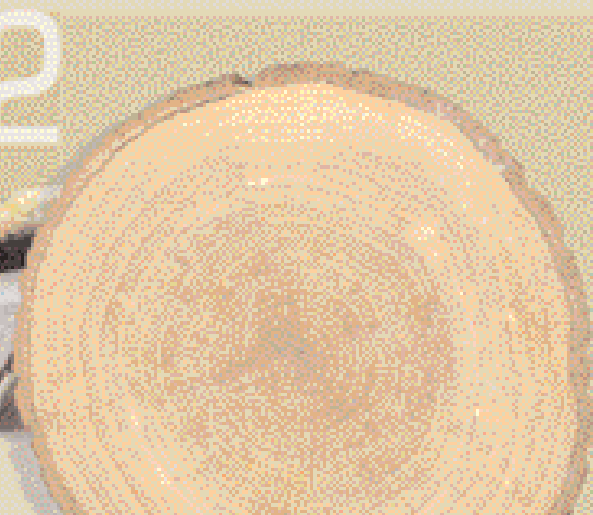


# Production of walnut (*Juglans regia* L.) timber

in **3** steps

关于生产核桃木材的三个步骤



# Tree farming for walnut timber production

Tree farming is set of cultivation practices aimed exclusively at quality timber production.

Many tree species can produce high quality timber getting up to high prices on the European market. Among these the following may be quoted: sweet-cherry, pear, sorbus spp., maple-tree, chestnut, poplar spp., but, in Italy, **walnut** is certainly the most requested one.

This handbook contains information on the walnut tree farming techniques, which provides not only commercially valuable logs, but also fruit production.

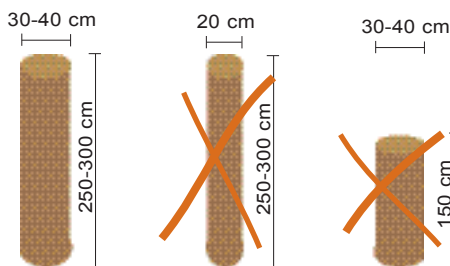
Walnut trees, planted at suitable distance from each other, may be cultivated as a pure walnut plantation or mixed with other tree species.

The walnut logs may be classified in three price classes, maintaining same relative score over the time (*prices 2003 are listed in the Table*).

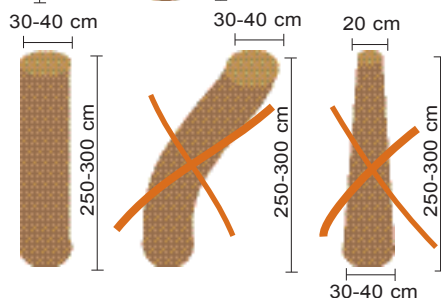
	Euro/m <sup>3</sup>
1 <sup>st</sup> class	1.100
2 <sup>nd</sup> class	350
3 <sup>rd</sup> class	160

## MAIN TECHNICAL FEATURES OF FIRST QUALITY TIMBER

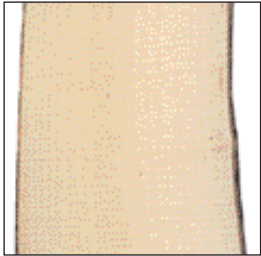
### Sizes



### Straight and cylindrical stem



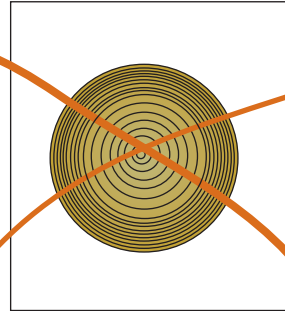
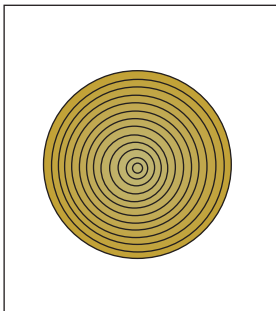
### Presence of knots



### Homogeneous wood colour



### Regular growth



## ATTENTION!

The presence of only one of these defects can downgrade the stem to the second or third class.

# The three production are:

## 1st step > ROOTING

The rooting step is devoted to overcoming the **transplanting stress**

## 2 nd step > QUALIFICATION

The qualification step is devoted to obtain a stem at least 250-300 cm tall. The stem should be **clean of branches** before reaching the size of 8-10 cm in diameter.

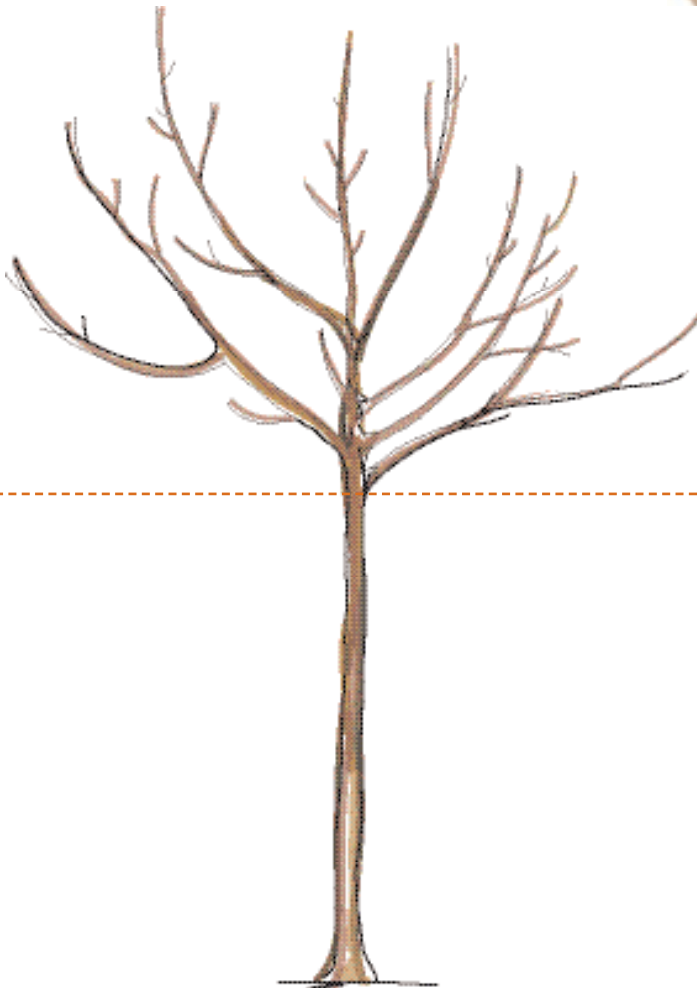
AIMED PRODUCTION HEIGHT



# steps in tree farming

## 3 rd step > DIMENSIONING

The dimensioning step aims to obtain tree sizes of 30-40 cm in stem diameter with constant width of the **growth rings**.



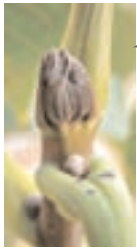
D i m e n s i o n i n g   s t e p

# 1

## 1<sup>st</sup> step: rooting

In order to be successful in this step it is necessary:

- to produce or to purchase well-developed plants;
- to plant correctly and at the right time in a well-prepared soil suited for the species
- do not prune the plants before they reach at least 50 cm in length.



