dry, stripped wood that has been stored for 1–3 years.
- Only the heart of the wood is durable (not the sapwood).



Since 1997, testing has been conducted by FiBL in Frick, Switzerland, on false acacia, chestnut and oak stakes to identify alternatives to impregnated wood.



According to observations, non-impregnated wood does not burn vegetation.

- Wood stakes for trees (see above)
- Stainless steel metal wire (leaches nearly no heavy metals)
- Enclosing orchard with thorny hedges rather than zinc-coated chain link fence.



Stainless steel wires last a particularly long time.

- Hail damage insurance rather than anti-hail nets (not always possible)
- Hardy varieties rather than weather protection for cherries. However, these do not always meet market demand.
- Cultivate between trees or spread mulch rather than using plastic sheets.
- Use biodegradable tying material (like string) for training branches and other tasks.
- Use a high quality irrigation system that will last.

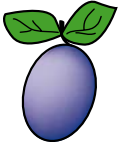
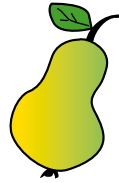


Biodegradable tying string is particularly well suited for training.

Weather protection

Advantages and disadvantages

Increasing pressure to obtain consistently high yields is forcing some growers to implement weather protection measures in their orchards. Unfortunately these measures have some significant disadvantages as well.



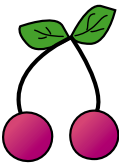
Anti-hail nets

Advantages

- Good protection against hail damage on both fruit and trees and valorization of the grower's work
- Partial protection from sun damage
- Constant supply of product to the market, as there is nearly no hail-related fruit loss

Disadvantages:

- High installation costs
- Consumes additional resources and alters the landscape.
- Blocks some light, especially in the fall. The black nets also have a negative affect on varieties that have difficulty coloring.
- Slows ripening by several days.
- Blocks access to the orchard for birds of prey, but not sparrows.



Umbrella covers

Advantages

- Good protection against fruit splitting caused by rain (for more efficient harvesting). However, hail tends to damage the plastic.
- Partial effectiveness against brown rot and other diseases if the trees are covered before bloom (new studies are currently underway).
- Constant supply of product to the market as harvest can take place even in bad weather.
- Production of high quality varieties is possible (large varieties with firm flesh).

Disadvantages:

- High installation costs
- Consumes a large amount of resources and significantly alters the landscape.
- Some systems take much time to open and close.



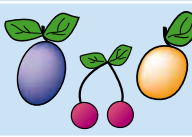
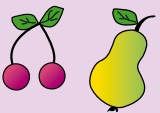
Plants

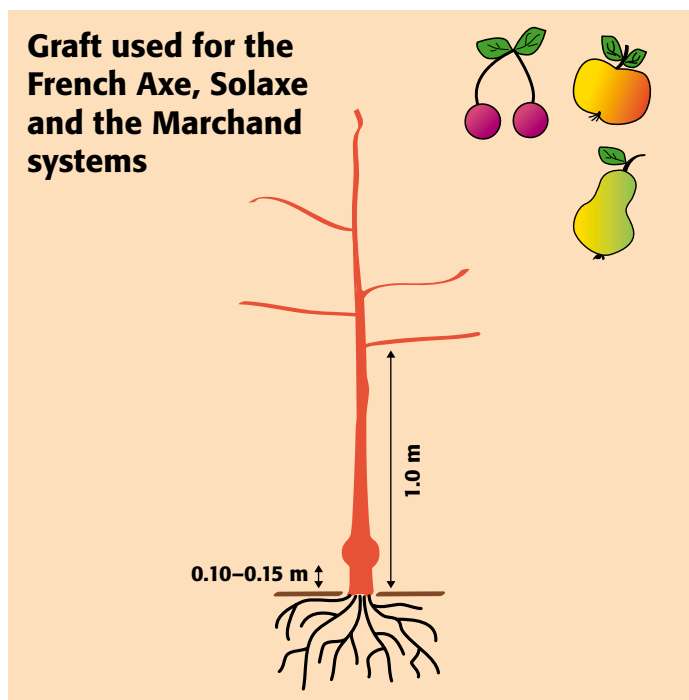
Good quality plants get the orchard off to a smooth start

Plants should be ordered far enough in advance and if possible using a contract. The contract guarantees that the right number of the desired variety of plants is available on the proper rootstock, and that they will be organic. In addition, your particular preferences can be accommodated, such as for a fairly high grafting point so that the graft is not damaged if the soil is mechanically cultivated.

