



## NATURE AND LANDSCAPE MANAGEMENT STANDARDS

**TSES AND LANDSCAPE-  
FORMING ELEMENTS**

**MANAGEMENT OF  
FUNCTIONAL PLANTINGS  
OF FRUIT WOODY PLANTS**

**SPPK C02 005:2016**

**SERIES C**

Management of functional plantings of fruit woody plants

Die Obstbäumepfanzungspflege

This standard is intended for definition of agrotechnical operations connected with land management of fruit trees growing outside intensive production orchards up to 10 years of age on a permanent site.

### References:

ČSN EN 12944-1 Fertilizers and liming materials - Vocabulary - Part 1: General terms

ČSN EN 12944-2 Fertilizers and liming materials - Vocabulary - Part 2: Terms relating to fertilizers

ČSN EN 12944-3 Fertilizers and liming materials - Vocabulary - Part 3: Terms relating to liming materials

ČSN 83 9051 Vegetation technology in landscaping – Care of vegetation during development and maintenance in green areas

Act no. 13/1997 Coll., on Roads

Act no. 114/1992 Coll. on Nature and Landscape Protection

Act no. 127/2005 Coll. on Electronic Communications and on amendment of certain acts

Act no. 156/1998 Coll. on fertilizers, auxiliary soil agents, auxiliary plant preparations and substrata, and on agrochemical testing of agricultural lands

Act no. 326/2004 Coll. on Medical Plant Care and on amendment of certain acts

Act no. 458/2000 Coll. on Requirements for Business and Public Administration in Energy Industries and on amendment of certain acts

Decree no. 32/2012 Coll. on preparations and other products for plant protection

Decree no. 189/2013 Coll. on Protection of woody plants and permission of their cutting

Ministry of Agriculture Decree no. 474/2000 Coll. laying down requirements for fertilisers

Ministry of Agriculture Decree no. 275/1998 Coll. on agrochemical testing of agricultural soils and identification of soil properties of forest land plots

Council Directive 2000/29/EC of 8 May 2000 on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community.

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Documentation for standard development is available in the library of NLPA CR.

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## **1. Standard purpose and contents**

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The standard defines agrotechnical operations associated with management of fruit woody plants growing in extensive plantings from the 10th year of age on a permanent site, which comprise old, regional and local varieties. The standard also discusses the comprehensive issues of pruning of fruit woody plants after planting. The standard also defines management of the herb layer of fruit plantings and attendant non-fruit woody plants that accompany fruit woody plants in performance of non-productive functions. The standard is connected to SPPK C02 003:2014 Planting of fruit trees in the agricultural landscape.

The standard does not deal with management of intensive fruit plantings of trees and shrubs in which the productive function significantly dominates over non-productive ones. For this reasons, some of the parameters are set differently from those in fruit-farming.

The standard does not deal with management of memorial and senescent trees, which are discussed in SPPK A02 009 Special treatment of trees.

The purpose of the standard is, among other things, to preserve the wide genetic diversity of old, regional and local varieties of fruit woody plants, which have been a long-term component of the Czech Republic's landscape in the form of orchards, linear plantings and solitary trees. The purpose of the standard is also to provide a standardisation framework for preservation of fruit woody plants grown in ways where production of utility items is in harmony with performance of non-productive functions such as ecological, biological, landscape-forming, historic, social and cultural.

Fruit woody plants comprise the fruit species and varieties specified in SPPK C02 003 Planting of fruit trees in the agricultural landscape. The fruit trees are enumerated in that standard in chapters 2.1.2 and 2.2.2; varieties in chapter 3.3 are distinguished as so-called preservation varieties of fruit trees into the categories priority, local, specialised, acceptable and research varieties, and enumerated in Annex 4. Priority in management is given to priority, local, specialised and research varieties. In succession after the priority management categories, management pursuant to this standard is provided for plantings with acceptable varieties and undetermined varieties, always with respect to the importance of their non-productive functions on the site.

### **Legal framework**

**Act no. 114/1992 Coll.** on Nature and Landscape Protection, as amended, defines rights and obligations in connection with cutting of woody plants growing outside forest, including fruit trees, as well as rights and obligations in connection with substitute planting and levies. The Act is based on the principle that cutting of woody plants growing outside forest is essentially subject to a permission regime; cutting of such woody plants requires a permit from a nature

protection authority, unless specified otherwise therein (e.g., cutting of woody plants of defined sizes, or for the sake of life and health protection).

**Decree no. 189/2013 Coll.**, on Protection of woody plants and permission of their cutting, as amended, makes a detailed specification of requirements for protection of woody plants and, in particular, defines conditions for permission of cutting of woody plants and defines terms related to cutting of woody plants. According to the Decree, no permit is required for woody plants with a trunk circumference up to 80 cm measured at 130 cm above ground, for canopied patches of woody plants up to 40 m<sup>2</sup>, for fruit trees growing in gardens, and for woody plants grown on land plots used as tree or shrub plantations. Simultaneously, it sets out stricter protection of canopied stands in excess of 40 m<sup>2</sup> and avenues.

**Act no. 326/2004 Coll.** on Medical Plant Care and on amendment of certain acts, and its executive **Decree no. 32/2012 Coll.** on Preparations and other products for protection of plants, define the use of preparations and other products for protection of plants.

**Act no. 13/1997 Coll.** on Roads, as amended, defines conditions for planting of trees and shrubs along roads in terms of viewing conditions. Section 15 stipulates that road vegetation on auxiliary land along roads and other suitable land comprising parts of motorways, highways or local roads must not pose a threat to road use safety or disproportionately complicate road maintenance or management of adjacent land.

**Act no. 127/2005 Coll.** on Electronic Communications and on amendment of certain acts, as amended (Section 102) defines protective zones for telecommunications equipment in which permanent vegetation must not be planted without the telecommunications line owner's consent.

**Council Directive 2000/29/EC** of 8 May 2000 on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community.

**Act no. 458/2000 Coll.** on Requirements for Business and Public Administration in Energy Industries and on amendment of certain acts (Energy Act), as amended, defines the rights of electricity transmission and distribution system operators, gas producers and gas transport and distribution system and tank operators, and holders of licences for heat distribution to regulate vegetation endangering the operation of said systems, including on other owners' land. In addition, the Act deals with maintenance and planting of woody plants in protective zones of certain power system facilities, gasworks facilities and heat production or distribution facilities (Sections 46, 68 and 87).

**Act no. 156/1998 Coll.** on fertilizers, auxiliary soil agents, auxiliary plant preparations and substrata, and on agrochemical testing of agricultural lands (Fertilisers Act)

**Ministry of Agriculture Decree no. 474/2000 Coll.** laying down requirements for fertilisers.

**Ministry of Agriculture Decree no. 275/1998 Coll.** on agrochemical testing of agricultural soils and identification of soil properties of forest land plots.

## **2 Planning (management project planning)**

### 2.1 Site survey

- 2.1.1 Before development of a management project, the site has to be visited in person and its current status determined; a written documentary report shall be made on it.
- 2.1.2 For woody plants, the documentary report shall contain at least the following information:
- species, quantity and location of woody plants to cut,
  - species, quantity and location of woody plants to continue growing.
- 2.1.2.1 Woody plants scheduled for cutting or further growing have to be numbered in the field using a method that cannot be confused.
- 2.1.2.2 For each woody plant to continue growing, a framework proposal of measures shall be developed, using the terminology of this standard.
- 2.1.3 For the herb layer, the proportion of meadow and ruderal vegetation and presence of invasive introduced species shall be assessed approximately.
- 2.1.4 The documentary report has to end with a brief description of non-productive functions that the fruit planting on the site performs.
- 2.1.5 The documentary report may be accompanied with a pomological site assessment, comprising notably identification of fruit varieties.
- 2.1.6 Based on the contracting authority's requirement, the documentary report shall be developed as an assessment pursuant to the standard SPPK A 01 001 Assessment of tree condition.

### 3 Pruning of fruit woody plants

Pruning of fruit woody plants is governed by provisions of SPPK A02 002 – Pruning of trees. This standard only discusses issues specified for the cultivation categories in question on a permanent site.

#### 3.1 Pruning technique

- 3.1.1 **Shoot reduction pruning** – the objective is to promote rooting of the fruit woody plant and vegetative growth after planting, direct growth in the desired direction and branching of the remaining part of the reduced shoot. Done as part of winter pruning (see Fig. 1 in Annex 4).
  - 3.1.1.1 **Short shoot pruning** – shoot reduction to a lateral bud by more than 1/2 the original length. Promotes vegetative growth and branching of the basal part of the shoot.
  - 3.1.1.2 **Medium shoot pruning** – shoot reduction to a lateral bud to about half the original length. Promotes vegetative growth and branching of the middle part of the shoot; in some species, it enables production of fruit-bearing shoots on the basal part of the shoot.
  - 3.1.1.3 **Long shoot pruning** – shoot reduction to a lateral bud by less than half the original length. Promotes vegetative growth and branching of the top part of the shoot; in some species, it enables production of fruit-bearing shoots on the basal and central parts of the shoot.
  - 3.1.1.4 **Shoot pruning to pin** – a very short cut to 1-3 lateral buds. Promotes vegetative growth very significantly. In some species, it excludes production of fruit-bearing shoots on the remaining part of the shoot.
  - 3.1.1.5 **Shoot pruning to base** – a very short cut directed to dormant buds. The objective is to make the dormant buds sprout and produce fruit-bearing shoots on newly formed short increments.
  - 3.1.1.6 **Alternating pruning.** Reduction of the terminal shoot to a lateral bud growing over the cut made the year before. The objective is even vertical growth of the terminal (see Fig. 2 in Annex 4).
- 3.1.2 **Annual shoot reduction pruning** – the objective is to reduce vegetative growth and promote formation of fruit-bearing shoots on the remaining part. Done as part of summer pruning. Analogously to shoot reduction pruning, divided into long, medium, short, etc. annual shoot pruning (see 3.1.1).
- 3.1.3 **Pruning to outer bud.** The cut is made to a lateral bud pointing out of the crown in the direction of the desired branch increment. The objective is increased branch deflection angle (see Fig. 4 in Annex 4).
- 3.1.4 **Pruning to inner bud.** The cut is made to a lateral bud pointing into the crown in the direction of the desired branch increment. The objective is reduced branch deflection angle (see Fig. 3 in Annex 4).
- 3.1.5 **Fruit tree pruning to branch ring.** Corresponds to pruning to branch collar in

SPPK A02 002 – Pruning of trees. It is used in order to completely remove a lateral branch (see Fig. 5 in Annex 4).

- 3.1.6 **Nipping (pinching)**. Reduction of annual shoots forming on the trunk of a planted maiden whip past the 3-5th leaf in order to produce strengthening shoots (see Fig. 6b in Annex 4).
- 3.1.7 **Round shoot trimming**. Removal of strengthening shoots from the trunk by pruning to branch ring (see Fig. 6c in Annex 4).
- 3.1.8 **Reverse pruning**. Cut into two-year-old and older wood to bud or lower-level branch. The objective is to facilitate the woody plant growth in the desired direction (see Fig. 11c and 22 in Annex 4).
- 3.1.9 **Pruning to fruit-bearing shoots**. The cut is made to fruit-bearing shoots in case the one-third rule cannot be observed and the effort is to promote vegetative growth (revitalisation effect).
- 3.1.10 **Reduction of fruit-bearing shoots**. Removal of fruit-bearing shoots in order to reduce the prolificacy of the fruit tree and establish an equilibrium between vegetative growth and prolificacy.
- 3.1.11 **Balance pruning**. Adjustment to the tree crown or aboveground part of a shrub so that ends of same-level branches are approximately at the same horizontal plane and the aboveground part can develop evenly and harmoniously. Most commonly, the technique used is shoot or annual shoot reduction or reverse pruning to lower-lying branch (see Fig. 7, 13, 14, 15 in Annex 4).
- 3.1.12 **Šitta's pruning** – a special technique for pruning apricots by reducing annual shoots in the first sap period approx. in the second half of May in order to make premature annual shoots sprout. The annual shoot has to show strong vegetative growth; it should be at least 0.2 m long and is reduced by long pruning by 1/3 to 1/2 of its length. The objective is to promote branching and production of generative organs on premature annual shoots (see Fig. 9 in Annex 4).
- 3.1.13 **Zahn's pruning** – a technique used particularly in drupe-bearing species and almonds in order to reduce the risk of pathogenic infections and gummosis. Done during growing season – from sprouting to the end of August. It involves gradual removal of an inappropriately growing branch that is thicker than half the axis below the branching point. The branch to be removed is first reduced to a long active weakened pin – stub. The length of the stub has to be ten times the diameter of the undesirable branch at the branch ring. The activity consists in the stub viability – the cut has to be made to a bud or thinner lateral branch with a high deflection angle. The stub growth stagnates and its growth activity is transferred to the remaining adjacent branches. After the area below the branching point has thickened to at least twice the diameter of the weakened branch, the stub is removed to the branch ring (see Fig. 10 in Annex 4).
- 3.1.14 **Two-phase (sectoral) pruning**. Done in order to increase a branch deflection angle. It starts with a cut to an inner or another lateral bud; the bud from which the competing annual shoot will grow should point out of the crown in the direction of the desired length increment. Later in the growing season, a reverse cut to the competing annual shoot is made; alternatively, a cut to the competing shoot in the following year (see Fig. 11 in Annex 4).