Robust bud

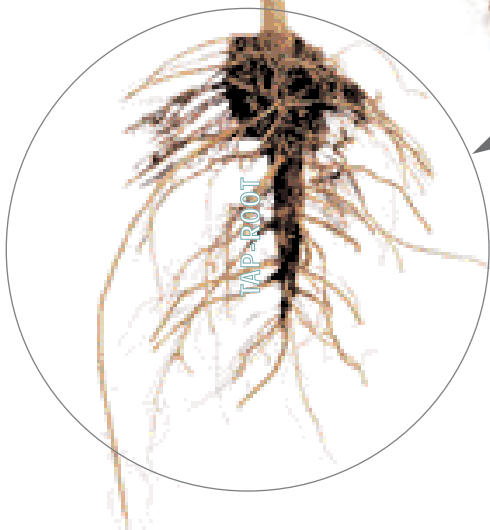
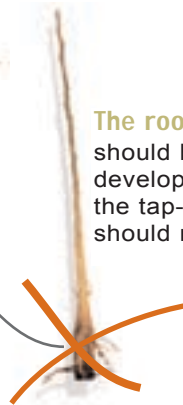


Weak bud

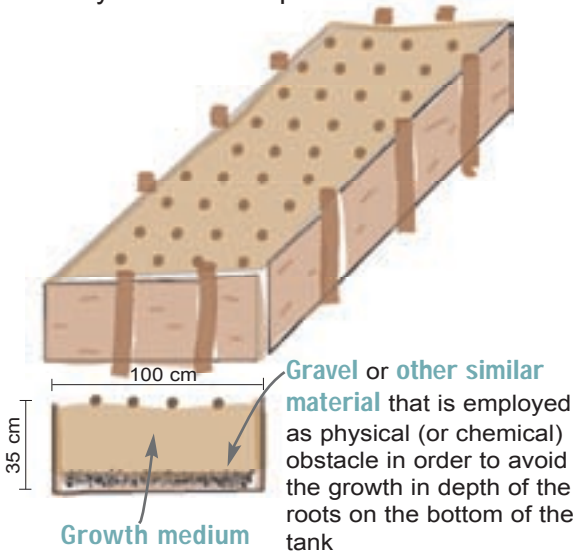
It is not important to have a long stem, but a **strong stem**, having a length/diameter ratio  $\leq 40$ .



The root system should be well-developed and the tap-root should not be cut.



A tank filled with earth, as shown in the figure below, can be used as a nursery bed for the production.



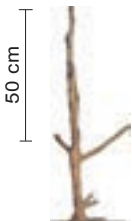
The nuts should be put in the tank, as shown in the photo, with a mutual distance of **20 cm** and at a depth of 3-4 cm

### How to graft

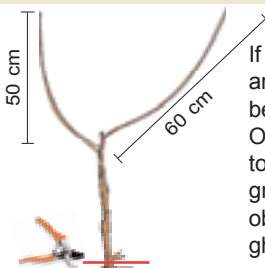
Plants aged one year may be out-planted, or **grafted** and then outplanted in the following year.



### After one or two growth seasons



A shoot of **50 cm** or more shows that the plant has overcome the rooting stress



If the plant shows a proper architecture, it is possible to begin the qualification step. Otherwise, it is convenient to cut the plant at the ground level in order to obtain a new-formed, straight and vigorous stem.

# 2

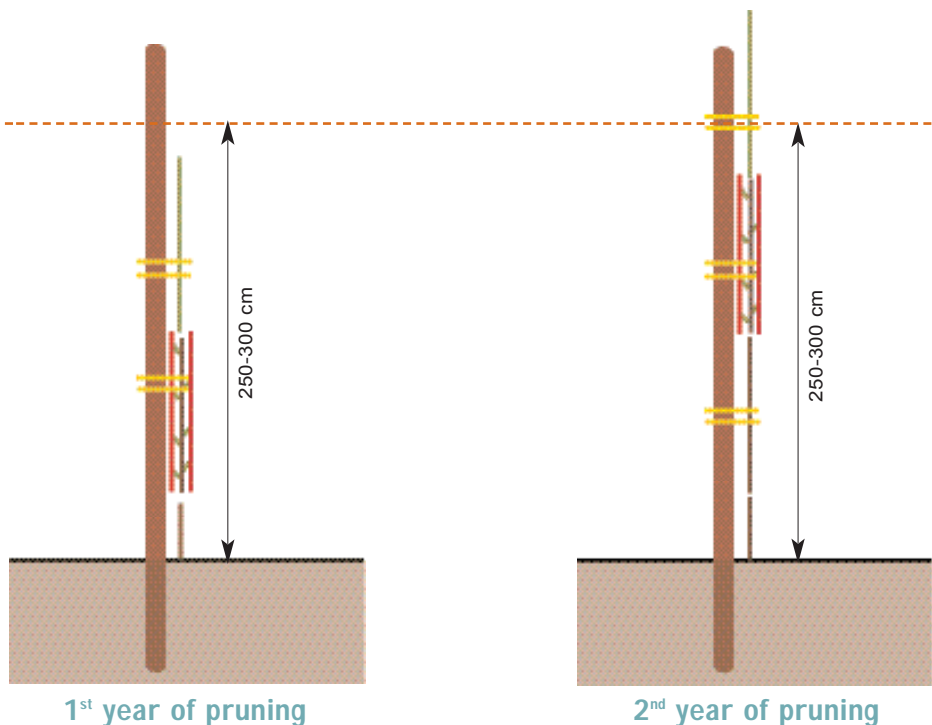
## 2<sup>nd</sup> step: qualification of

If the walnut is planted in a soil with very good characteristics, it may develop apical shoots 100 cm long and over.

In such conditions it is possible to carry out the “pivot pruning” until the apical shoot is more than 250-300 cm.

When the “pivot pruning” has been decided, it is necessary to fix in the soil a **strong pole 50 cm higher** than the productive goal

The **twines between the plant** and the pole should be located in the stem portions aged **1 and 2 years**. It is indispensable to control periodically the twines: if they are too tight or too slack, they could cause defects which would decrease the price of wood



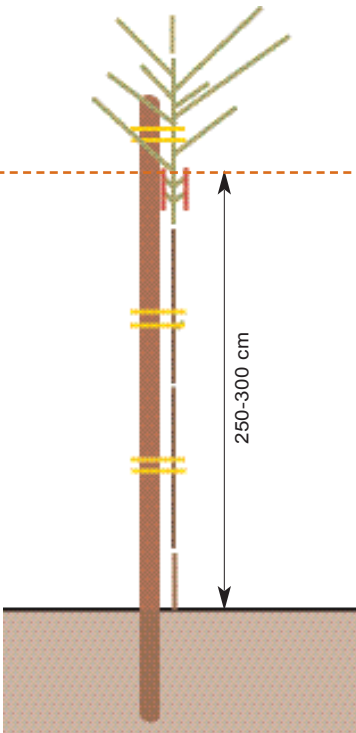


# vigorous plants

The “pivot pruning” is the systematic cutting of the shoots growing on the stem during the first or the following years. The elimination of the shoots, which should be carried out during the spring in one or more repeated cuttings. This practice improves the stronger growth of the apical shoot and makes it covered with leaves.

