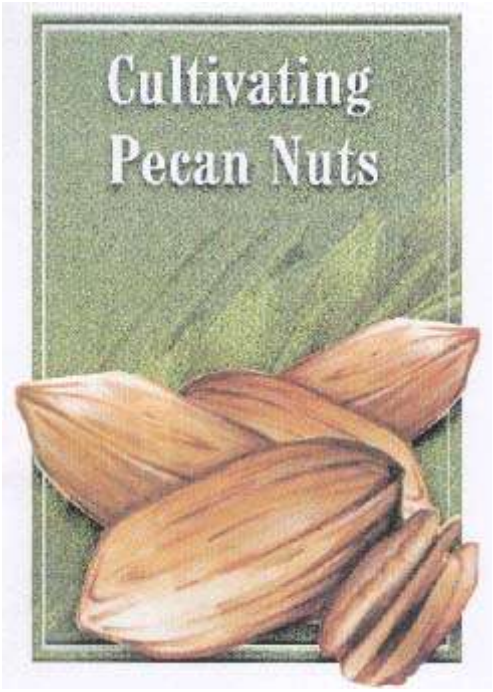
DEPARTMENT:AGRICULTURE



Cultivation of pecans

Pecan-nut trees are fast growers and can become very tall. The nut has a high nutritional value because it is rich in protein, vitamins, carbohydrates and nut oil.

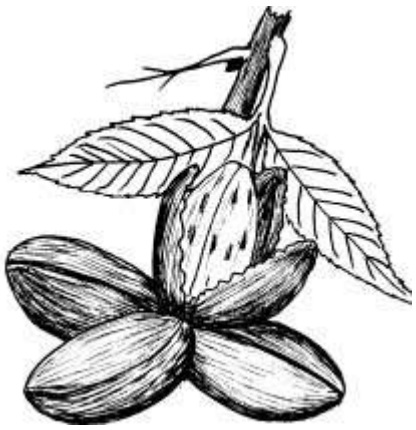
Nut size and kernel development

Factors causing poorly filled nuts:

- A general water shortage
- Limited carbohydrate reserve
- Early leaf-drop (caused by scab disease or inadequate fertilisation)
- Zinc deficiency
- General tree starvation
- Unfavourable climatic conditions such as cool summers

Climatic requirements

- The pecan-nut tree is well adapted to subtropical areas.
- It also grows well in areas with short, cold winters and long, very hot summers.
- Low temperatures and even frost during June to August are required for successful budding and flower formation.
- During the summer months (October to April) the tree requires high temperatures for fruit growth.
- Trees are successfully established in valleys and along rivers where the winter temperature is low and frost occurs.
- In the subtropical areas only cultivars that are tolerant to scab should be planted since humidity is very high along rivers, in valleys and in low-lying areas.



Temperature

The average monthly maximum temperature should be higher than 28 °C during summer and lower than 23 °C in winter.

The average monthly minimum temperature during the summer must rise above 16 °C, but drop below 8 °C in winter.

Humidity and rainfall

High humidity and rainfall are ideal for the development of scab.

The most suitable production areas are therefore those with short, cold winters and long, hot summers, with no early or late frost and a humidity below 55 % during the greater part of the growing season.

Soil requirements

The pecan-nut tree performs best in a fertile, well-drained, deep soil with a loose to medium texture.

Cultivars

To produce pecan nuts successfully and profitable, it is essential to plant cultivars that comply with the high standards concerning adaptability to an area, disease tolerance, production, kernel percentage, nut size and shape, appearance and taste of the kernels.

Tolerance to scab

- Scab is a fungal disease that can spread rapidly in areas with a high summer rainfall and humidity.
- It can be controlled with fungicides, but the long-term solution is to plant cultivars with a high degree of natural resistance to the disease.

The following cultivars are resistant to scab and can be produced in all production areas: Moore (Bester), Barton, Ukulinga, Shoshoni (also areas with a high rainfall and humidity).

Soil preparation

Examine the soil regarding depth, drainage and compacted layers.

- The soil should be at least 2 m deep.
- The physical suitability of a soil can only be evaluated by digging holes in the ground and examining the soil profile.
- If these properties are suitable for growing pecans, the soil should be prepared carefully and well in advance of planting.

Soil sampling

A representative sample of the proposed orchard must be taken for soil analysis. This sample should be taken 12 to 24 months, or at least 9 months, before planting. This gives the farmer ample time to thoroughly prepare the soil, particularly if large quantities of lime are required.

Method of soil preparation

If the soil is very acid, heavy lime applications may be necessary. In such a case two-thirds of the recommended agricultural lime must be distributed over the entire area 12 months before planting, mixed into the topsoil by disking, and then ploughed in as deeply as possible. Because calcium (lime) moves very slowly in the soil, it is essential to work it into the future root zone of the trees.