## 3.2 Pruning times

- 3.2.1 **Winter pruning.** Done in vegetative rest on dormant shoots or branches, in winter or early spring. The optimum time is early spring, after hard frost has passed, when temperatures no longer drop below  $-10^{\circ}\text{C}$ ; phenologically speaking, during exogenous dormancy. It generally promotes vegetative growth.
- 3.2.2 **Spring pruning.** Done in spring after sprouting. Applied to wood grown in previous growing seasons. Done in order to slightly weaken growth, reduce the risk of pathogenic infection or reduce loss by sap discharge (walnut).
- 3.2.3 **Summer pruning.** Complete removal or reduction of annual shoots. Reduction of annual shoots reduces vegetative growth and promotes production of fruit-bearing shoots or branching by premature annual shoots. As a standard, it has to be completed by the end of August; by mid August in areas over 500 a.s.l.
- 3.2.4 Dead branches can be removed by cutting at any time.
- 3.2.3 Cutting of living branches has to respect species-specific properties, primarily with respect to the ability to withstand infection pressure by pathogens.
  - 3.2.3.1 Pome-bearing species, hazels and cornels are pruned in winter and early spring as a standard. Individuals showing strong vegetative growth may be pruned in summer, which then slows down the growth.
  - 3.2.3.2 Drupe-bearing species, almonds, walnuts, sorbs, chestnuts and mulberries are pruned in growing season as a rule, on sprouting at the earliest, by the end of August at the latest.
  - 3.2.3.3 With a view to reduction of the pathogenic infection risk, drupe-bearing species and almonds should ideally be pruned while in blossom. The optimum pruning time for sorbs, chestnuts and mulberries is after sprouting.
  - 3.2.3.3 Walnuts are pruned in growing season in a period when it does not discharge sap intensively. Late spring pruning is ideal; cut branches up to 50 mm in diameter when annual shoots have grown 30-50 mm long; cut thicker branches when annual shoot are 50-100 mm long. Pruning is permitted by the end of August.
  - 3.2.3.4 Pruning of fruit species should not be done while it rains or snows.

## 3.3 Size and treatment of wounds left by pruning

- 3.3.1 Pruning has to be done using high-quality and well-sharpened gardening tools to make straight and smooth cuts.
- 3.3.2 The maximum diameter of branches cut off at the branch ring is 100 mm as a standard; it is 50 mm for drupe-bearing species and almonds. The necessity of removal of thicker branches has to be justified properly.
- 3.3.3 Cut wounds on healthy branches more than 30 mm in diameter can be treated using an appropriate brush coat. The products used have to be registered as “auxiliary plant protection products” in the official registry pursuant to Section 54, Para. 1 of Act no. 326/2004 Coll. (Decree no. 32/2012 Coll.). Smaller wounds



do not have to be treated in most fruit species.

3.3.4 Any treatment has to be made immediately after the cut.

3.3.5 On principle, brush coats are not used for old dried-up wounds or for individuals infected by wood-decaying fungi.

### **3.4 Process categories of fruit tree pruning**

For ease of assignment and inspection of works, the different pruning types are classified by purpose into the following process categories. They are shown including the recommended codes, which are used in work designs and in development of management plans. This standard lists pruning categories normally applied to fruit woody plants. Besides them, techniques described in SPPK A02 002 – Pruning of trees can generally be used, except shaping pruning: S-RTHL Pruning to head, S-RTPP Pruning to pin, S-RTZP Pruning of hedges and tree walls.

#### **Establishment pruning**

O-RK Pruning of fruit woody plants to crown

O-RV Juvenile pruning of fruit woody plants

#### **Maintenance pruning**

O-RP Thinning pruning of fruit woody plants

O-RZ Medical pruning of fruit woody plants

O-OV Removal of suckers and rootstock shoots of fruit woody plants

#### **Revitalisation pruning**

O-RZM Gentle revitalisation pruning of fruit woody plants

O-RZS Medium revitalisation pruning of fruit woody plants

O-RZH Deep revitalisation pruning of fruit woody plants

#### **Special pruning**

O-RO Reparatory pruning of fruit woody plants

### **3.4.1 Establishment pruning**

The purpose is to establish and raise juvenile fruit trees or aboveground parts of fruit shrubs. The objective is to promote rooting and vegetative growth and branching of the aboveground system and produce a stable crown with well distributed primary (main) branches that do not compete for light, allow good hygienic conditions inside the crown and are capable of providing mechanical stability of the woody plant even during high fruit yields in future.

#### **3.4.1.1 Pruning of fruit woody plants to crown (O-RK)**

3.4.1.1.1 Done by reducing planted maiden whips to the desired cultivation shape. The cut is made to the 5-7th lateral bud above the desired future trunk height using alternating pruning (see Fig. 6a in Annex 4).

3.4.1.1.2 In case the transverse diameter of the maiden whip in the root collar is less than 10 mm, annual shoots grown on the trunk are periodically pincerred in order to promote strengthening shoots (see Fig. 6b in Annex 4). Round shoot trimming is

done in mid August at the latest (see Fig. 6c in Annex 4).

- 3.4.1.1.3 In case the transverse diameter of the maiden whip in the root collar is more than 10 mm, pinching is not applied and annual shoot growing on the trunk are removed immediately by breaking off or cutting to branch ring, always taking care not to damage the trunk.
- 3.4.1.1.4 The majority of species are pruned in winter, ideally in early spring; phenologically speaking, during exogenous dormancy. Drupe-bearing species, almonds, walnuts and sorbs are pruned on sprouting at the earliest, by the start of intensive annual shoot growth at the latest.
- 3.4.1.1.5 Pruning to crown is not necessary in walnuts, chestnuts and mulberries.

### **3.4.1.2 Juvenile pruning of fruit woody plants (O-RV)**

- 3.4.1.2.1 The principle is a reduction to the terminal bud and the lengthening shoots of main branches, as well as next-level branches as necessary, to a lateral bud, and removal or reduction of competing and inappropriately growing shoots or annual shoots.
- 3.4.1.2.2 Fruit trees are pruned to form a pyramidal crown with a terminal bud or a hollow crown without a terminal.
- 3.4.1.2.3 The pyramidal crown shape is preferred for fruit trees, with 3–5 primary (main) branches and a terminal bud (see Fig. 7a in Annex 4).
- 3.4.1.2.4 A hollow crown with 3–6 main branches without a terminal bud may be formed in justified cases (see Fig. 7b in Annex 4). The reason is the distinctively sympodial branching of the woody plant for which a terminal bud is unnatural.
- 3.4.1.2.5 The primary (main) branches are established from strong crown shoots growing at a deflection angle of approx. 45° to the vertical axis (trunk extension) (see Fig. 8a in Annex 4) and having the most balanced distribution angles between them (see Fig. 8b in Annex 4).
- 3.4.1.2.6 The deflection angle is increased by pruning to outer bud, reverse pruning to lower-lying shoot with a greater deflection angle from the vertical axis, or two-phase pruning.
- 3.4.1.2.7 The deflection angle is reduced by pruning to inner bud, reverse pruning to lower-lying shoot with a smaller deflection angle from the vertical axis.
- 3.4.1.2.8 In multistorey crowns, another or a third storey is produced above the basic first storey. An upper storey always has to have at least one main branch less than the storey below it. Main branches of upper storeys have a greater deflection angle than those on the first storey, ideally 60°. The vertical distance between arms of the highest-lying main branch of a lower storey and the lowest-lying branch of the next storey has to be at least 1 m.
- 3.4.1.2.9 The juvenile pruning of trees lasts for 3–6 years depending on the tree species. Cherries, apricots, peaches and almonds require juvenile pruning until the 3rd year after planting; sour cherries until the 3–4th year after planting; pome-bearing species and plums until the 5-6th year after planting. Juvenile pruning is not necessary in walnuts, chestnuts and mulberries.

3.4.1.2.10 Juvenile pruning of shrubs lasts for 1–5 years after planting. Hazels and cornels typically only require a shoot reduction in the first year after planting; medlars until the 3rd year after planting. Shoots of shrub forms of quinces and mulberries are reduced until the 3–5th year after planting.

3.4.1.2.11 Times for juvenile pruning are identical for those for pruning to crown.

3.4.1.2.12 Summer pruning – reduction or removal of annual shoots by pruning to branch ring – can be applied to competing and inappropriately growing annual shoots.

3.4.1.2.13 Šitta's pruning can be used in apricots.

3.4.1.2.14 Zahn's pruning can be used in drupe-bearing species and almonds if the situation requires it.

#### 3.4.1.2.15 **Juvenile pruning in the 1st year after planting**

- a) The procedure for nursery cultivates of trees grafted in the crown with a single shoot is similar as in pruning of maiden whips to crown (see 3.4.1.1.1).
- b) In nursery cultivates of trees grafted in the crown with two shoots, the weaker or less suitable growing shoot is removed by pruning to branch ring or reduced to the first outer bud. The stronger shoot is pruned to crown (see Fig. 12 in Annex 4).
- c) In nursery cultivates of trees with a crown made of three or more shoots (normal crown), the terminal bud and outer shoots are reduced to an outer or inner bud depending on the desired deflection angle (see Fig. 3 and 4 in Annex 4). The degree of reduction depends on the species, cultivation shape, planting time and shoot thickness.
- d) In autumn planting, short pruning is applied in early spring or spring; shoots are reduced using balance pruning, cutting at least 2/3 of the length (more in full standards or thin shoots). After the reduction, the lateral shoots should reach an approximately identical elevation level (balance pruning) (see Fig. 7, 13a, 13b in Annex 4).
- e) In spring planting, the number of shoots typically has to be reduced by up one half. Retained shoots are reduced to pin – to the first outer bud (see Fig. 13c in Annex 4).
- f) In pyramidal crowns, the terminal bud is reduced by alternating pruning so that, after the pruning, it exceeds the height of lateral shoots by 0.1-0.2 m, thus producing a tree apex angle of 70-110° (see Fig. 13a, 13b in Annex 4). The terminal bud height difference is species-specific.
- g) In hollow crowns, all the shoots are reduced by balance pruning to approximately the same vertical level. The degree of reduction is identical to that of lateral shoots in pyramidal crowns (see Fig. 7b in Annex 4). The shoot competing with the terminal is removed, unless it is used as a substitute for a damaged or inappropriately growing terminal, using reverse pruning.

#### 3.4.1.2.16 **Juvenile pruning in 2-5th year after planting (see Fig. 14,15 in Annex 4).**

- a) Lengthening shoots of main branches are reduced as a standard by pruning

to outer bud and balance pruning; by 1/2 of their length in the second year and by 1/3 in the third; if necessary, also by 1/4 in the fourth and 1/6 in the fifth year.

- b) As a standard, the terminal bud is reduced by alternating pruning so that it exceeds the height of reduced lengthening shoots of main branches by 0.1-0.3 m.
- c) Lower-level branches can be reduced proportionally so that they do not exceed the length of lengthening shoots of main branches. Lengthening shoots of main branches should be 1/4 or 1/3 longer than shoots growing on two-year-old wood below them (see Fig. 16 in Annex 4).
- d) Competing (annual) shoots and rampant (annual) shoots growing into the crown are removed to branch ring, reduced to base or used for reverse pruning.
- e) Any missing main branches are added by choosing appropriately growing shoots, which are reduced by balance pruning as necessary to harmonise the crown.
- f) Thin and long annual increments in the second and third year after planting (shorter than 0.25 m) indicate the need to boost vegetative growth, i.e., application of pruning shorter than that specified in 3.4.1.2.16a.
- g) Any blossom sprouts in pome-bearing species are removed by cutting or breaking off.
- h) The deflection angle can be changed by two-phase pruning or reverse pruning to an appropriately growing lower-lying shoot.
- i) A second storey of tree crowns, if any, is established no earlier than in the 4th year after planting. Shorter shoots with greater deflection angle from the vertical axis are left between storeys. Cultivation of higher-storey main branches follows rules analogous to those for the first storey.

### **3.4.2 Maintenance pruning**

The objective is to maintain the required cultivation shape and ensure long-term good health of fruit woody plants and performance of all their functions (ecological, biological, landscape-forming, historic, social and cultural), while respecting their species and variety-specific biological requirements. At the onset of fertility, maintenance pruning should establish a balance between vegetative growth and fertility and prevent alternating fertility. At the same time, it maintains good lighting and hygienic conditions in the aboveground part. Pruning is repeated at intervals defined by the pruning objective, specific site conditions, cultivation shape, species and variety, developmental phase, degree of differentiation of blossom sprouts, expected fertility, vitality and cultivation status of the woody plant. The overall habitus of the woody plant has to remain unchanged after the pruning.