This kind of pruning is very stressing for the plant, but provides the best production of **first quality** wood and a higher quantity of **fruits**.

When the aimed production height is reached, the crown is being left to its natural development or branches may be grafted



3<sup>rd</sup> year of pruning

AIMED PRODUCTION HEIGHT



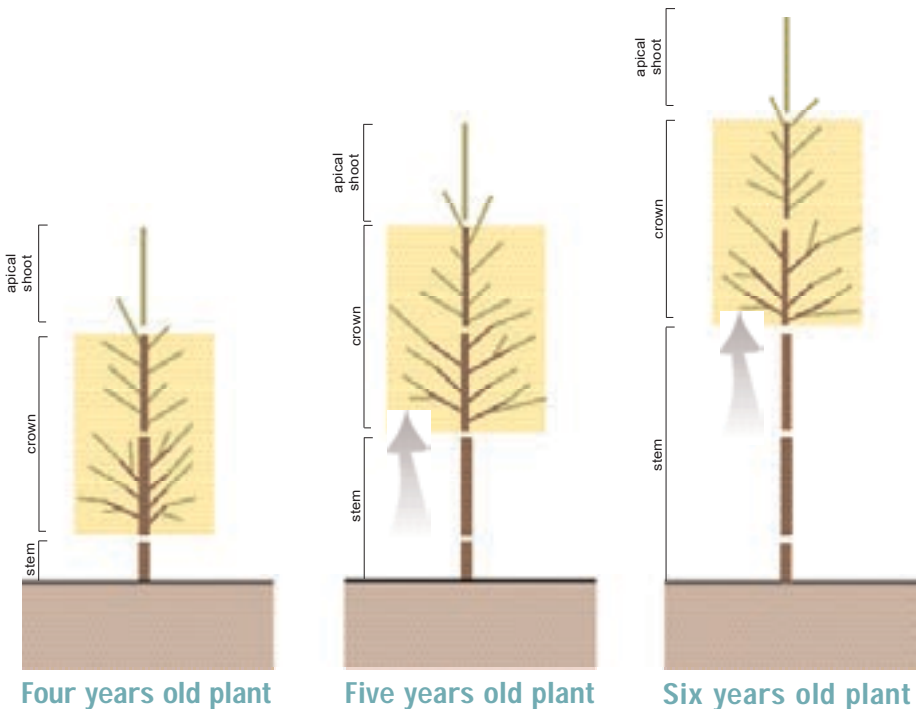
The “pivot pruning” gives rise to plants with **wide crown**

## 2<sup>nd</sup> step: qualification of “mean” and “mean-low”

If the walnut tree is planted in a good (but not very good) soil, it may develop apical shoots between 50 and 100 cm.

In these cases it is advisable to carry out a “**reiterative pruning**”. Pruning after pruning, this practice drives the walnut plant to rise its crown and to build up the same architectural pattern which is characterised by:

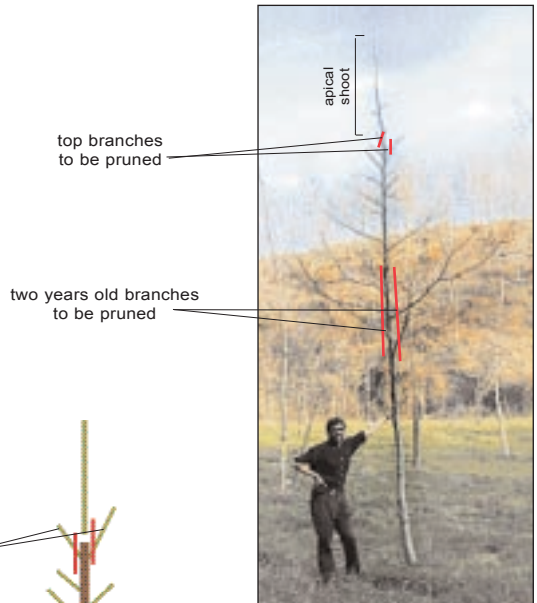
- an apical shoot where the crown will be located in the following year;
- a crown located on the two years old stem for vigorous plants, and on the two-three years old stem for plants showing medium/low vigour;
- a stem clean of branches.



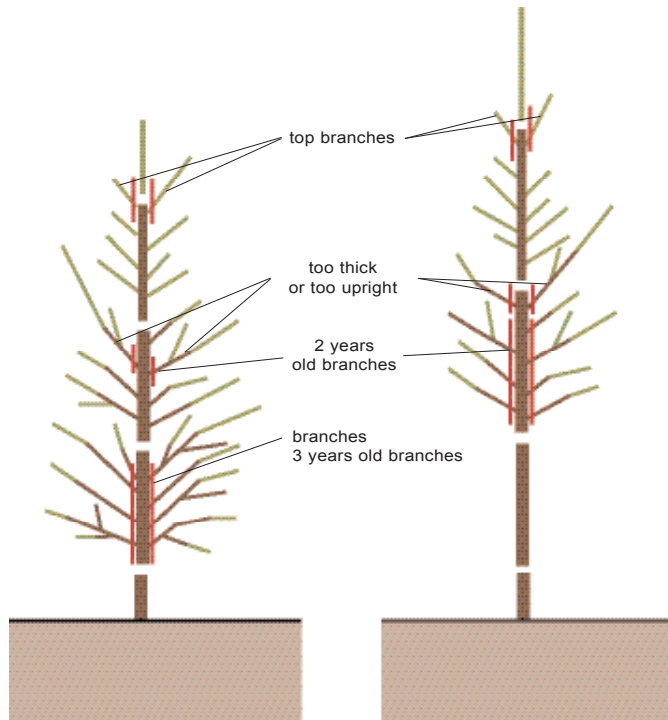
# plants with vigour

The “reiterative pruning” aims at obtaining a crown composed by many **small-size branches**. In order to achieve this result, it is necessary to carry out, at the end of the winter or at the beginning of the summer, the following pruning action:

- top branches
- too thick or too upright branches
- 2/3 years old branches



Tree with architecture already addressed by “reiterative pruning” before the following pruning



Pruning of a medium/low vigour 5 years old plant

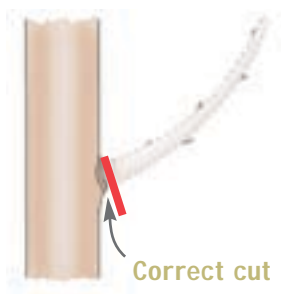
Pruning of a vigorous 5 years old plant

# 2

## 2<sup>nd</sup> step: qualification

How and when the pruning cut should be done

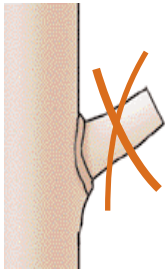
For walnut, the period of the year and the point of the branch in which the cut is done gives rise to different reactions.