A cover crop can then be planted and ploughed in 6 months later. This will increase the organic matter content of the soil. The remaining lime and all the required phosphate must be applied and lightly worked in simultaneously. The trees can then be planted 3 months later.

If soil samples have not been taken early enough to proceed as described, two-thirds of the lime must be mixed with the soil and ploughed in deeply; the phosphate and the rest of the lime are then distributed and worked in lightly. If large quantities of lime are required, this must be applied at least 3 months before planting, thoroughly mixed with the soil and worked in deeply.

Planting

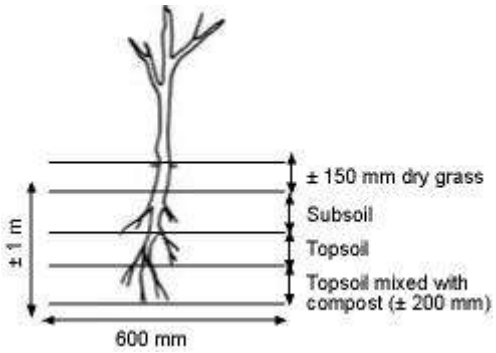
The pecan-nut tree is deciduous and can therefore only be transplanted during the winter. The best results are obtained when establishing orchards with trees planted during July and August.

Nursery trees

- The pecan tree has a long, strong tap-root system.
- The tap root has to be cut at a length of 1 m with a sharp spade. The tree should then be carefully removed from the soil and immediately taken to a shed or shady place. Cover the roots with wet sawdust or any other suitable damp material to prevent them from drying out.
- Inspect the trees carefully, and discard those with bent roots.

Planting in orchards

- Loosen the topsoil to a depth of 1 m before planting.
- The depth of the hole must be deeper than 1 m, or at least 200 mm deeper than the length of the tap root.
- Some loose soil should be replaced, so that the cut end of the tap root is in loose soil. This promotes vertical root growth during the first season of establishment.
- Well-rotted compost (plant material) can be added to the hole.
- Zinc fertiliser (22 % Zn) should be added (0,5 kg/ hole) and mixed well with the topsoil. No other fertiliser should be applied at planting.
- Plant the tree at exactly the same depth in the orchard as it was in the nursery. If it is planted too shallow, the root collar will be exposed to the sun, causing sunburn and eventual die-back or stunted growth.



Planting method

Aftercare

- Newly planted trees must be irrigated immediately. Thereafter, irrigation should be applied carefully, because too much water given before the tree starts growing, may cause the roots to rot.
- They should be treated against possible termite attacks by timeously destroying all termite nests in the vicinity.
- The trees should be white-washed to prevent sunburn damage. It is advisable to put a straw mulch around the base of the young tree for better moisture conservation and to protect the roots against high temperatures. After planting, the trees must be topped to encourage branching to form a framework. A height of 1 m is recommended.
- Inspect young trees regularly during the first season after planting.

Fertilisation

- Do not fertilise young, transplanted trees too soon. They must first become well established and start growing vigorously.
- The first application should only be made one year after planting. Never apply fertilisers against the stems of the young trees.
- Immediate irrigation is important.

Fertilisers

- Fertilisers should be spread evenly about 0,2 m from the stem to about 0,5 m outside the drip area of the tree.
- Each fertiliser application must be followed by a light, controlled irrigation. Fertilisers must not be worked in.

- Once the trees are established and start growing, fertilisers should be applied regularly according to the table.

Annual application of fertilisers for pecan-nut trees

Application	LAN	Superphosphate	Potassium chloride
g/tree/year Maximum application kg/tree/year	250 4,5	300 3	100 2

Time of application

- August: $^1/_2$ of the LAN + all the superphosphate
- October: $^1/_2$ of the LAN + all the potassium chloride

Zinc

Since most soils are low in zinc or the zinc is not available, this element must be added every year. Spray with 150 ml NZN or 200 g zinc oxide/100 l water when the leaf buds are 50 mm long. Repeat at least 3 times at intervals of 2 to 3 weeks. It may be necessary in some cases to spray as many as 5 times.

Boron

Many orchards are low in boron. The trees should be sprayed every 2 years with 100 g borax or 75 g Solubor/100 l water from the start.

Leaf and soil analyses

Soil and climatic differences as well as cultural practices greatly affect the quantities of fertilisation that have to be applied.