#### **3.4.2.1 Thinning pruning of fruit woody plants (O-RP)**

- 3.4.2.1.1 Thinning pruning follows juvenile pruning immediately and is done annually on fruit trees until the 10th year. In following years, the pruning frequency and

quantity of removed branches is individual depending on the species, variety, tree in question, quantity of blossom sprouts, and quality of previous pruning.

- 3.4.2.1.2 The objective is to provide good lighting for the internal parts of the aboveground system of fruit woody plants and regulate fertility.
- 3.4.2.1.3 Branches that intersect each other, grow inwards and result in excessive thickness are removed (Fig. 17 in Annex 4). Pruning is applied consistently to pressure branching and codominant branching (see chapter Pruning technique in SPPK A02 002 – Pruning of trees).
- 3.4.2.1.4 Thinning does not include reduction of lengthening shoots of main branches and the terminal bud.
- 3.4.2.1.5 Competing (annual) shoots and rampant (annual) shoots growing into the crown are removed by pruning to branch ring or restricted in their growth by reduction to base.
- 3.4.2.1.6 Branch reduction by pruning to lateral branch is only done if the branch being removed is damaged, prevents normal operation or disrupts the tree's balance. The one-third rule shall be respected, with the exception of drupe-bearing species and almonds, where Zahn's pruning has to be used if the daughter branch being removed is thicker than one half the diameter of the parent branch below the branching point.
- 3.4.2.1.7 The pruning frequency is species-specific and is governed by the following principles:
  - a) O-RP is done more frequently, typically once every 3-5 years, in drupe-bearing species, plums and sour cherries, as they tend to produce dense crowns.
  - b) Thinning is not done in cherries and apricots as a standard, as they have a naturally thin crown and do not show periodic fertility.
  - c) Thinning is not done in walnuts, mulberries and chestnuts as a standard, unless there are special reasons for it.
  - d) In pome-bearing species, thinning is an important regulatory intervention for maintaining a balance between vegetative growth and fertility. In pome-bearing species in full fertility, the annual length increment has to be at least 0.2-0.3 m to assure good assimilation. With shorter increments and dense blossom sprouting, winter pruning shall remove more branches to balance the vegetative and generative organs.
  - e) The pruning frequency in fast (short) development varieties of pome-bearing species is greater than in medium and slow (long) development varieties.
  - f) O-RP in peaches and almonds is done ideally annually with the objective to regulate the number of fertile shoots to 60-120 per tree depending on the degree of differentiation.
  - g) Thinning pruning of hazels and cornels is sufficient once every 7 years.
- 3.4.2.1.8 As for times, both winter and summer pruning is applied, while respecting species-specific requirements. Winter and spring pruning is primary; summer pruning is auxiliary.

3.4.2.1.9 The crown habitus shall be retained after the pruning.

### **3.4.2.2 Medical pruning of fruit woody plants (O-RZ)**

3.4.2.2.1 The objective is to maintain or improve the medical condition of the woody plant, thus ensuring its long-term existence and functionality in agricultural landscape.

3.4.2.2.2 The principle of O-RZ is to remove damaged parts the presence of which is an indicator of impaired medical condition. Such parts include ones that are:

- broken, cracked
- mechanically damaged by machinery, animals and game, hail, etc.
- infected by pathogens and animal pests,
- drying or dead,
- frostbitten,
- not matured enough

3.4.2.2.3 Branches are most frequently broken as a consequence of wrongly performed juvenile pruning and negligence of agrotechnology, notably absence of maintenance and revitalisation pruning, resulting in alternating fertility of the trees. An excessive fruit yield in one year causes branches to break apart.

3.4.2.2.4 Completely dry branches can be removed from all fruit species year-round. In other cases, species-specific properties have to be respected.

3.4.2.2.5 Mechanically damaged, broken, cracked, frostbitten or immature shoots shall be removed or reduced to an appropriately located side branch by reverse pruning to undamaged or fully matured wood.

3.4.2.2.6 Hollows are left untreated; holes may be secured against penetration of rainwater at most. The entrance hole has to remain accessible for air flow. Filling hollows with any material is prohibited.

3.4.2.2.7 Unless the removed tree is infected by pathogens and pests, which then could endanger the fruit woody plants as well, it may be chipped and left in the vegetation. In other cases, it shall be disposed of in an appropriate manner.

- a) Cut off annual shoots, shoots or branches infected by brown rot should ideally be taken away from the planting or burnt.
- b) Fruits infected by rots shall be taken away from the orchard or buried in the ground.
- c) When pruning individuals suffering from bark necroses of fungal or bacterial origin, tools have to be disinfected chemically or physically (singed).
- d) The procedure for trees suffering by fireblight (*Erwinia amylovora*) has to be consulted with a medical plant care authority. Infected wood has to be burnt. Consistent disinfection is required for tools and employees who were in contact with the plant.

### **3.4.2.3 Removal of suckers and rootstock shoots of fruit woody plants (O-OV)**

- 3.4.2.3.1 Sucker-like annual shoot (suckers) growing on the trunk or bases of main branches shall be removed immediately by tearing off complete with the base while in semi-woody state in the course of June. Woody suckers shall be removed by pruning to branch ring while respecting species-specific times (see Fig. 18 in Annex 4).
- 3.4.2.3.2 In pome-bearing species, suckers growing on the central and top parts of main branches can be used as substitutes for unpromising aged terminal parts of the primary crown. In that case, the cut is made to the suckers (like pruning to side branches), while respecting the one-third rule if possible.
- 3.4.2.3.3 Periodic inspection and removal of rootstock undergrowth from the root collar or roots is necessary throughout the life of a fruit tree.
- 3.4.2.3.4 In addition, grafted individuals require removal of any rootstock suckers from the trunk under the grafting point.
- 3.4.2.3.5 Rootstock undergrowth has to be removed immediately, ideally by pulling out in the annual shoot phase in June. For woody suckers growing from the root collar or roots, a portion below ground level typically has to be exposed and the rootstock removed at the connection.

### **3.4.3 Revitalisation pruning**

The principle is reduction of the aboveground system and fruit-bearing sprouts; the objective is to boost the growth phase, reduce alternating fertility, and improve fruit quality. It is done typically in older individuals in which maintenance pruning, O-RP in particular, fails to promote desirable vegetative growth. The fruit woody plant responds to revitalisation by producing new annual shoots from adventitious or dormant buds. Winter pruning in early spring provokes the greatest revitalisation effect. Species and variety-specific requirements have to be respected. Revitalisation of drupe-bearing species has to be done during growing season. Revitalisation pruning is preceded by thinning pruning (O-RP). A well-done revitalisation can typically extend the lifetime of a fruit woody plant by up to 1/3 of its life.

#### **3.4.3.1 Gentle revitalisation pruning of fruit woody plants (O-RZM)**

- 3.4.3.1.1 The objective is to optimise fertility, prevent alternating fertility, maintain and boost vegetative growth in the internal parts of grown-up crowns – prevent formation of a non-productive zone – crown arch, and branch balding if any, in the fertility and growth stages.
- 3.4.3.1.2 The pruning principle is reduction to fruit-bearing sprouts and/or reduction of branches to two- or three-year-old wood (see Fig. 19 in Annex 4). Fruit-bearing sprouts are reduced by braking off freshly sprouted blossom or mixed buds or cutting off fruit-bearing sprouts. Reverse pruning to two-year-old wood is the gentlest form of revitalisation.
- 3.4.3.1.3 It is applied before the onset of first symptoms of ageing, manifested by a radical reduction in annual shoots, onset of alternating fertility, drying of fruit-bearing sprouts, and worsening fruit quality.
- 3.4.3.1.4 It can also be applied to younger individuals that have their development

disrupted, e.g., as a consequence of process errors in juvenile pruning (no reduction to shoots) or drought or damage to the root system by rodents. The pruning is typically done in case the woody plant has short annual length increments (less than 100 mm annually) and the number of generative organs is disproportionately large.

- 3.4.3.1.5 O-RZM can be applied to all fruit species.
- 3.4.3.1.6 The pruning onset and frequency is individual and depends on the species, variety and developmental stage.
- 3.4.3.1.7 In particular, gentle revitalisation pruning is done early on and frequently in sour cherries and very fast developing varieties of pome-bearing species.

### **3.4.3.2 Medium revitalisation pruning of fruit woody plants (O-RZS)**

- 3.4.3.2.1 The objective is to optimise fertility, reduce alternating fertility and boost vegetative growth in the full fertility and beginning ageing stages.
- 3.4.3.2.2 It is applied in full fertility if fertility becomes periodic evidently due to a disproportion of generative organs and assimilation organs. The woody plant has experienced a significant decrease in annual increments and ageing is manifested by drying fruit-bearing sprouts at the bottom and on the inside of the aboveground system.
- 3.4.3.2.3 The cut is made to four-year to six-year-old wood and is the most commonly used type of revitalisation pruning in individuals older than 40 years (see Fig. 20 in Annex 4).
- 3.4.3.2.4 It employs pruning to side branches while respecting the one-third rule. If the one-third rule cannot be observed, the pruning is to a thinner branch or to fruit-bearing sprouts.
- 3.4.3.2.5 O-RZS is usually not a one-off intervention. Production of new annual shoot requires a thinning pruning (O-RP) in following years.

### **3.4.3.3 Deep revitalisation pruning of fruit woody plants (O-RZH)**

- 3.4.3.3.1 It is applied to pome-bearing species (apples and pears), but not to memorial and senescent trees, which require special procedures defined by the standard SPPK A02 009.
- 3.4.3.3.2 The objective is to eliminate alternating fertility, restore growth equilibrium in favour of vegetative growth, extend the life of the fruit woody plant in its ageing stage, or stabilise the mechanical strength of the crown. It is a special intervention requiring a high level of professionalism and follow-up management.
- 3.4.3.3.3 It is applied if a woody plant does not respond to maintenance, gentle and medium revitalisation pruning and it is desirable to restore the vegetative growth and extend the individual's life.



- 3.4.3.3.4 It is done in individuals exhibiting minimal vegetative growth (annual increments are less than 10 mm) caused by a physiological imbalance between growth and fertility, previous neglect to pruning or biotic or abiotic stress.
- 3.4.3.3.5 Individuals with strong symptoms of bark necroses or infested by wood-decaying fungi are not revitalised, as they cannot heal the wounds well enough. The intervention might damage them even more.
- 3.4.3.3.6 Deep revitalisation pruning is always preceded by O-RP removing excessive branches by pruning to branch ring.
- 3.4.3.3.7 O-RZH is made to seven-year and older wood, while respecting the maximum permitted diameter of cut wounds and general pruning rules (pruning to side branch, one-third rule, Zahn's pruning, etc.).
- 3.4.3.3.8 The operation starts from the tree's terminal bud and top parts of the crown, and proceeds down the main branches.
- 3.4.3.3.9 Branches in the top part of the crown are reduced deeper than those lower down, so that the remaining reduced branches form a cone with the required apex angle depending on the species and variety. The apex angle is 90–120° for apples and 70–80° for pears. The actual angle is determined by the species or variety-specific crown shape, which has to be respected and retained (see Fig. 21 in Annex 4).
- 3.4.3.3.10 The cut is made to a side branch manifesting vegetative growth, or exceptionally to fruit-bearing sprouts. If possible, the one-third rule is observed.
- 3.4.3.3.11 In the top part of the crown, the cut is made to a side branch with a more horizontal position than the part being removed; in the bottom part of the crown, to a side branch with a more vertical position.
- 3.4.3.3.12 In the bottom part of the crown, the rule is to make the cut to thickened revitalisation branches produced from suckers due to the tree's self-rejuvenating ability, if present. Ends of higher-level branches bending below the horizontal plane shall be replaced and their function is taken over by branches formed at the tops of the arches manifesting stronger vegetative growth.
- 3.4.3.3.13 O-RZH is a radical intervention in the development of the fruit woody plant: the treated individual requires follow-up management for several years. Frequently, it is necessary to cultivate a secondary crown from newly formed annual shoots following the principles of juvenile pruning O-RV in combination with maintenance pruning O-RP and O-OV by reducing excessive annual shoots for at least 3 years.
- 3.4.3.3.14 New annual increments not used for branch formation should advisably be removed while still in the form of annual shoots. Sucker-like annual shoot (suckers) growing on the trunk or bases of main branches shall be removed ideally by tearing off complete with the base in June.
- 3.4.3.3.15 Removing a larger quantity of branches by radical revitalisation depletes a considerable part of the tree's reserve nutrients stored in the wood. Therefore, it is advisable to fertilise fruit trees after revitalisation by adding 50 kg of organic fertiliser per tree.
- 3.4.3.3.16 The revitalisation pruning is individual and shall respect specific aspects of fruit

species, varieties and individuals.

- a) O-RZH can be applied to pome-bearing species in early spring with cut wounds up to 100 mm diameter.
- b) As a standard, O-RZH is not done in drupe-bearing species, since the size of the cut wounds usually exceed the permitted limit of 50 mm. In addition, drupe-bearing species do not respond to deep revitalisation due to the short lifetime of dormant buds and the limited ability to produce adventitious buds.
- c) Walnuts, chestnuts and mulberries are not revitalised on purpose. In the case of frostbite, the cut is made to healthy wood to the thickest branch possible.