If the cutting is made at the **beginning of the summer season**, it is difficult that the walnut may produce new shoots close to the cut



If the cutting is made at the **end of the winter season**, it is possible that the walnut may produce new shoots close to the cut



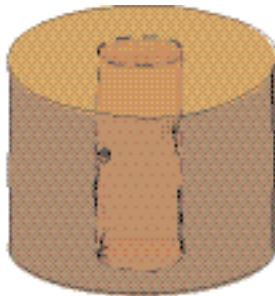
Leaving a branch portion **decrease** the wood quality because it will give rise to undesirable knots



The branches should be eliminated **before** the stem reaches **10 cm of diameter**. In this way, both knots and heals will be grouped in a small central cylinder



8-10 cm



30-40 cm

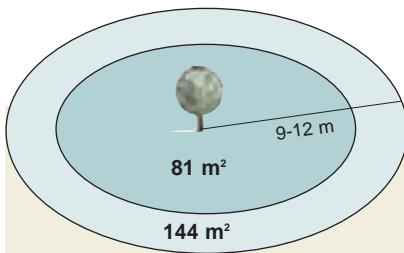


# 3

## 3<sup>rd</sup> phase: dimensioning

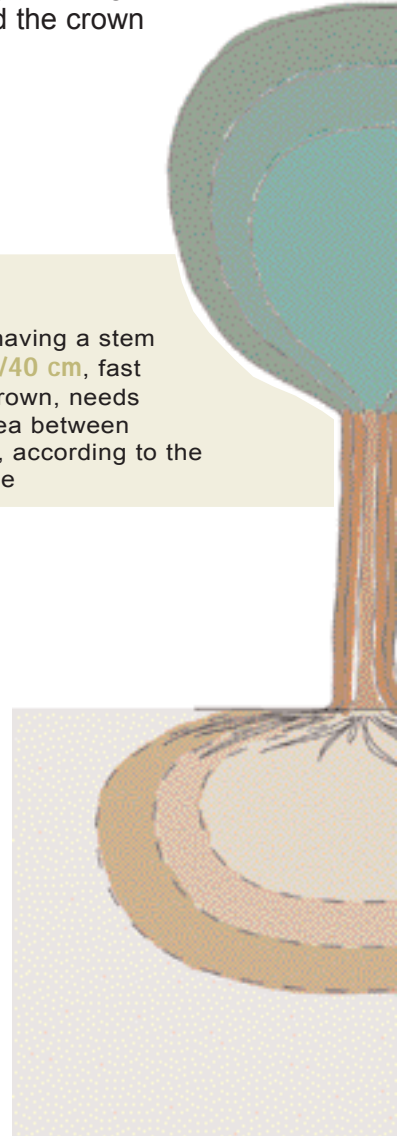
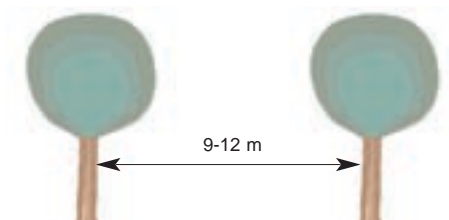
The aim is focused on a sustained and regular growth pattern

Regular growth of the diameter is obtained by allowing the walnut tree to “explore” with the roots and the crown progressively wider spaces.



A walnut tree, having a stem diameter of 30/40 cm, fast and regularly grown, needs an available area between 81 and 144 m<sup>2</sup>, according to the pruning technique

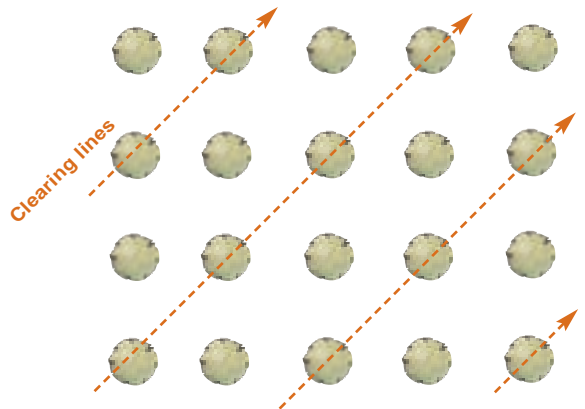
In order to produce first quality wood, the availability of growing space should be decided at the time of outplanting, making the choice of an interplanting distance between 9 and 12 m (81-144 m<sup>2</sup>)



The **regular** diameter growth is the indispensable feature of first quality wood



If the walnut trees are planted at a distance **less than 9 m**, it is necessary to clear the 50% of the trees two years before their crowns get in touch



# Examples: walnut plantations

The walnut can be planted both in pure or mixed with other species

The plantation models presented in the two following pages are examples showing the wide possibilities of different outplanting schemes, distances, species that can be chosen in order to address the social-economic situation and to respect the local environmental conditions.