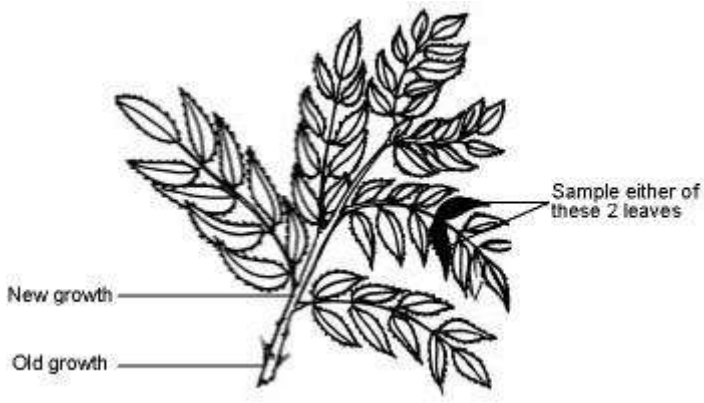
Soil and leaf analyses give an excellent indication of the actual requirements of a particular planting. If is therefore recommended that, when the trees reach fruit-bearing stage, full use be made of a soil and leaf analysis service. This will make it possible to obtain an accurate and complete fertiliser programme for every planting.

Leaf analysis

- Leaf analysis determine the concentrations of specific elements in the plant. Adequate, inadequate or excessive amounts of nutrients could be present in the plant.
- It is therefore possible to determine the nutrient status of an orchard and to fertilise accordingly.
- Limiting factors that must be taken into account are weather conditions, irrigation water and soil. In the latter case the most important requirements are usually good depth and drainage, correct pH and the absence of high salt concentrations in both the soil and the irrigation water.

Sampling

- Leaf samples should be taken during the first 2 weeks of January.
- The right leaf must be sampled (see figure). Sample 4 leaves per tree.
- A soil sample must accompany the first leaf sample.
- It is advisable to have soil analyses done every year.
- Leaves for analysis must only be taken from healthy trees and must be free of sunburn, deficiency symptoms, insect damage and disease.
- A leaf and soil sample must represent a planting of not more than 3 ha.



Pecan leaf sample

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Method

- Select about 20 trees, spread throughout the planting, that are homogeneous in appearance and are representative of the planting.
- Strikingly good or poor trees should not be sampled.
- The 20 pre-selected trees must be clearly marked, for example with a spot of paint on the stem. Leaf and soil samples are then taken annually at the same marked trees.
- The fertilisation programme can then be adapted according to the analysis results. Adjustments to the previous programme, according to leaf and soil analyses, can only be done effectively if the previous applications are known.
- A rational fertilisation programme for a specific planting can only be obtained if the leaf samples are analysed annually for a period of at least 5 years. The situation cannot always be rectified in a single season, since it is a gradual process.

Irrigation

Rainfall in South Africa is often insufficient and does not satisfy the water requirements of pecan-nut trees for optimal production. Additional irrigation is usually necessary during the critical growth stage.

The pecan-nut tree has a deep-tap root system, but for optimum irrigation purposes it will be adequate to supply the top 1 m with water.

Recommended wetting area based on tree age

Age (years)	Diameter (m) of wetting zone	Wetting area (m^2)
12	2,0	3
35	3,0	7
610	4,5	16

1115 15+	6,5 8,0	33 50

Pruning

Scaffolds

- To obtain a well-balanced tree, all scaffolds must develop evenly around the main stem, about 300 to 360 mm apart.
- Scaffolds must be pruned back during the second, third and fourth seasons. The primary bud is not removed so that the scaffold can continue growing upwards and outwards.
- Primary buds are only removed on the leader shoot to form scaffolds.

Summer pruning

- Scaffolds are pruned in summer (Nov/Dec) by removing 100 to 200 mm of the growth. This forces a branch to develop numerous lateral branches which can bear fruit during the same year in which they were pruned.
- Summer pruning dwarfs a tree and will increase production considerably during the first 10 years.
- After 10 to 15 years the producer can start pruning adult trees, especially if they begin crowding one another.
- The young tree must be shaped from the day it is planted.
- Control the growth that follows pruning.

Rejuvenation pruning

Many old trees with declining production and nut quality can be stimulated to more active growth and increased nut production by pruning. By completely pruning back a big tree, the production of 1 or 2 years is lost, but later new growth and the resultant increase in the production of nuts with improved quality compensate for this.

Growth regulants

A registered plant growth regulant will control excessive vegetative growth. This substance must be applied strictly according to the directions on the label. If pruned trees are treated, the concentration of the recommended dosage must be reduced by half.

Diseases

Scab

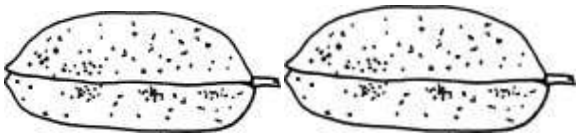
Scab is caused by a fungus and is the most important disease in pecan nuts in South Africa.