3.4.3.3.17 Shrubs revitalise naturally from the root collar and roots. If sucker production is insufficient, production of new annual shoots is promoted by deeper pruning of some branches.

### **3.4.4 Special pruning**

#### **3.4.4.1 Reparatory pruning of fruit woody plants (O-RO)**

- 3.4.4.1.1 The objective of reparatory pruning is to remedy imperfections in the development of a fruit woody plant if juvenile pruning has not been done correctly or if the woody plant has been damaged (e.g., frostbite, damage to roots or aboveground parts by disease or pests).
- 3.4.4.1.2 If thin and short annual increments (less than 50 mm) appear during the juvenile pruning period (1st-5th year after planting), vegetative growth typically has to be promoted by reverse pruning to two-year-old wood.
- 3.4.4.1.3 Short reverse pruning to two-year-old wood to base is applied in pome-bearing species (see Fig. 22b in Annex 4), to pin in drupe-bearing species (see Fig. 22a in Annex 4), followed by crown adjustment following juvenile pruning rules.
- 3.4.4.1.4 Leaving an excessive number of main branches, pressure branching or codominant branching is a frequent process error. Reparatory pruning consists in a reduction to the number of main branches to the desirable 4-6 depending on the fruit species, or their gradual replacement with more appropriately growing shoots or branches.
- 3.4.4.1.5 If the second storey is too close to the first storey or is developed more strongly than the first one, one of the storeys has to be removed and the remaining storey pruned to balance (see Fig. 23 in Annex 4).

## **4 Management of fruit woody plants**

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### **4.1 Precautions against damage by animals and game**

- 4.1.1 Individuals have to receive due protection in the case of grazing farm animals or presence of wild game. After removal of anchoring elements, woody plants have to be fitted with barriers that will effectively protect them for their entire life.
- 4.1.2 On sites with a high snow cover or snow accumulation, the protection has to remain effective against game approaching on top of the snow.
- 4.1.3 The method of leaving parts of branches under tree crowns after winter pruning as a source of food for game can only be used in full standard trees, if adequate protection of trunks against gnawing is provided.

### **4.2 Fertilisation and nutrition**

- 4.2.1 Fertilisation and nutrition shall respect balanced performance of productive and non-productive functions of woody plants on the site. The woody plant fertility should be reduced by appropriate pruning, thus reducing the need for intensive drawing of easily accessible nutrients.
- 4.2.2 Nutrition is handled by using an appropriate rootstock, support to mycorrhizal relationships, support to fixation of aerial nitrogen and creation of suitable conditions for slow release of nutrients from less readily soluble forms into the soil solution.
- 4.2.3 Adequate nutrition shall be provided by maintaining a species-rich herb layer at the average vegetation height permitting a significant share of photophilous perennial leguminous species.
- 4.2.4 Replenishment of nutrients can only be done using organic fertilisers or natural mineral fertilisers. Organic fertilisers with a predominant ammonia and nitrate form of nitrogen are prohibited. The fertilisers have to comply with ČSN EN 12944-1, 12944-2 and 12944-3. Fertiliser doses have to conform to ČSN 83 9051.

### **4.3 Protection from disease and pests**

- 4.3.1 Protection of fruit woody plants from pathogenic organisms is handled comprehensively throughout the plant life. It is done using preventive, mechanical and biological procedures.
- 4.3.2 Any exceedance of the threshold of pest or pathogen harmfulness has to be regulated. Effective biological preparations are preferred to chemical ones.
- 4.3.3 Prevention of disease is implemented by maintenance pruning, applied at the right times, ensuring an airy and well lit crown.
- 4.3.4 Protection from animal pests is preferably provided by means of natural self-regulation involving helpful organisms, antagonists, predators and parasitoids. Management of the herb layer and attendant woody plants produces ecologically

diverse sites providing suitable conditions for diverse communities, including antagonists to harmful organisms (see Annex 1).

- 4.3.5 It is advisable to install interactive elements in orchards or around individuals: dry stone walls, wetlands, ruderal areas, artificial overnighing and nesting places for helpful organisms (bird nest boxes, bat boxes, piles of branches topped with leaves, hiding places for earwigs, places for hymenopterans, including pollinators, particularly solitary bees and bumble bees).
- 4.3.6 Mechanical protection includes removal of infected parts by pruning or collecting following by a suitable disposal (mulching, chipping, burning, composting, clearing).
- 4.3.7 If occurrence of a regulated pathogenic organism is identified, the situation has to be consulted with the national plant medical authority.
- 4.3.8 Leaving dead fruit woody plants in the orchard is permitted in order to promote non-productive functions of fruit orchards. Their share must not exceed 10% of the total number of target fruit woody plants. Dead woody plants have to be secured so as not to pose a safety risk on the site or a reservoir for serious pests and disease agents.

## **5 Herb layer management**

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### **5.1 General rules of herb layer management**

- 5.1.1 Herb layer management is an important component of planting maintenance. It has to be done so as to prevent damage to target woody plants.
- 5.1.2 The species composition and height structure of the herb layer have to be designed so that it prevents primarily excessive increase in air humidity, occurrence of infectious conditions, excessive competition for water and nutrients and impairment of the aesthetic function by ruderalisation of the herb layer.
- 5.1.3 The herb layer is one of the instruments for promotion of self-regulating mechanisms in protection from organisms harmful to fruit woody plants.
- 5.1.4 The herb layer is a key instrument for improving nutrition for fruit woody plants.

### **5.2 Routine herb layer management**

- 5.2.1 Maintenance mowing is done 1-2 times a year. The first mowing shall be completed by 15 July; the stubble height must not be lower than 0.1 m. The second mowing shall be completed by the end of October.
- 5.2.2 To assure functional biodiversity, the mowing must not be done across the entire orchard area at once; it has to be at least two-phase with an interval of at least 10 days.
- 5.2.3 The mown biomass shall be removed from the orchard or used as organic fertiliser in the form of mulch under tree crowns.
- 5.2.4 Large-scale use of machinery for simultaneous mowing and chopping of plant matter or chopping previously mown matter is not permitted, with the exception of assurance of road traffic safety along roads.
- 5.2.5 Leaving areas with a maximum extent of 15% of the fruit planting area unmown is permitted for no longer than a year. The unmown part has to be moved to another part of the plot in following years.
- 5.2.6 In areas with increased occurrence or wintering of rodents, autumn mowing has to reduce the growth height to no more than 0.1 m across the entire area of plantings up to 20 years of age.
- 5.2.7 Mowing may be replaced with grazing of farm animals, which shall respect prescribed requirements for assurance of good farming practice principles, zoohygienic and veterinary regulations. Grazing of the herb layer requires mechanical protection of fruit woody plants from the respective species and category of farm animals. In addition, the farm animals' excrements have to be spread effectively to prevent emergence of areas overfertilised with nitrogen and potassium. Trampled ground is tolerated on no more than 15% of the total area.

### **5.3 Special procedures in herb layer management**

- 5.3.1 The following herb layer management procedures can be implemented temporarily if the herb layer has ruderalised or if introduced plant species have been spreading invasively to the extent that the general rules of herb layer management are violated.
- 5.3.2 Forced grazing of farm animals consists in applying short-term deliberate stress caused by farm animals to the extent that the vegetation is grazed down. This method requires adequate additional fodder for the animals.
- 5.3.3 Rehabilitation mowing is done 3-5 times a growing season. The biomass is taken outside the orchard area while still fresh. The objective is to destroy any accumulated last years' dry, weaken perennial ruderal species, and create conditions for germination of species in the soil stock.
- 5.3.4 Mechanical tillage of the plot surface is used if the plot contains bumps that hinder mowing of the area. The surface layer is levelled using machinery that ensures no damage to the underground and aboveground parts of the target woody plants. This procedure must not be applied to sites where birds are demonstrably nesting in the herb layer.
- 5.3.5 Sowing with clover-and-grass mixture is done in places where ruderal vegetation has been removed or critically weakened. The mixture used for the sowing shall contain at least a 25% share of clover crops. Depending on the availability of seed, the mixture can be enriched with common meadow species adequate for the site. Permitted and unpermitted clover crop species are specified in Annex 2.
- 5.3.6 Herbicidal products registered for regulation of respective types of undesirable vegetation in orchards can only be used in cases with a realistic justification why the herb layer parameters cannot be adjusted using any other methods.

## **6 Management of attendant woody plants**

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### **6.1 General rules of attendant woody plant management**

- 6.1.1 Plantings may include woody plants other than fruit woody plants if they are not invasive, do not compete with the fruit woody plants, do not pose a risk of transmission of pathogens or pests, and do not have a degrading effect on the herb layer.
- 6.1.2 Attendant woody plants may be planted in the orchard deliberately or may grow there thanks to the spontaneous spread of the species.
- 6.1.3 Woody plants playing a positive role in biological protection of fruit woody plants are promoted (see Annex 1).
- 6.1.4 Common hosts of regulated harmful organisms or their vectors have to be eliminated (see Annex 1).

### **6.2 Routine management of attendant woody plants**

- 6.2.1 Routine management is governed by SPPK A02 001 – Planting of trees and SPPK A02 002 – Pruning of trees.

### **6.3 Special procedures in attendant woody plant management**

- 6.3.1 Special procedures are applied only in cases where attendant woody plants endanger safety of persons and property in fruit plantations, compete with or endanger the fruit woody plants.
- 6.3.2 Cutting of attendant woody plants is governed by the standard A02 005 – Cutting of trees.
- 6.3.3 If cut-off wood is healthy and does not pose a risk of transmission of common pathogens or animal pests from the attendant to the fruit woody plants, it can be left in the vegetation after chipping. In other cases, it shall be removed and disposed of in an appropriate manner.

## Annex 1 Examples of desirable and undesirable attendant woody plants and herbs in or near fruit plantations

Desirable species		Undesirable species	
woody plants	herbs	species (genus)	for
black elder ( <i>Sambucus nigra</i> )	dwarf elder ( <i>Sambucus ebulus</i> )	savin juniper ( <i>Juniperus sabina</i> )	pear
common ivy ( <i>Hedera helix</i> )	stinging nettle ( <i>Urtica dioica</i> )	Chinese juniper ( <i>Juniperus chinensis</i> )	pear
white birch ( <i>Betula pendula</i> )	wild chamomile ( <i>Matricaria recutita</i> ), disc chamomile ( <i>M. discoidea</i> )	medium juniper ( <i>Juniperus media</i> )	pear
sessile oak ( <i>Quercus petraea</i> ) pedunculate oak ( <i>Q. robur</i> )	common yarrow ( <i>Achillea millefolium</i> )	hawthorn ( <i>Crataegus</i> spp.)	pome-bearing species
common hornbeam ( <i>Carpinus betulus</i> )	burnet-saxifrage ( <i>Pimpinella saxifraga</i> )	common blackthorn ( <i>Prunus spinosa</i> )	plums, apricots, peaches
common ash ( <i>Fraxinus excelsior</i> )	garden fennel ( <i>Foeniculum vulgare</i> )	European bird cherry ( <i>Prunus padus</i> )	plums, apricots, peaches
Norway maple ( <i>Acer platanoides</i> ), sycamore maple ( <i>A. pseudoplatanus</i> )	garden dill ( <i>Anethum graveolens</i> )	myrobalan plum ( <i>Prunus cerasifera</i> )	plums, apricots, peaches
guleder rose ( <i>Viburnum opulus</i> ), wayfaring tree ( <i>V. lantana</i> )	garden angelica ( <i>Archangelica officinalis</i> )	European spindle ( <i>Euonymus europaeus</i> )	pome-bearing species
grey alder ( <i>Alnus incana</i> ), black alder ( <i>A. glutinosa</i> ), green alder ( <i>A. alnobetula</i> )	garden caraway ( <i>Carum carvi</i> )	common barberry ( <i>Berberis vulgaris</i> )	general
common hazel ( <i>Corylus avellana</i> )	garden parsnip ( <i>Pastinaca sativa</i> )	fly honeysuckle ( <i>Lonicera xylosteum</i> ), black honeysuckle ( <i>L. nigra</i> )	cherries, sour cherries
common blackthorn ( <i>Prunus spinosa</i> )*	wild carrot ( <i>Daucus carota</i> )		
	wild chervil ( <i>Anthriscus sylvestris</i> )		
	common sunflower ( <i>Helianthus annuus</i> )		
	oxeye daisy ( <i>Leucanthemum vulgare</i> )		
	white goosefoot ( <i>Chenopodium album</i> )		