## 举例 核桃种植林地的间作模式

核桃树的单种种植或和其他种类混合种植。

图例及中的林地种植示意图只是大概列出了大槲河流域的树种组合，其中包括间作选择方式，间作和共栽，但这些决策需要根据环境状况和社会经济所需进行。

### WALNUT and AGRICULTURAL CROPS

核桃树和种植农业

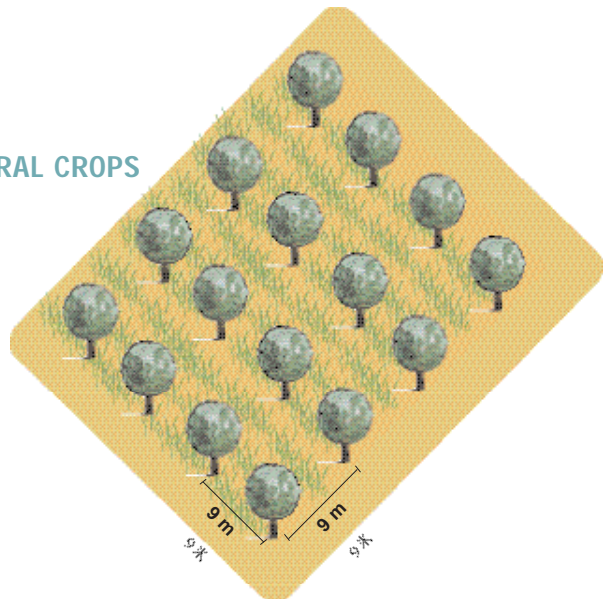
**CAPTION** 文字说明



walnut 核桃树



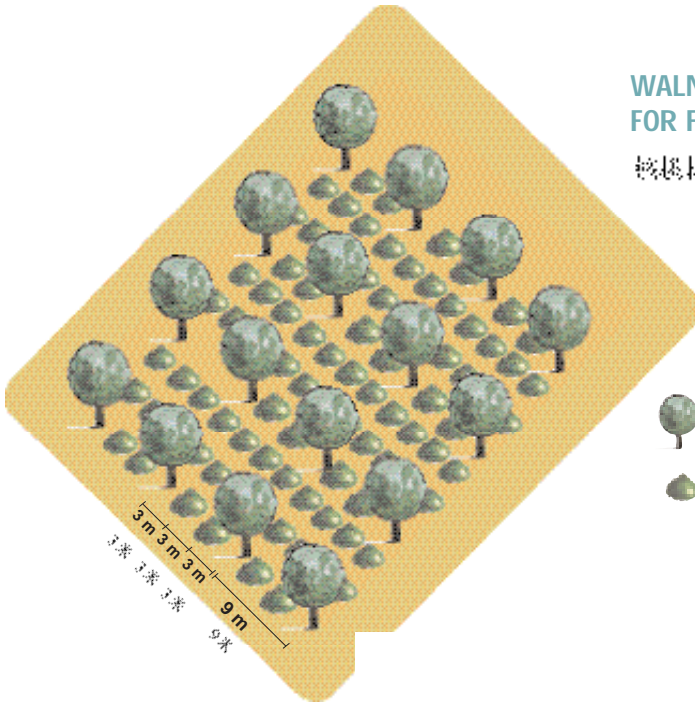
cultivated field 种植园







## WALNUT and SHRUBS FOR FRUIT PRODUCTION

核桃树和有果灌木



### CAPTION | 文字说明

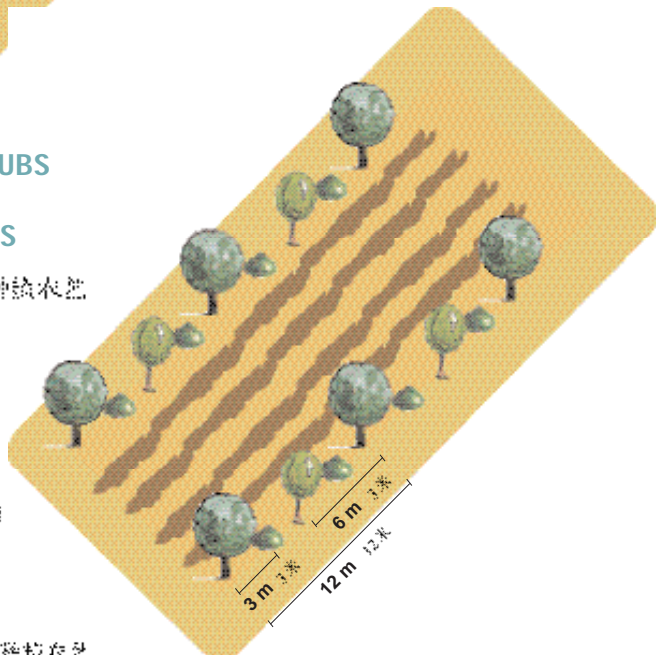
-  walnut 核桃树
-  hazel, red and black currant, pomegranate-tree  
榛子树, 红醋栗树, 石榴树

## WALNUT, TREES and SHRUBS FOR FRUIT PRODUCTION and AGRICULTURAL CROPS

核桃树, 树木, 有果灌木和种植农作

### CAPTION | 文字说明

-  walnut 核桃树
-  red and black currant, pomegranate-tree, hazel  
红醋栗树, 石榴树, 榛子树
-  peach, apricot, plum  
桃树, 杏树, 李子树
-  agricultural crops 种植农作



# 材用型核桃木的栽培技术

本书详细介绍了核桃木的栽培技术，包括从选种、育苗、造林到收获的全过程。

本书主要介绍了核桃木的栽培技术，包括从选种、育苗、造林到收获的全过程。本书共分八章，第一章介绍核桃木的栽培技术，第二章介绍核桃木的育苗技术，第三章介绍核桃木的造林技术，第四章介绍核桃木的抚育管理技术，第五章介绍核桃木的收获技术，第六章介绍核桃木的木材特性，第七章介绍核桃木的木材用途，第八章介绍核桃木的木材加工技术。

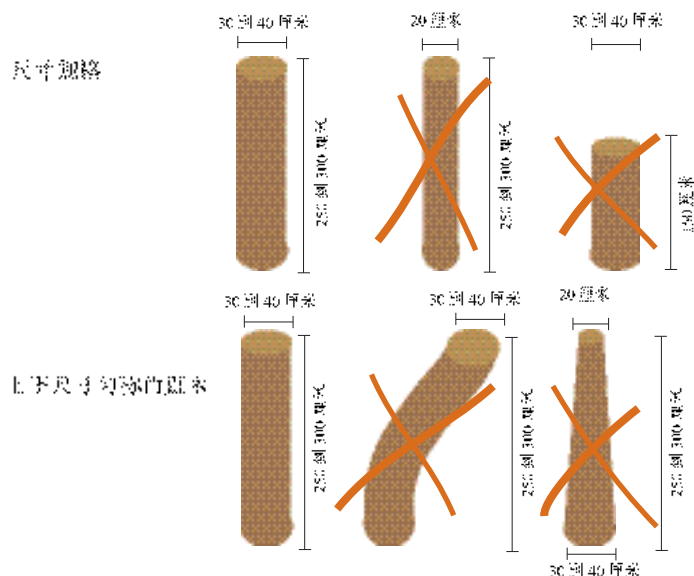
本书可作为从事核桃木栽培、育苗、造林、抚育、收获、木材加工等工作的技术人员、管理人员、科研人员和大专院校师生的参考书。

核桃木的栽培技术包括以下几个方面：

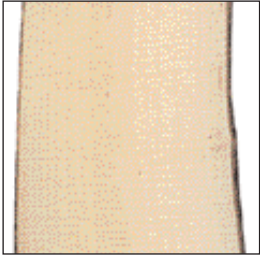
核桃木的价格可按木材中核桃木所占比例分为固定三种。（见 2003 年价格表）。

一级 欧元/立方米	1100
二级 欧元/立方米	350
三级 欧元/立方米	160

## 核桃木的主要特点



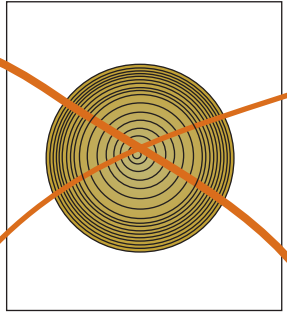
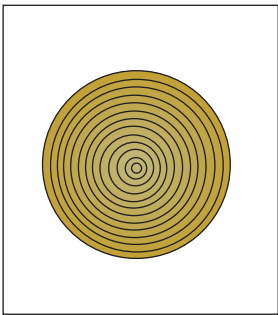
有节疤的木材图示