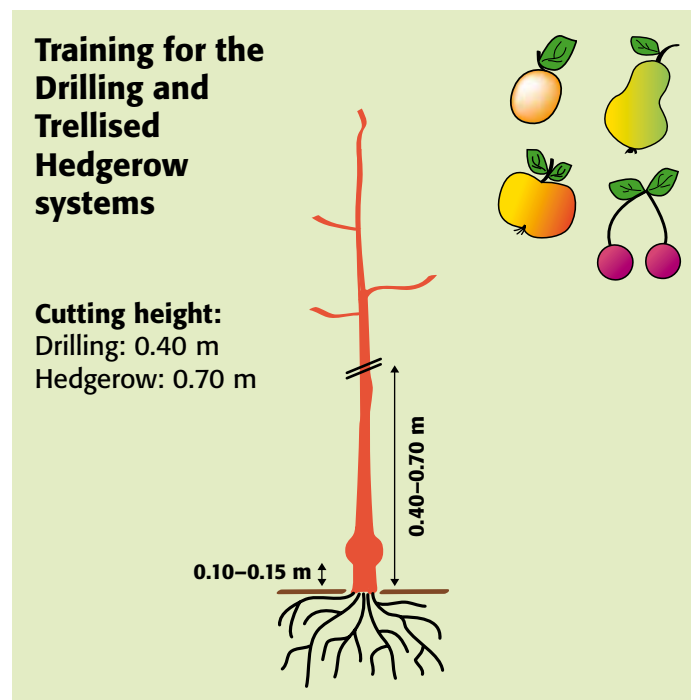
The use of organic plants is obligatory in some countries. If there is any difficulty procuring organic plants, the responsible governing body should be contacted.

The plants must be virus-free and the grafting point must be healed. The plants must also have a well-developed root structure.

Fruit varieties	Orchard systems	Plant age	Requirements	Notes
	French axe and Solaxe	1–2 years	Solaxe, maximum of French axe: 4–5	Choose plants of excellent quality, even if they are a little more expensive.
	Drilling	1 year	Avoid overly weak materials	Use the EMA or BA29 rootstock. For vigorous varieties like «Beurre Bosc», use a weaker rootstock and an intermediary graft with «Hardy» or «Conference».
	Trellised Hedgerow	1 year	Avoid overly weak material	
	Marchand system	1 year	Avoid overly weak materials	Use only certified, virus-free material as contaminated material can cause compatibility problems with weak rootstock.



Un-cut shape



Cut-back shape

Preparing the Land

Take plenty of time

1

Study the soil

A one-meter deep soil analysis is the best means of detecting future problems. It will also illustrate whether the soil can support an orchard and whether any soil improvement needs to be carried out before the orchard is established. It may be necessary to pulverize compacted soil, improve soil organic matter content or install drainage. If the soil is not deep enough, an irrigation system will need to be installed. If there is any uncertainty, consult a specialist before proceeding with costly measures.

The results of the soil profile should be verified across the rest of the plot using a spade test (examining the top layer of the soil to a depth of approximately 40 cm).



Spade test: requires minimal equipment and is very useful. This method allows even the novice to view soil structure.

2

Improve the soil and combat rodents

Fixing the issues discovered in step 1.

- Pulverize the compacter areas by subsoiling and stabilize the soil with a green fertilizer with a deep root structure such as the oil radish. Break up the soil at least 5 cm below the compacted areas.
- Only work the soil under ideal weather conditions, when the soil is not too wet.

Strategies for rodent control

1. Install zinc-coated anti-rodent mesh all along the fence and the entry doors.
2. Maintain at least three meters of well-mowed grass between the natural areas and the fruit trees.
3. Encourage the presence of birds of prey and have farm cats.
4. Conduct weekly inspections, even in the winter:
 - Inspect for rodents in the orchard, but also in a ten-meter wide zone around it.
 - Set traps. If necessary, hire an expert. Keep the three-day rule in mind: after rodents are detected, no more than three days should pass before action is taken.
5. Rodent gassing should be kept to an absolute minimum as it is damaging to the surrounding environment.
6. After action has been taken, flatten the molehills and block the holes and tunnels so that new activity can be rapidly recognized.