\* blackthorn is inappropriate for plum plantations



## Annex 2 Clover crop species permitted and unpermitted for sowing in plantations with special herb layer management

Permitted	Unpermitted
red clover ( <i>Trifolium pratense</i> )	common alfalfa ( <i>Medicago sativa</i> )
white clover ( <i>Trifolium repens</i> )	crimson clover ( <i>Trifolium incarnatum</i> )
alsike clover ( <i>Trifolium hybridum</i> )	polyploid varieties of red clover
bird's-foot trefoil ( <i>Lotus corniculatus</i> )	introduced species
common kidneyvetch ( <i>Anthyllis vulneraria</i> )	
purple crownvetch ( <i>Securigera varia</i> )	
black medick ( <i>Medicago lupulina</i> )	
common sainfoin ( <i>Onobrychis viciifolia</i> )	

### Annex 3 Classification of fruit species by development speed

Slow development species	Fast development species
Persian walnut	common plum
sorb	garden plum
sweet rowan	wild cherry
shipova tree	sour cherry
apple tree	Tibetan apricot
common pear	peach tree
white mulberry	almond tree
black mulberry	quince tree
sweet chestnut	common medlar
	European cornel
	common hazel

**Annex 4**

**Illustrations**

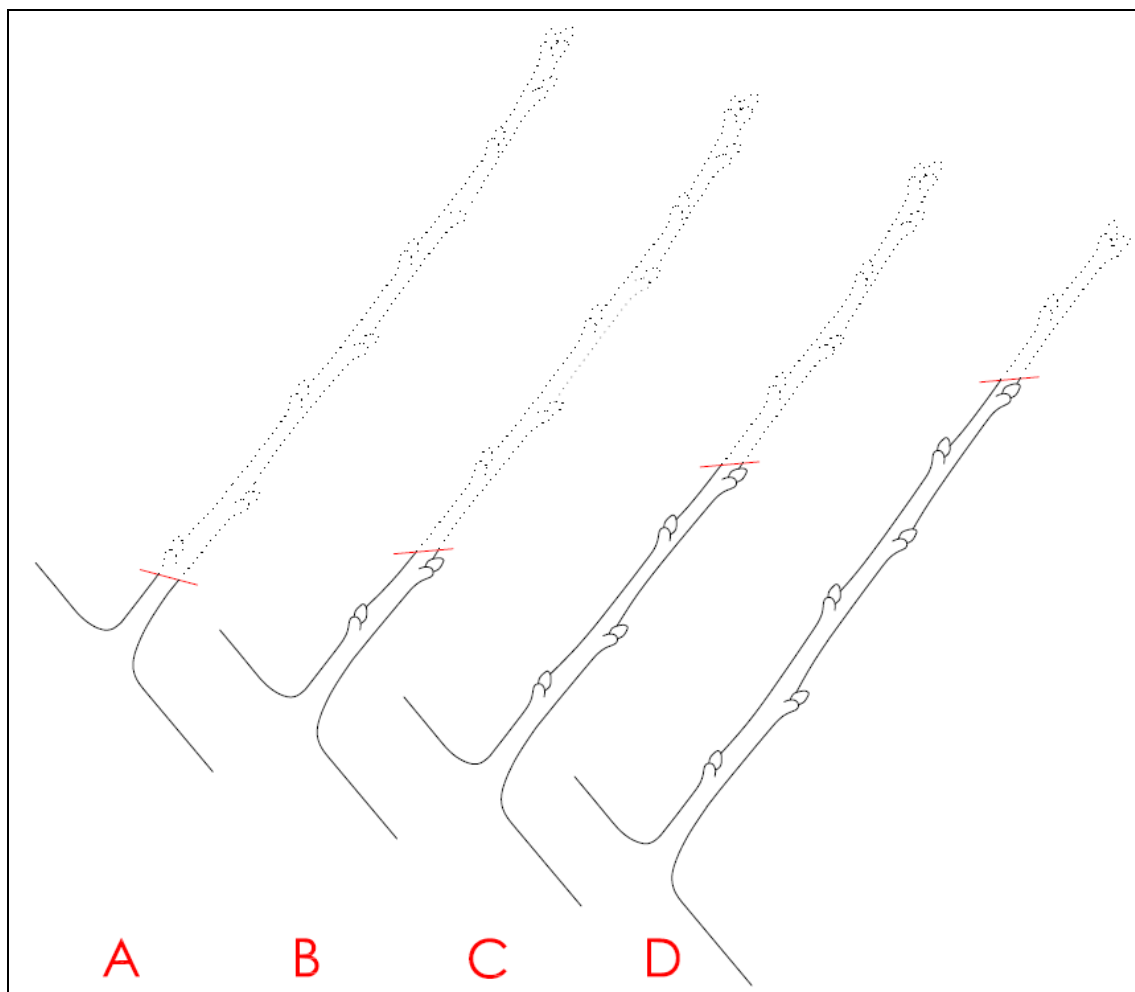


Fig. 1: Shoot reduction pruning: (A) to base, (B) to pin, (C) medium-length, (D) long cut (3.1.1).

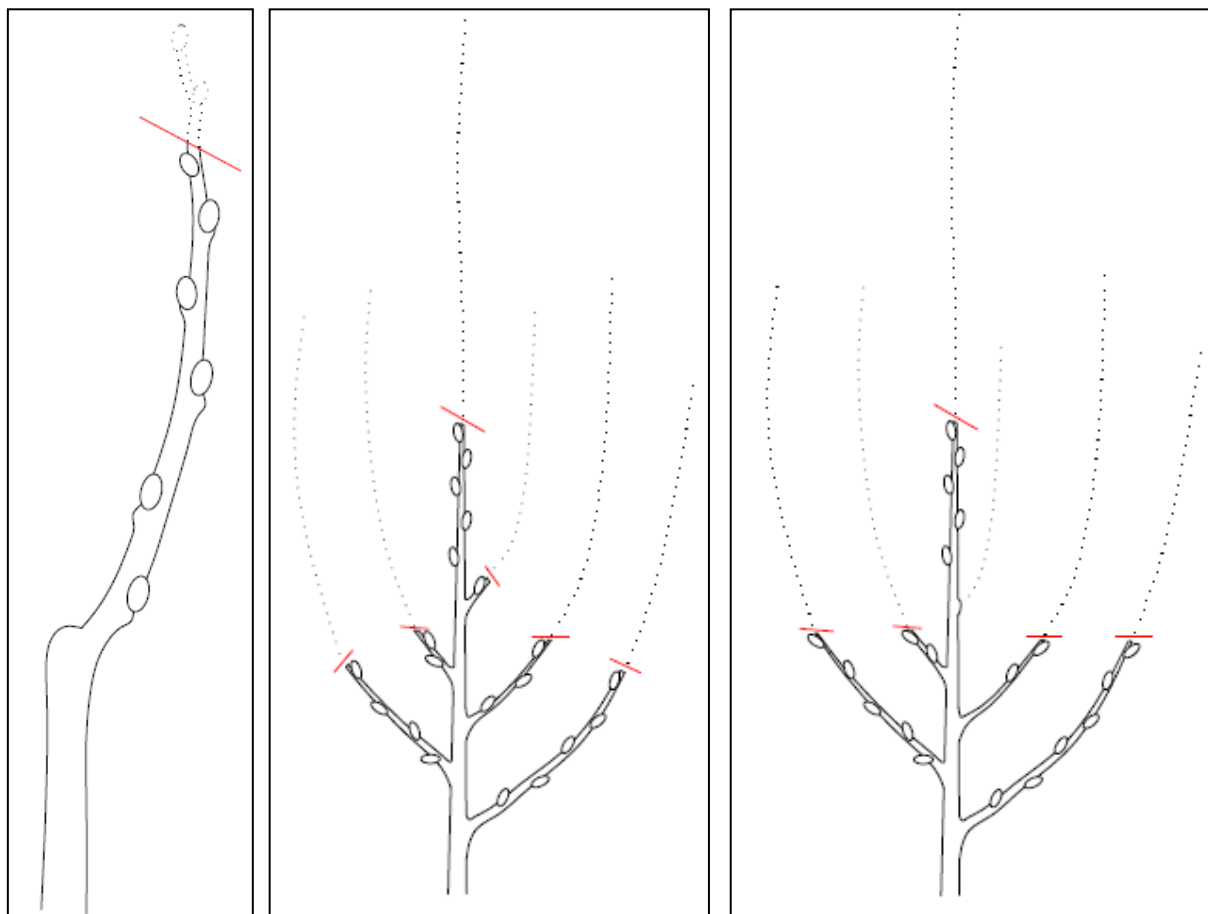


Fig. 2: Alternating pruning (3.1.1.6). Fig. 3: Pruning to inner bud (3.1.3); (3.4.1.2.15). Fig. 4: Pruning to outer bud (3.1.4); (3.4.1.2.15).

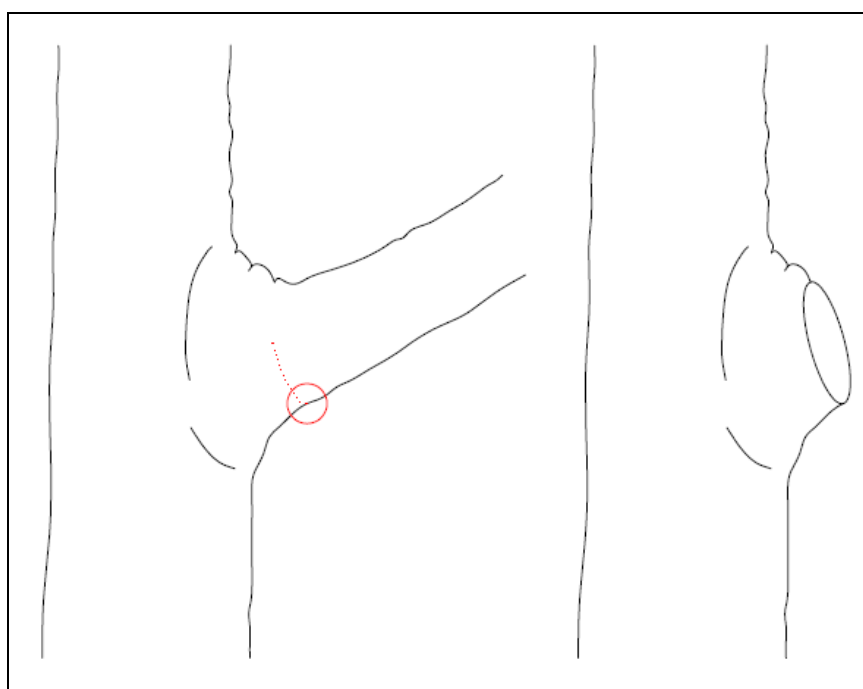


Fig. 5: Fruit tree pruning to branch ring (3.1.5).

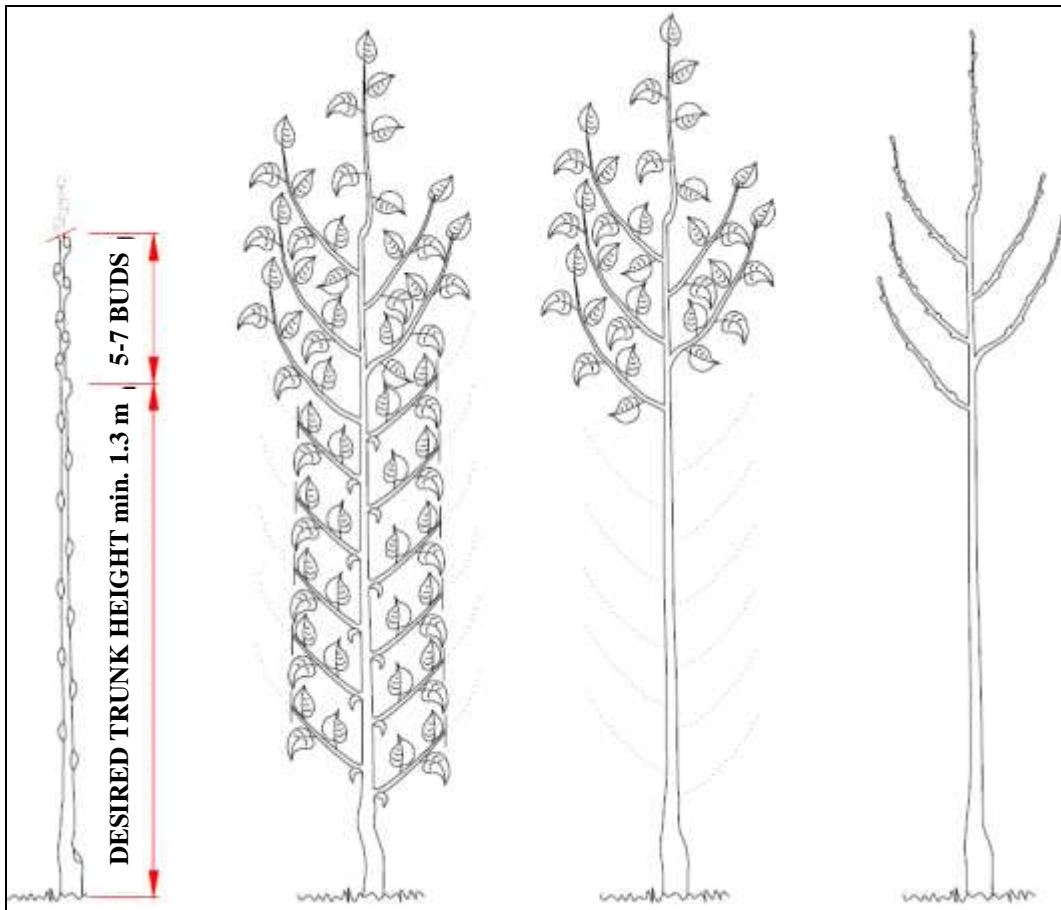


Fig. 6: Procedure for cultivating a crown from a maiden whip – pruning to crown:

- (a) pruning to crown (3.4.1.1.1)      (b) sprout pincering (3.1.6); (3.4.1.1.2)      (c) round shoot trimming (3.1.7); (3.4.1.1.2)      (d) tree in autumn

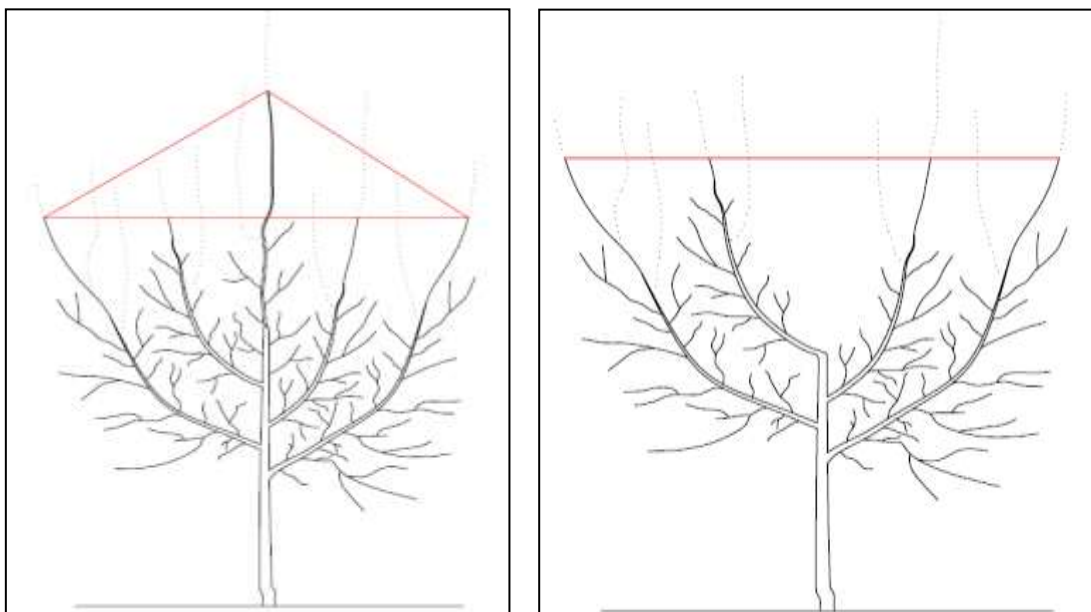


Fig. 7: Balance pruning (3.1.11); (3.4.1.2.15):

- (a) pyramidal crowns (3.4.1.2.3)      (b) hollow crowns (3.4.1.2.4)

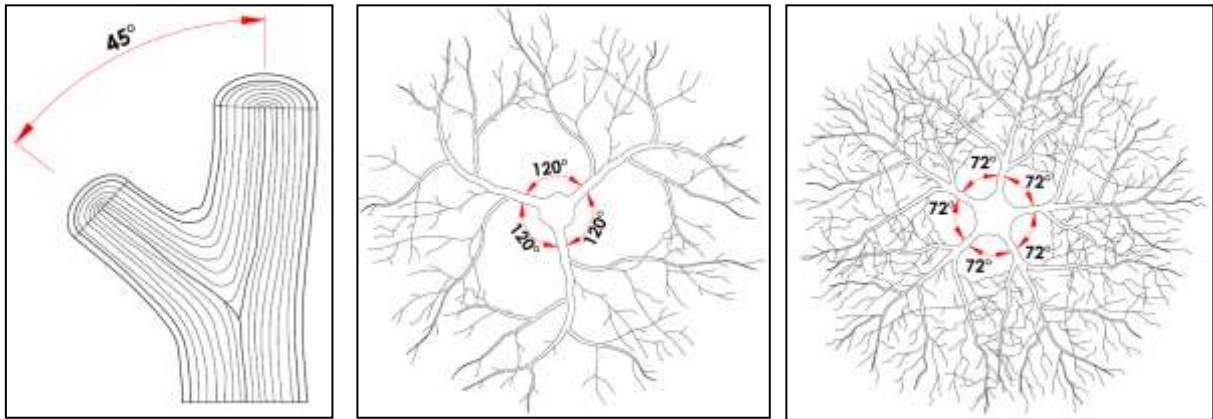


Fig. 8: Distribution of main branches in the crown (3.4.1.2.5):

(a) optimum deflection angle (b) optimum split angles for three and five branches

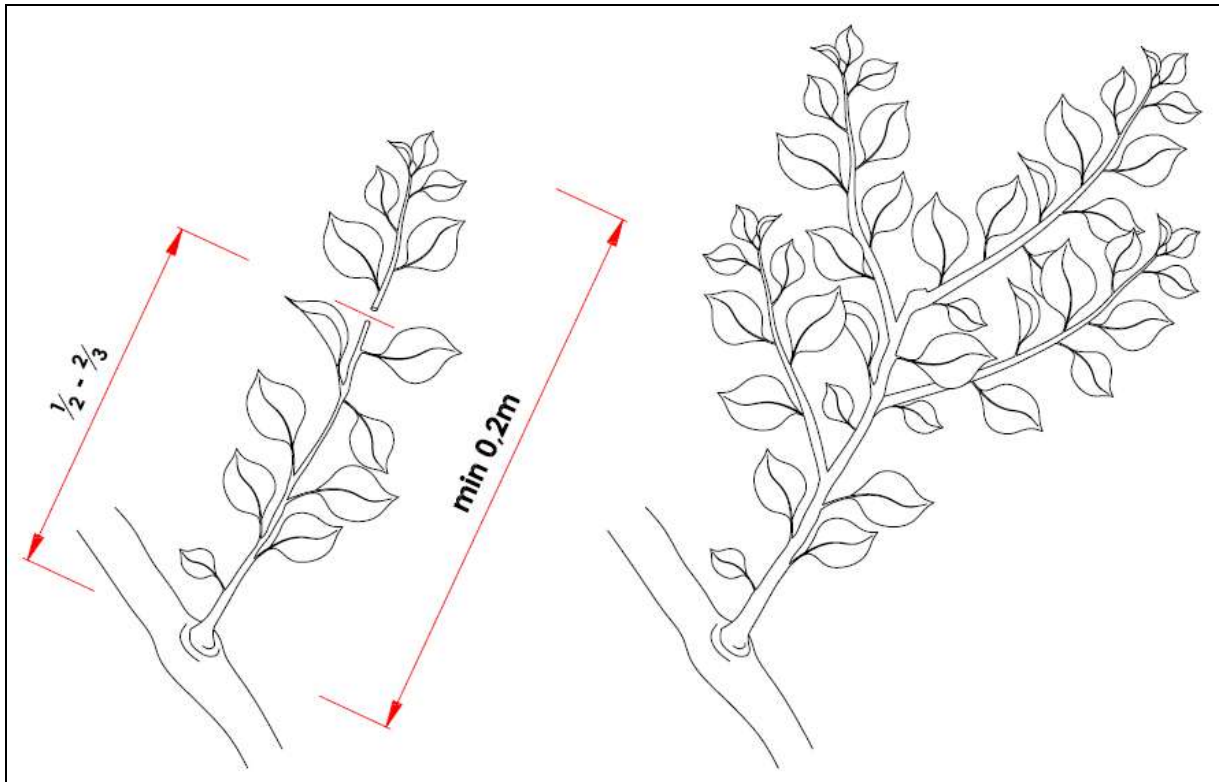


Fig. 9: Šitta's pruning (3.1.12).

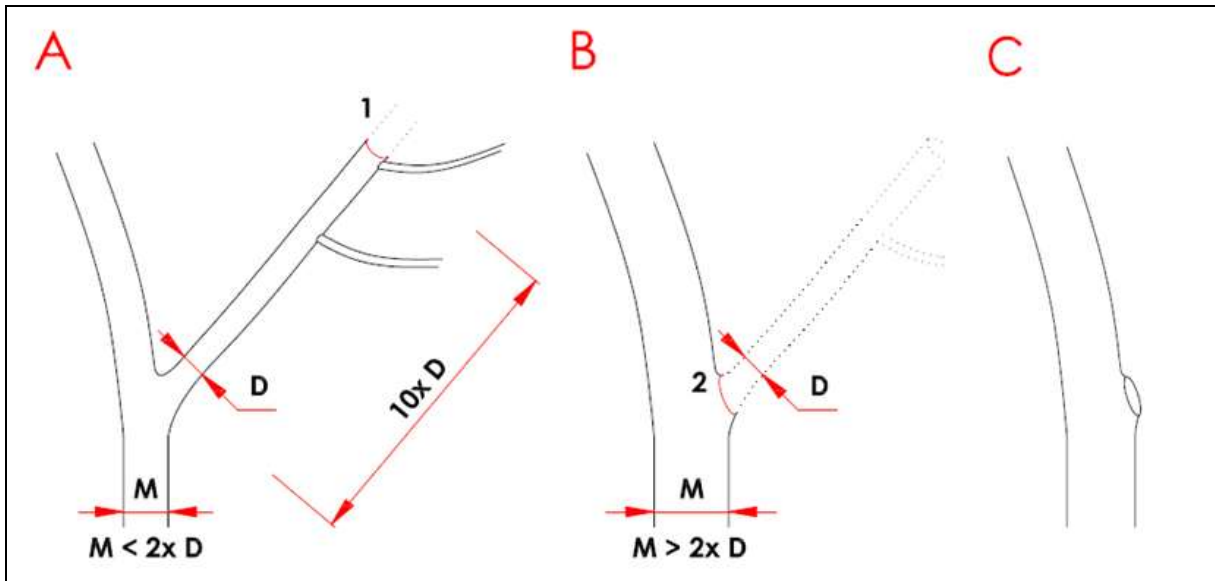


Fig. 10: Zahn's pruning (3.1.13): (A) formation of long pin on daughter branch (D); (B) enhancement of parent branch; (C) stub removal

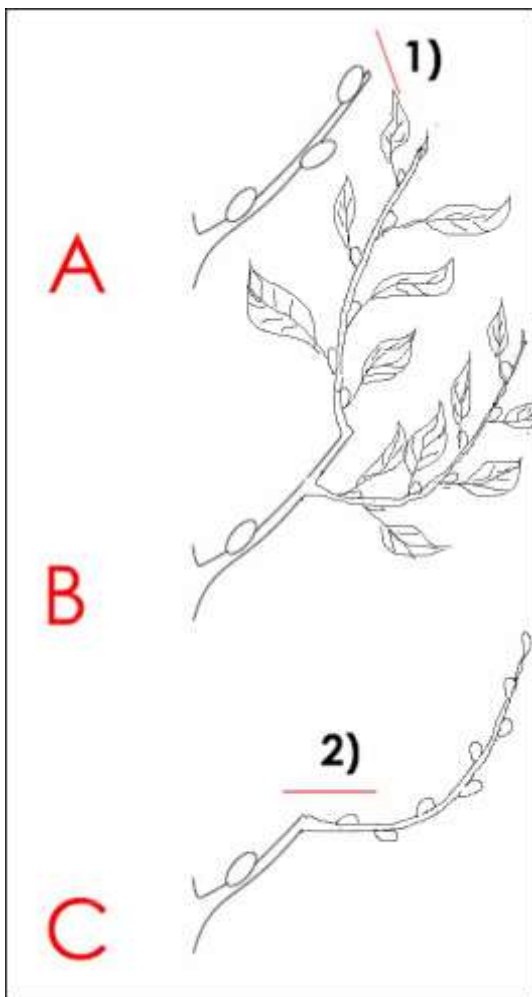


Fig. 11: Two-phase (sectoral) pruning (3.1.14):

- (A) phase 1 – pruning to inner bud
- (B) development of competing annual shoot with greater deflection angle
- (C) reverse pruning to competing shoot (3.1.8).