颜色均匀的木材图示



同心年轮的图示



注意事项 如果出现上述图表所示的一种，都可因此降低木材的等级到二级或三级

# 技术型栽培技术分为三个阶段:

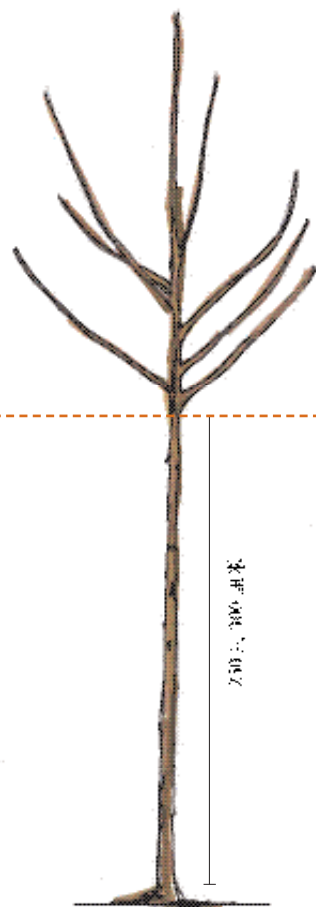
## 第一阶段 > 移植栽种

移植栽种阶段主要要避免因移植引起的植物应激状态

## 第二阶段 > 生产合格木料的过程

此阶段要确保在树干至少达到 250 到 300 厘米的高度，直径达到 8 到 10 厘米宽度之前，树干不能出现缺陷

对用型树木的树干标准高度

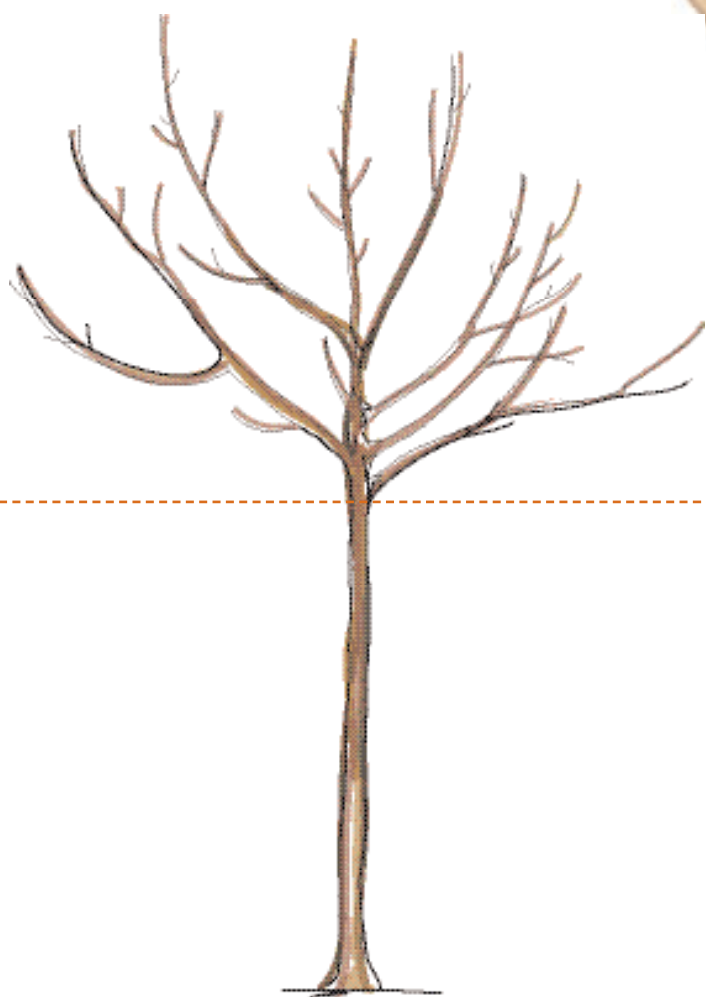


移植栽种

生产合格木料的过程

第三阶段 > 树木胸径直径的标准尺寸

此阶段新栽植保证树干直径达到 30 到 40 厘米，树冠生长均匀



树木胸径直径尺寸标准

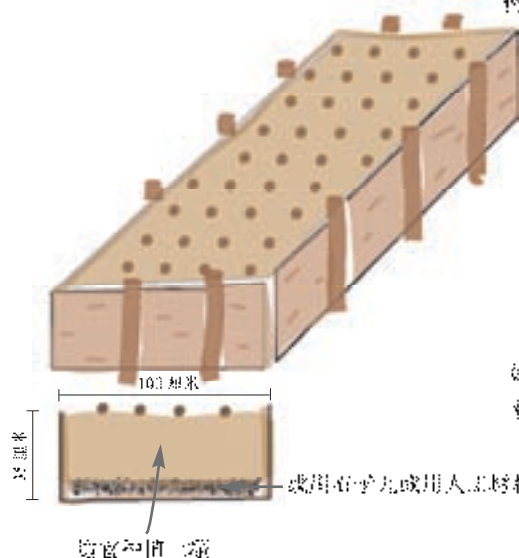
## 第一阶段：选择树种

达到此阶段标准需要：

选择或购买栽种成活好的树苗，在适宜核桃树种植的土地上，按季节播种。在树苗长到 50 厘米的高度之前，不要做任何修剪



树苗要在如下图所示的暖房中栽种。



如图所示，核桃苗应该在暖房中种植，株距间隔为 20 厘米，种植深度为 3 到 5 厘米

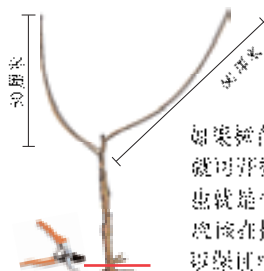
## 怎样嫁接

或待第一年核桃苗可移植种植，或从最近根部进行嫁接，来年再移植。



## 在一个或两个生长季节之后

如果枝条生长到至少 50 厘米或更多，就说明树苗在移植后已经适应。



如果树苗生长状态良好，就可开始第二阶段，也就是生产合格木料过程。青则，应该在接近根部嫁接，以保证可长出新的直立粗壮的树干。

# 2

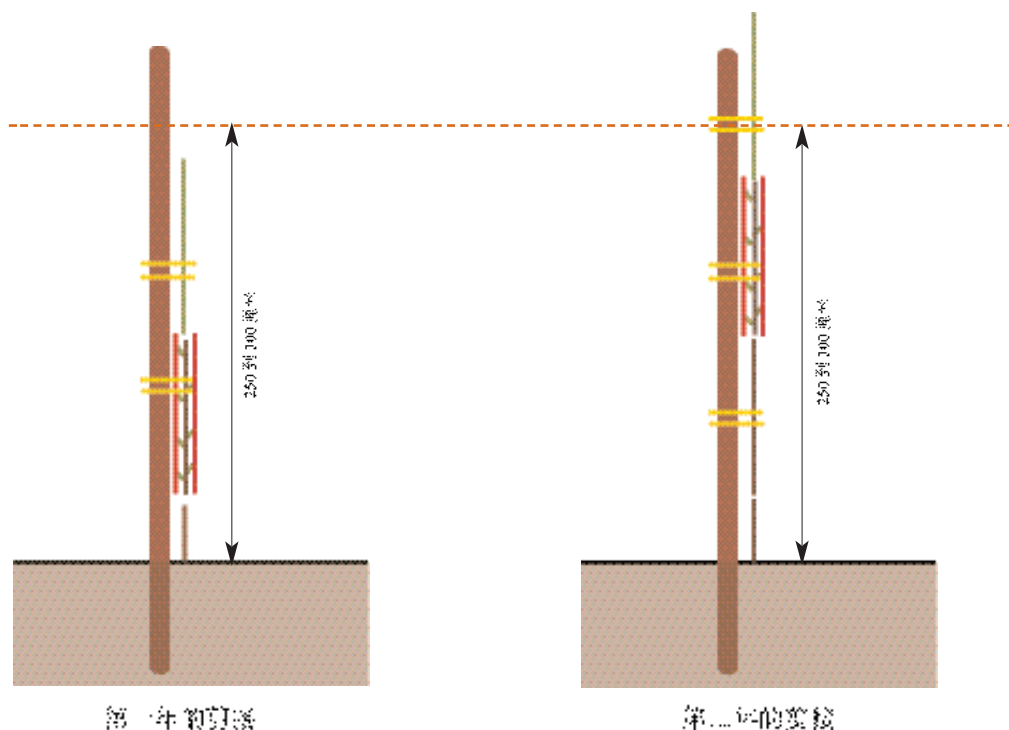
## 第二阶段：合格树木标准

如果接穗种植在优质肥沃的土壤上，  
顶端接枝长度可达到100厘米。

如果达到上述标准，可固定一根木桩后进行剪接，即为“推式剪接”  
这样顶端接枝长度就可达到250到300厘米。

如决定进行“推式剪接”，  
应选择一根粗壮的木桩，固定在上中，  
木桩的长度应略短于  
材料型树干的标准高度至少50厘米

每周应观察到接穗木桩木桩上，  
一处在于长到一半的高度，  
一处在于长到两年时  
高度。在树生长过程中，  
要保证捆绑的松紧合适以免木桩损伤或南北产生缺陷