Early symptoms are the appearance of numerous small, brown to black spots, especially on the underside of the leaves. The spots become larger and merge until the entire leaf turns black. Immature leaves drop off.

Similar spots are visible on the shuck of the nut (see figure). Such nuts suffer from delayed development and they are misshapen. Immature nuts may drop off and have no commercial value.

The fungus winters on branches and old shucks that have dropped. Fungal spores rapidly develop in spring and are spread by wind and rain. New spring growth on the trees is infected when the leaf surfaces are wet, especially after rain.

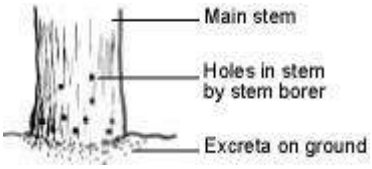
Susceptibility for the disease varies in different cultivars. Ukulinga, Shoshoni, Moore and Barton are regarded as highly tolerant, while Mohawk, Wichita and Chocktaw are susceptible.



Pests

Pecan nut stem borer

- This stem borer is sporadically observed on pecan-nut trees.
- The first sign of infestation is red-brown granular excretions around the base of the trunk. This discharge comes from the pink coloured larvae which have burrowed into the trunk and branches of the trees.
- The tunnels vary in size according to the age of the larvae and can be as much as pencil thickness. Numerous tunnels occur in a single tree trunk.
- Young larvae hatch from the middle of December until the end of February. The larvae reach their maximum size of approximately 40 mm during spring and early summer. At this stage the larvae become inactive and change into pupae in the tunnels. The pupal stage lasts approximately 6 weeks and it appears that only 1 generation occurs per year. The larvae remain in the trunk for about 11 months.



Damage caused by stem borer

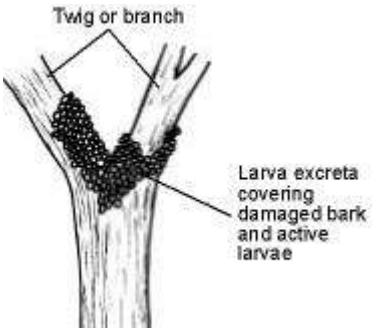
Control

- Good chemical control of the larvae in the tunnels can be obtained. By removing larval excreta around the stem just after spraying, the producer can later determine whether some of the tunnels were skipped during spraying.
- In young trees a piece of soft wire can be used to kill the larvae in the tunnels. This method, although primitive, is very effective and must be undertaken during winter when the tunnels and the excreta are more noticeable around the stem of the tree.

Bark borer

- Larvae of bark borer feed on the living bark of pecan-nut trees, especially in young plantings. They later bore into the hard wood.
- Penetration is usually where branches are formed and can occur in branches of any thickness.
- The holes in the branches that serve as shelter for the larvae, are about 70 mm long and 5 mm in diameter when the larvae reach maximum size.

- Feeding marks on the bark are covered with larval excreta spun together with threads in such a way that the larvae can move freely underneath the threads. As the larva feeds, this "house" of spun threads and excreta becomes bigger and could be found around a branch. Although infested trees do not die, the branch is ring-barked and it could die back.



Damage caused by bark borer

Control

- Good control can be achieved with a registered chemical, even if only the lesions on the branches are treated.
- It is not necessary to remove the excreta from the branches before spraying.
- Spraying of the entire tree is not recommended.

Parasitic plants in pecan-nut trees

Parasitic plants, *Tapinanthus* spp. (bird-lime), occur in most pecan-nut producing areas of South Africa. These plants have no root system and parasitise the host plant. They debilitate the tree and reduce the bearing area.

The plants, with their red and yellow flowers, are easily seen in the tops of pecan trees, especially during winter and September.

Control

There is no chemical control method for these parasitic plants. The only way is to prune the parasitic plants. The branch on which the bird-lime grows must be cut off and removed from the orchard.

Harvesting

Depending on the area, pecan nuts usually ripen from April to July. As soon as the nut is physiologically ripe, the green husk becomes dry, cracks open and the nut drops out.

In South Africa the nuts are mainly collected manually from under the trees.

A certain percentage of the nuts, for various reasons, do not drop. These nuts are called stickers and must be shaken from the trees. If a very large percentage of the nuts are stickers, it may be because of poorly filled nuts, scab or other factors such as irrigation and fertilisation.

Storage

The nuts can be stored at room temperature for as long as 6 months before they are marketed. Shelled nuts realise a much higher price than unshelled nuts, but the processing equipment is very expensive and most producers market cooperatively or through a processor. After processing the nuts are usually packed in vacuum-sealed packages, which means that they can be stored for a very long time.

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