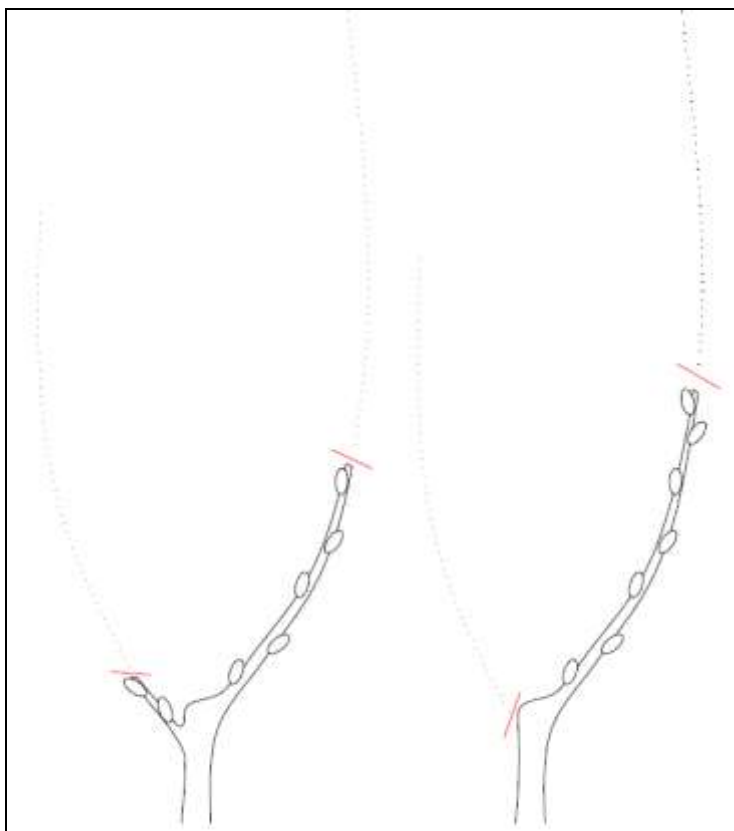


Fig. 12: Pruning of nursery cultivars with 2 shoots to crown (3.4.1.2.15).

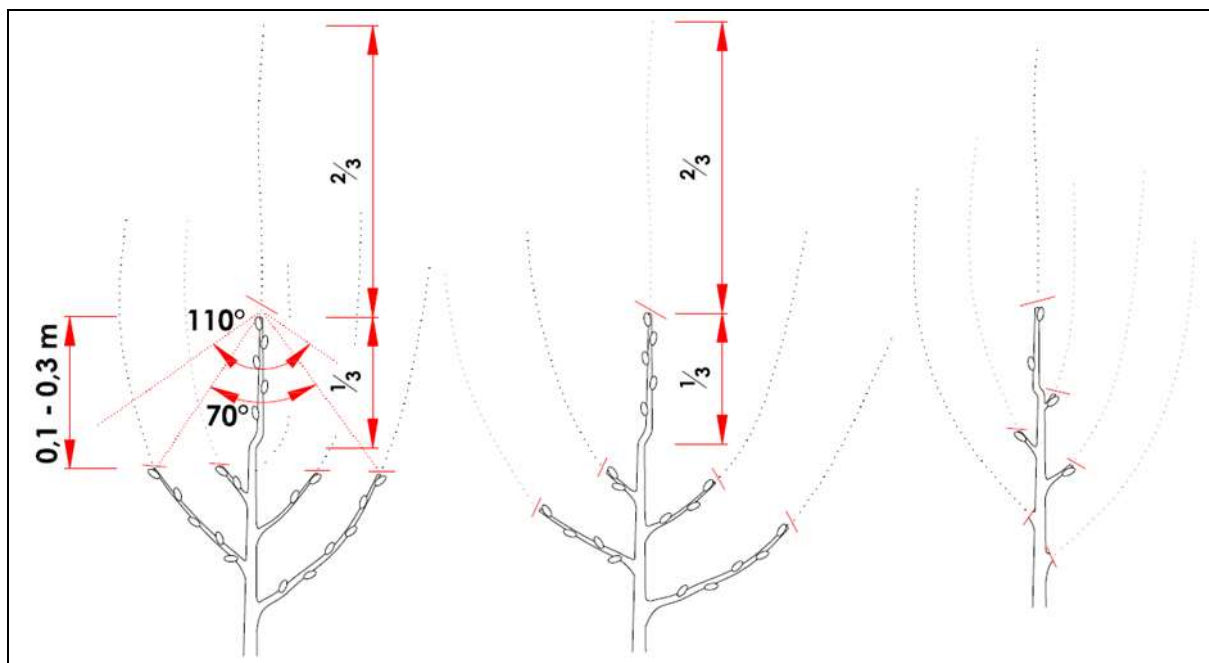


Fig. 13: Pruning in first year after planting (3.1.11):

- (a) to outer bud after autumn planting      (b) to inner bud after autumn planting      (c)  
 after spring planting      (all 3.4.1.2.15).



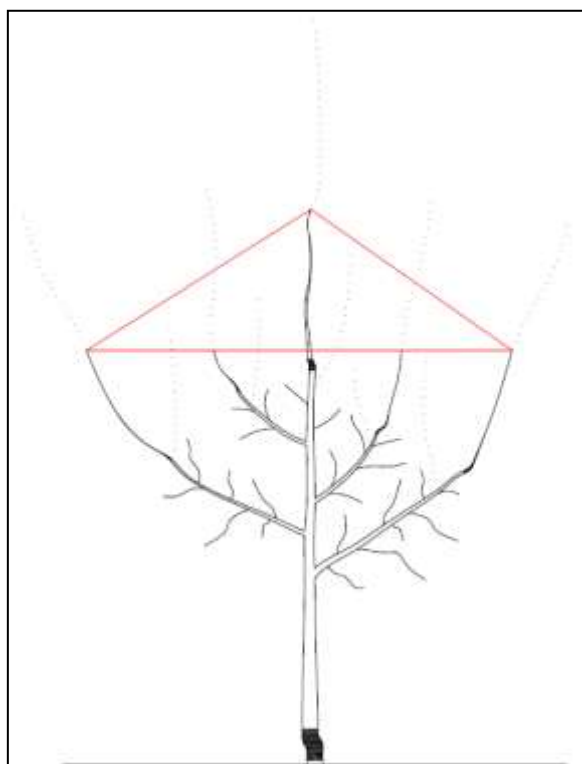


Fig. 14 Pruning in second year after planting (3.1.11); (3.4.1.2.16).

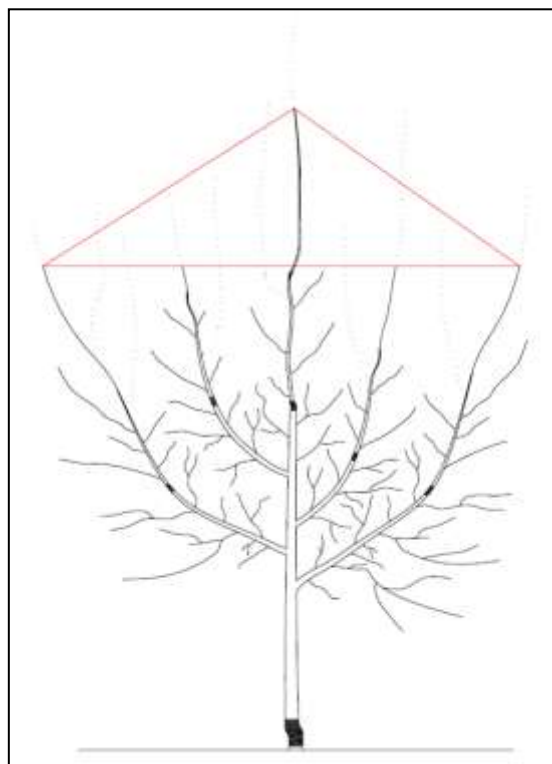


Fig. 15 Pruning in third year after planting (3.1.11); (3.4.1.2.16).

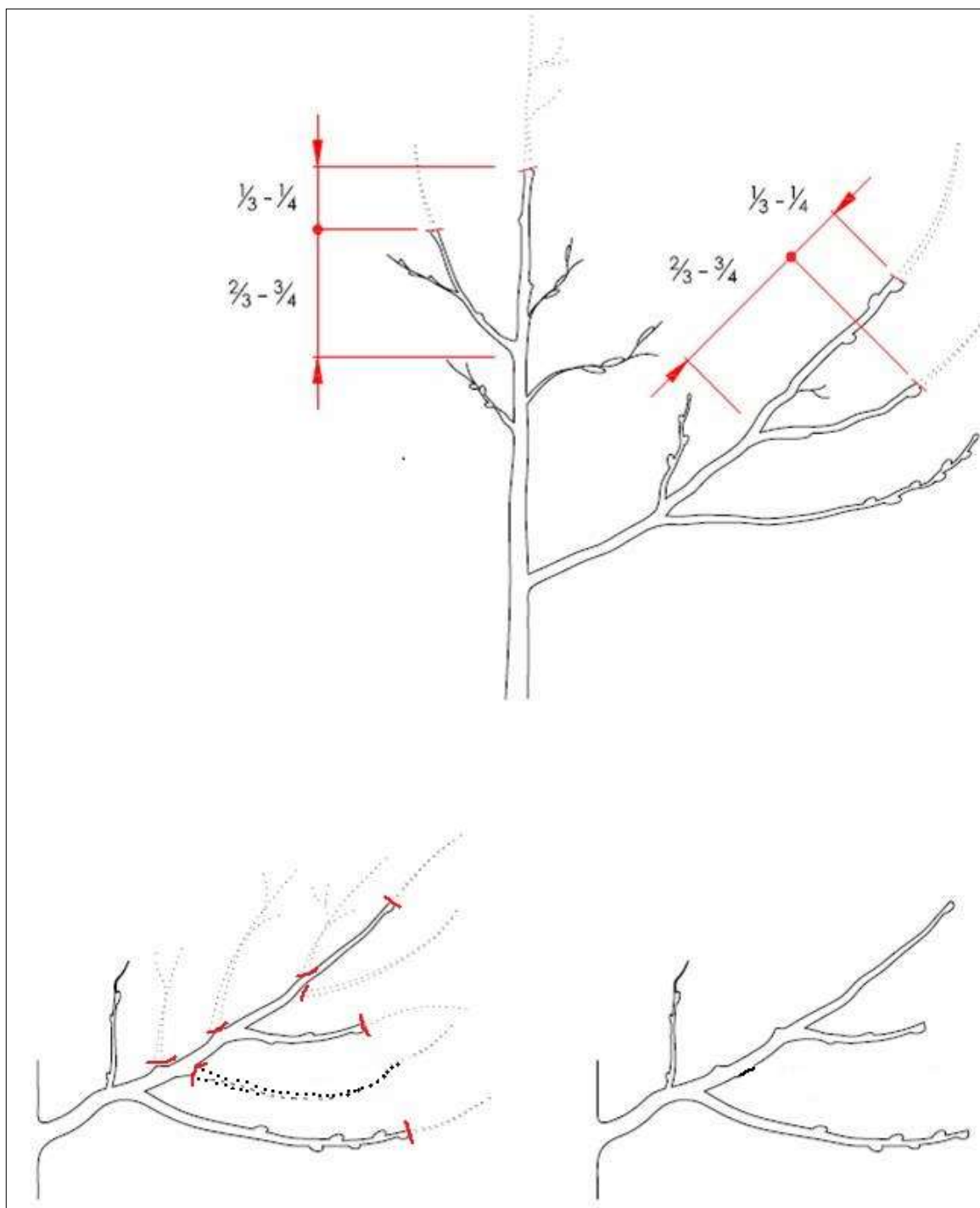


Fig. 16: Juvenile pruning – lower-level branches conform to higher-level ones by pruning (3.4.1.2.16).

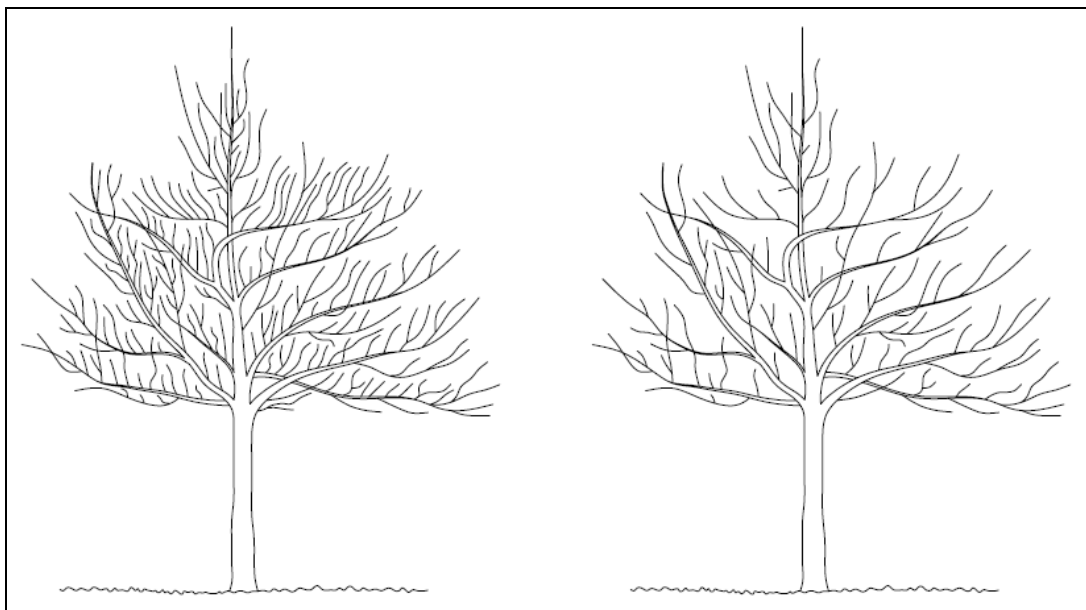


Fig. 17 Thinning pruning of fruit woody plants (O-RP) (3.4.2.1.3):