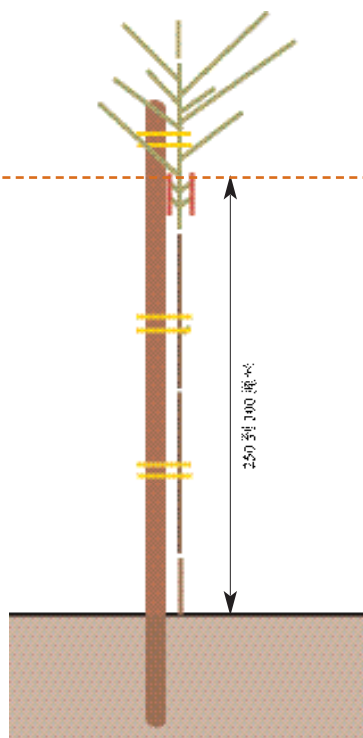




这种“棍式剪接”是在树干长到一年以后树枝枝芽修剪的系统方法。修剪可在春季进行，一次或者多次，这样就能使顶端树枝达到最大的生长限度，达到繁枝茂叶。

这种剪接方法使树处于紧张状态，但是能保证生产出一等好木料来丰富粮实。

当树干长到可用作木料的标准高度时，就可以不再对树冠进行修剪，让树根自由生长或者也可对树木进行嫁接。



村屋型树木的树干标准高度



“棍式剪接”可使树冠呈现球状

第一年的剪接

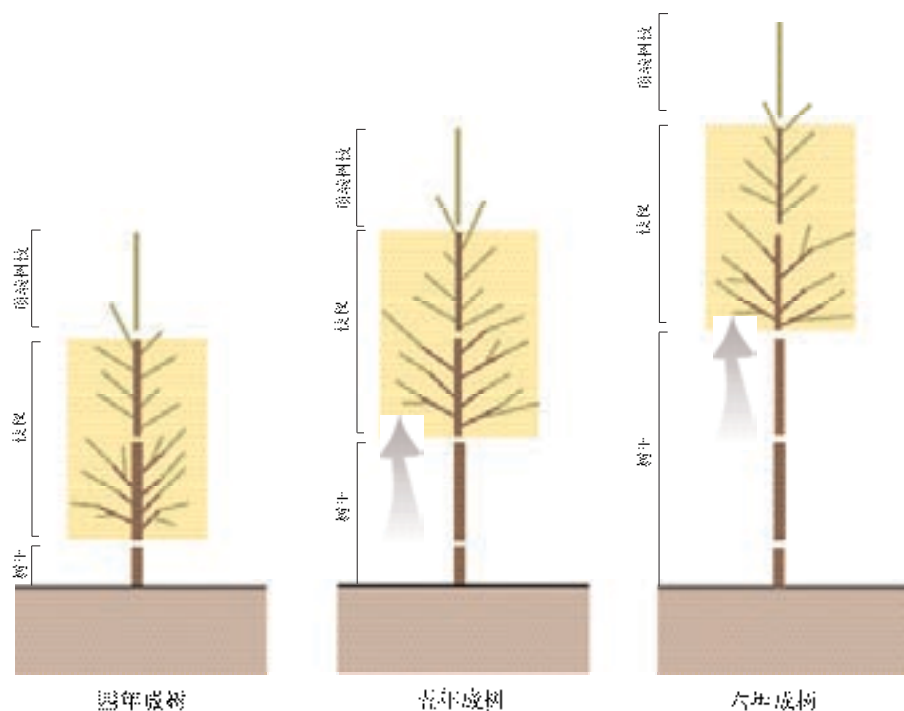
## 第二階段：中等粗壯或中等細壯樹木的品種標準

如果現在土壤是每層都優秀的土壤上和種植纖維，  
樹木的根頸長度可達到 50 到 100 厘米的長度。

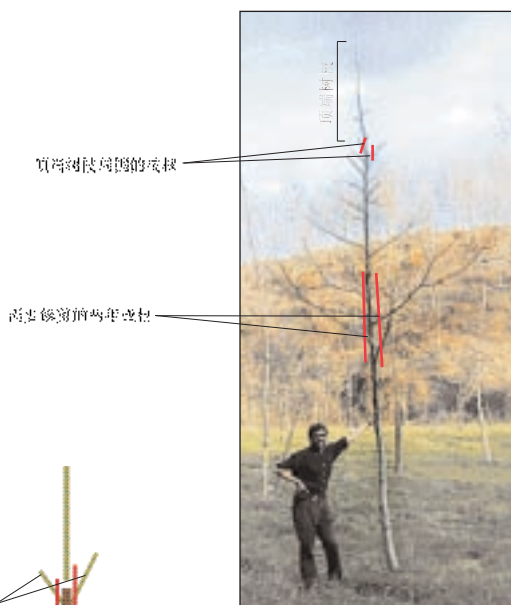
在此條件下，建議使用“重復剪接”，也就是說，在每次修剪后，  
枝條應長出枝條 的部份高度向上平行移動，

形成多次重復相同的結構特點，因為

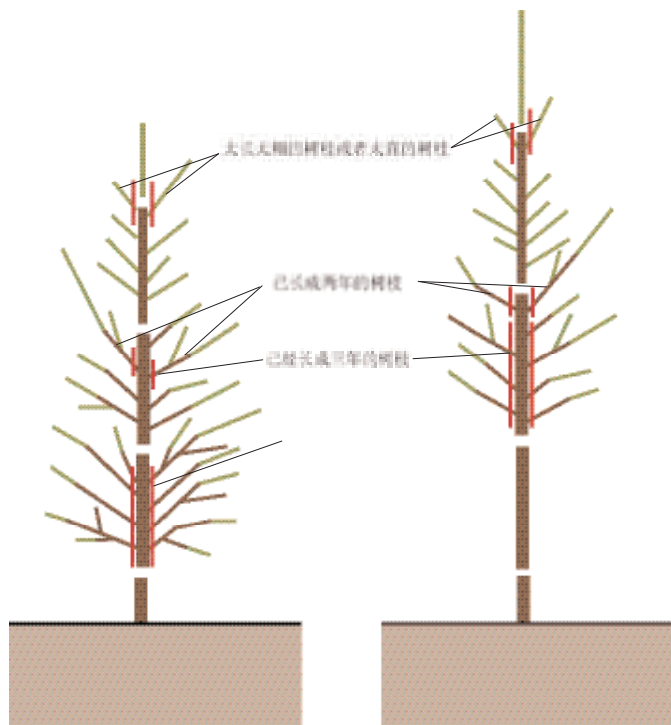
- 新枝部份在次年移動到去年的環狀樹枝部位。
- 如果樹木快速成長粗壯，在兩年的成樹樹干上會長出枝條。如果樹木長成較慢就需要兩到三年的時間。
- 樹干不斷增高但沒有發枝出現。