Anti-rodent mesh is being installed along the entire length of the fence. Provisional recommendations for installation:

- Mesh size: 0.5–1.0 cm (if larger, not effective against voles)
- Height: 80–100 cm, half of which should be buried beneath the soil (use a trench plough)
- At the top of the mesh, add a synthetic or metal edge about 10 cm wide that rodents cannot break through.

The European water vole (*Arvicola terrestris*) (pictured) and the meadow vole are among the most dangerous pests for orchards. The risk of rodent damage is particularly high for richly structured orchards, those with grassy or plastic-covered tree rows and those in close proximity to wildflower patches, pastures or freshly harvested grain fields.



Photos: Andi Schmid

3

Take soil samples to analyze its fertility



The technical guide «Maintaining a Dwarf-Tree Orchard» provides guidelines on soil sampling and the proper analyses.

4

Fertilize based on the soil analysis results



The technical guide «Maintaining a Dwarf-Tree Orchard» provides guidelines on authorized fertilizers and their dosage.

5

Sow the inter-row seed mixture



Standard option:

Sow an inter-row mixture across the whole field in the spring.

Alternate option:

If the soil is deficient in organic matter and/or has a poor structure, the standard inter-row mixture can be enriched with species that will have similar results to green manure. This will save time and money and will also preserve the soil structure as fewer machines will be compacting it. The ratio of different types of plants in the mix and the choice of species must be adapted to suit the site and the soil conditions. Seed companies can create personalized mixes.

Examples of inter-row seed mixtures that break up the soil and enrich its humus levels

Species	Advantages
Mix of grasses that withstand high traffic, form a dense layer of vegetation, and contain no Wheat-grass (<i>Agropyron</i> sp.) or Fescue (<i>Fetusca</i> sp.)	<ul style="list-style-type: none"> ■ Guarantees good bearing capacity even in unfavorable conditions. ■ Can rapidly fill holes that appear in vegetation.
Lucerne (<i>Medicago sativa</i>) ¹⁾	<ul style="list-style-type: none"> ■ Reaches deeply into the soil. ■ Breaks through compacte clods.
Oil radish ¹⁾	<ul style="list-style-type: none"> ■ Reaches the middle layers of the soil.
Clover	<ul style="list-style-type: none"> ■ Fixes atmospheric nitrogen.

¹⁾ These species do not tolerate frequent cultivation and fulfill their purpose within the first year.

6

Open the soil for planting

At the end of the summer preceding planting, widen the rows for the trees to about one meter in width with a hoe or spade and keep it clear of vegetation until planting.



Photos: Andi Schmid, Heiko Hammann (centre)

Planting

Proper procedure is essential

Important planting tips:

- Use only top quality plants (see page 15).
- Do not plant in freezing temperatures or when soil conditions are less than ideal. Soil should not stick to the tools or be too dry.
- Take care to keep roots moist until planting.
- Cut damaged roots.
- Plant as high as possible and as low as is necessary. To avoid rooting of the stock the graft must be located at least 15 cm above the surface of the soil.
- Add fine earth to the area around the roots and apply pressure to ensure good contact between the roots and the soil.
- The heavier and wetter the soil, the less pressure is needed.
- Mechanical planting can be worthwhile if the soil conditions are ideal and the planting area is large.
- If the soil is dry, water immediately after planting.



Photo: Franco Weibel

Planting period	Advantages	Disadvantages	Notes
Fall/Winter	<ul style="list-style-type: none"> ■ Plants have a stronger start. ■ More time available for planting 	<ul style="list-style-type: none"> ■ Losses during the winter must be borne by the grower. ■ Greater risk of rodent damage 	<ul style="list-style-type: none"> ■ Plant when the trees have lost their leaves. ■ Exception: Potted plants must be planted in September.
Spring	<ul style="list-style-type: none"> ■ If the trees are delivered in spring, losses in the winter are borne by the nursery. ■ Less risk of damage by rodents 	<ul style="list-style-type: none"> ■ Often poor bud break ■ Irrigation often needed ■ Less time available for planting 	<ul style="list-style-type: none"> ■ Plant before bud break if possible.

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This FiBL guide has been translated to English by OACC from its original Swiss German Edition. It was written and produced by FiBL for European organic producers, and reflects European conditions and terminology. Therefore, OACC recommends that Canadian growers consider the suitability of the information for their farms and adapt it only with awareness of the context of the original conditions. It is hoped that Canadian organic producers will nevertheless find much of the information beneficial.

The English translation was made available through the collaboration of FiBL and OACC.