(a) before pruning

(b) after pruning

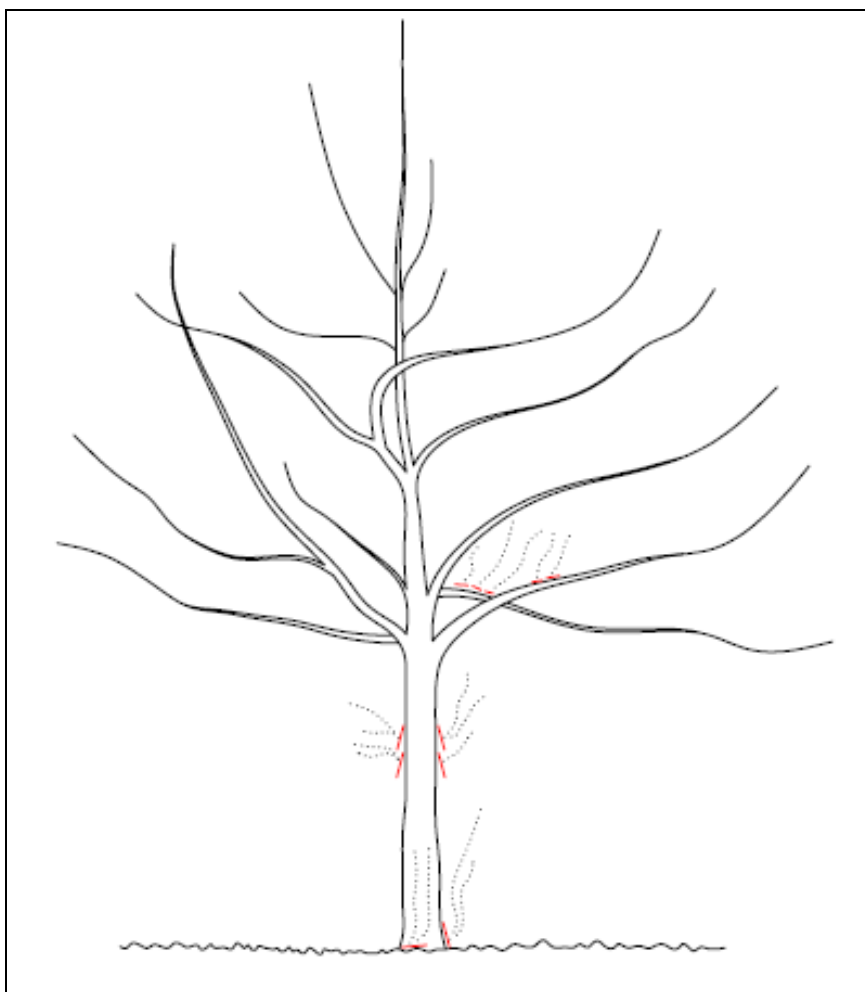


Fig. 18: Removal of suckers and rootstock shoots of fruit woody plants (O-OV) (3.4.2.3.1).

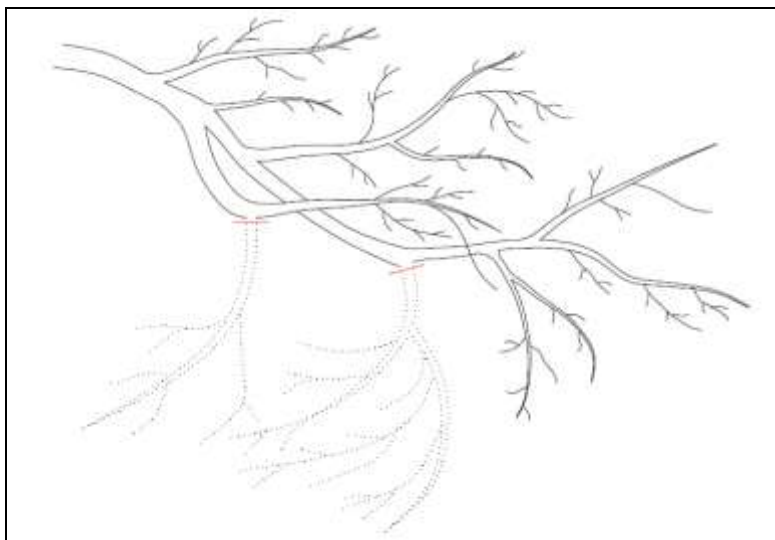


Fig. 19: Gentle revitalisation pruning (O-RZM) (3.4.3.1.2).

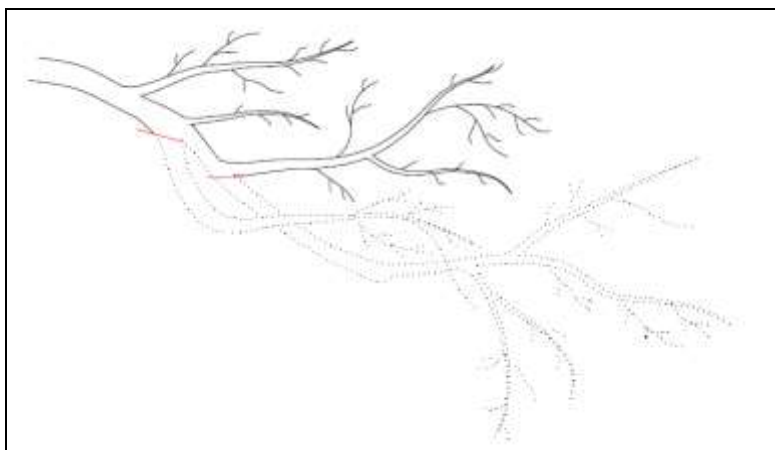


Fig. 20: Medium revitalisation pruning (O-RZS) (3.4.3.2.3).

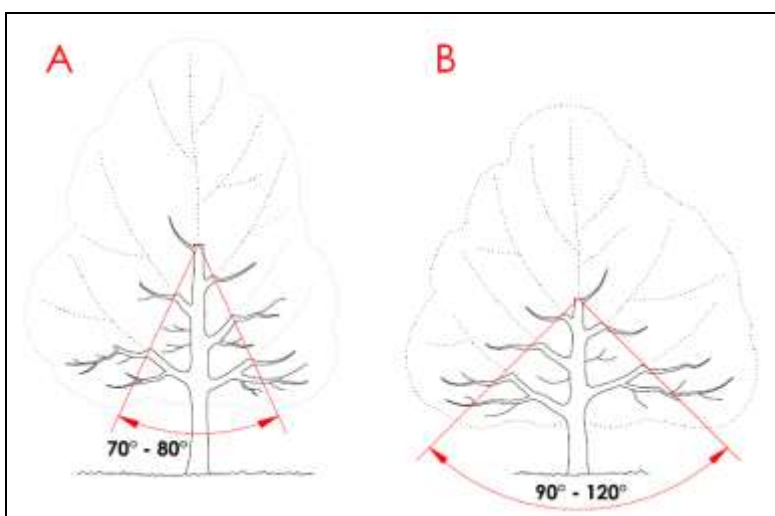


Fig. 21: Deep revitalisation pruning (O-RZH) (3.4.3.3.8):  
(A) pear: apex angle 70-80°      (B) apple: apex angle 90-120°

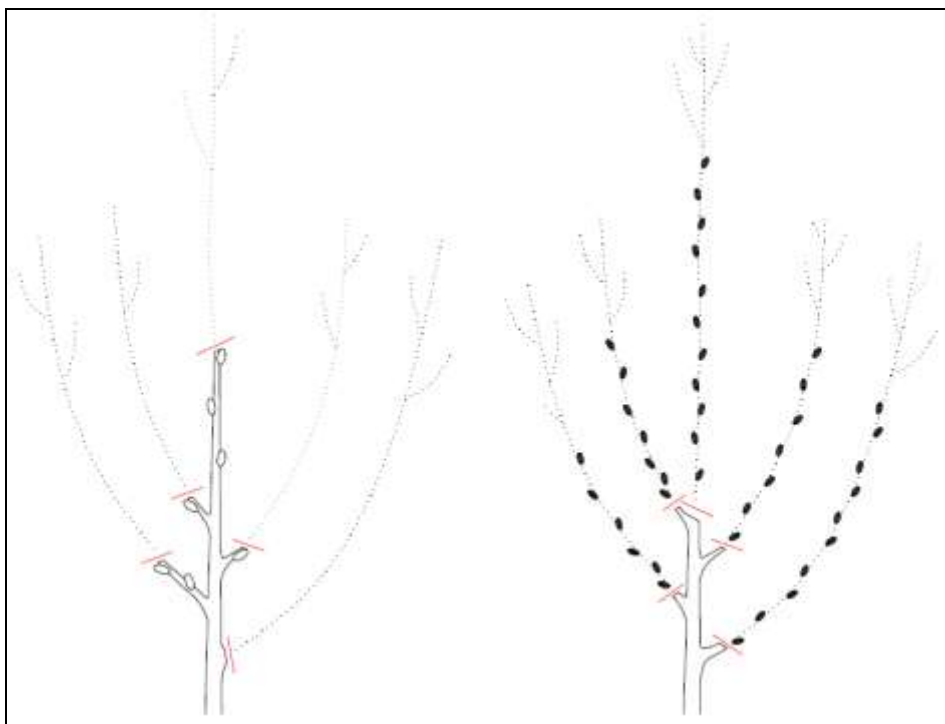


Fig. 22: Reparatory pruning (O-RO) of two-year-old crown (3.1.8):

(a) reverse pruning to pin (3.4.4.1.3)

(b) reverse pruning to base (3.4.4.1.3)

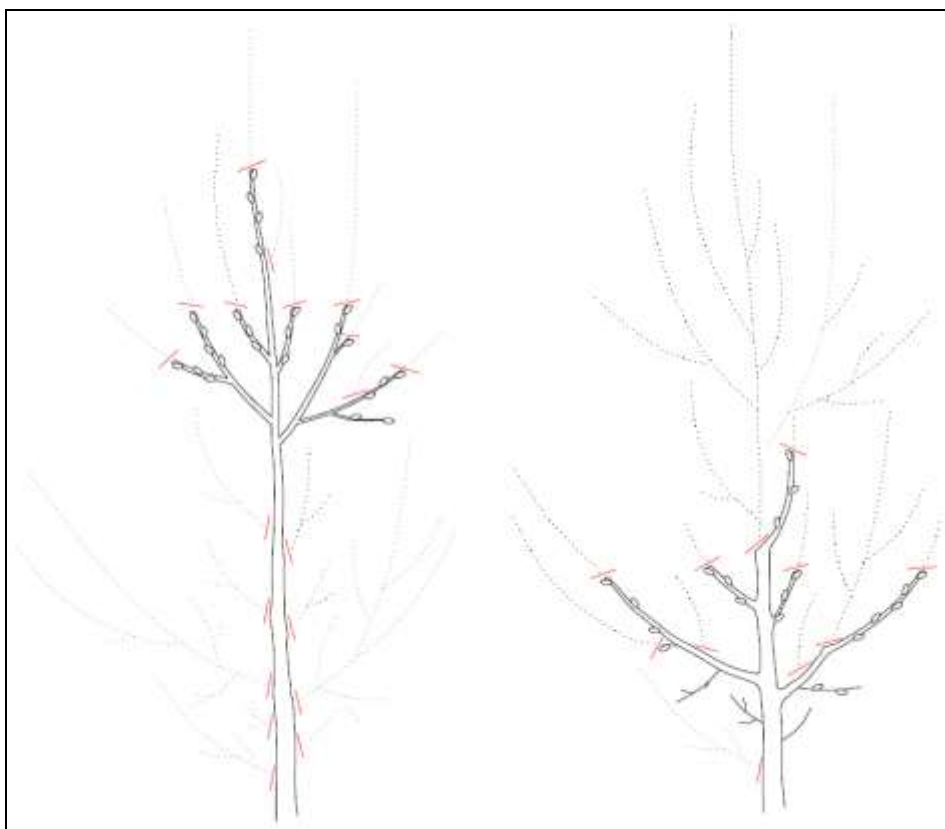


Fig. 23: Reparatory pruning (O-RO) of a crown with a dominant second storey (3.4.4.1.5):

(a) first storey removal

(b) second storey removal

**Annex 5 List of Nature and Landscape Management Standards (Series C – TSES and landscape-forming elements) developed**

**00 General**

00 001 Terminology

**01 Inspection, assessment, planning**

01 001 Assessment of TSES functionality

01 002 TSES development (plans and projects)

**02 Work procedures**

02 001 Implementation of TSES biocentres and biocorridors

02 002 Development of landscape-forming and interactive elements

02 003 Planting of fruit trees in the agricultural landscape

02 004 Management of TSES components, incl. landscape-forming and interactive elements

02 005 Management of functional plantings of fruit woody plants above 10 years of age

**03 Occupational health and safety**

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2016

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