重复剪接能使树木长出许多小型枝杈。  
 为此目的，在冬末或是夏初时，  
 需要在以下枝节部位上进行剪接  
 顶端树枝周围的枝杈，  
 太长太粗的树枝或者不直的树枝，  
 已长成两到三年的树枝



运用“重复剪接”法  
 长成的核桃树，  
 需要进行再次剪接的树木



修剪三年成树缓慢的树木图示

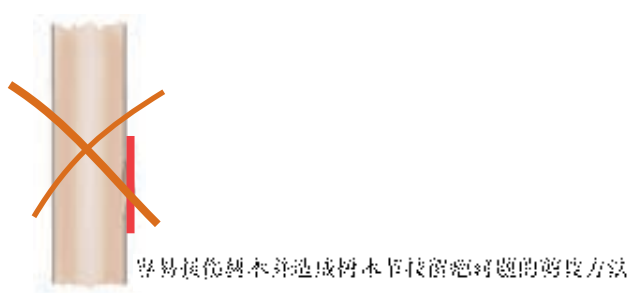
修剪五年成树较快的树木图示

# 2

## 第二阶段：标准剪枝的方法

怎样，按时进行剪枝

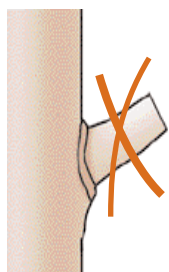
一年之中的不同季节，在核桃树上不同的部位进行剪枝，效果也不同：



如在夏初对核桃树进行剪枝，  
剪过枝干处一般就不会出现发芽的情况



如在冬末对核桃树进行剪枝，  
被可能在剪枝处出现一个或几个新芽的情况



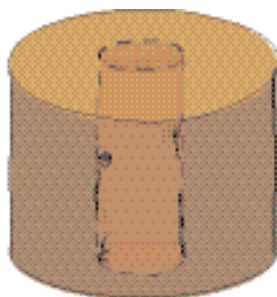
剪枝时如留有楔形窝干等枝节，以后木材就会因为有不合要求的节疤而降低其质量



剪枝要在树干直径长到 10 厘米以前进行，这样就可以保证把所有的节疤集中在树干最中心部位的圆柱体小范围内



直径 10 厘米



直径 40 厘米

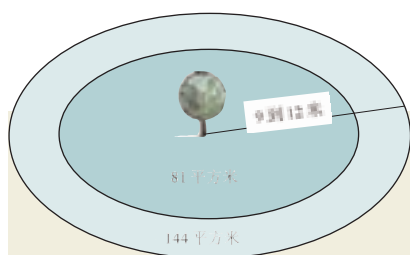


# 3

## 第三阶段：树木修剪与标准式修剪

目的在于使树木高效地生长

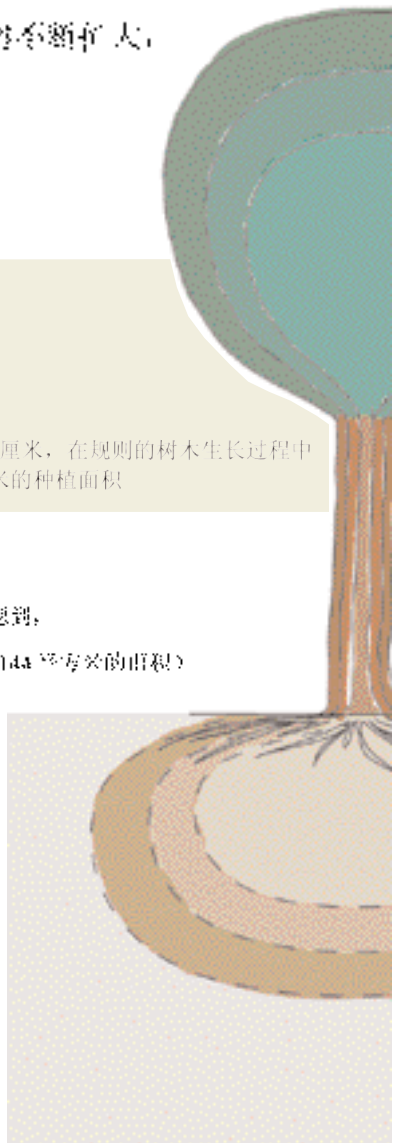
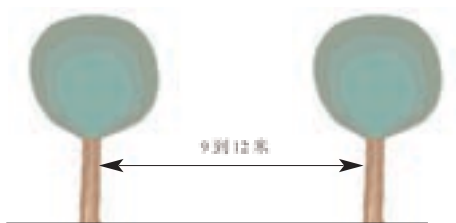
核桃树根部和树冠要求的生长空间随着时间而不断扩大，以此来保证树木全年生长的“关键化”



一棵快速长成的核桃树，树干直径要求为 30 到 40 厘米，在规则的树木生长过程中运用不同的剪枝方法，树木应需要 81 到 144 平方米的种植面积

生产一级核桃木料所需的空间面积可在种植时就能考虑到。

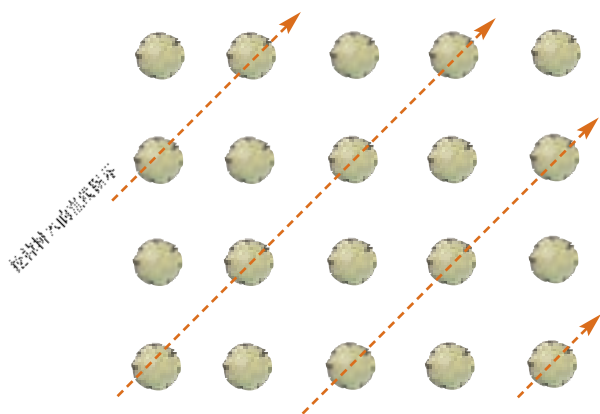
每棵树之间的 树间距在 6 到 12 米（也就等于需要给 81 到 144 平方米的面积）



級然桃櫟木材要求樹木切面年輪呈規則生長狀態



如果在種植桃櫟時，間距沒有達到5米，就必須在每株桃櫟的樹冠邊緣間隔相互鄰位的前兩年，挖掉相當于總數一半的樹木



## Wide-Importance Research Project 重要研究项目

Agroforestry: Agro-Alimentare, Ambiente | Scientific Responsibles

Involved Structures 有关机构名称 | 学术负责人

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#### Further reading

详情请查

[www.ibaf.cnr.it](http://www.ibaf.cnr.it)  
[www.arboricoltura.it](http://www.arboricoltura.it)



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