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MECHANICAL PRUNING OF WINE GRAPES

1. ORIGIN AND DEVELOPMENT OF MECHANICAL PRUNING

Hand pruning is labour and cost intensive and along with it, capable and productive pruners are becoming increasingly scarcer, due to urbanisation. As a result the pruning process of vines abroad is becoming increasingly mechanised. Even here in South Africa more and more vineyards are being designed for mechanical pruning and it is already practised on a large scale in areas such as the Breede River Valley.

1.1 General guidelines for pruning:

- Pruning is, besides harvesting, the most labour intensive practice on a wine farm.
- Pruning, however, can take place over a longer period than harvesting – from leaf drop to budding, often a period of five months.
- Pruning is divided into different actions, such as pre-pruning, clean pruning and final pruning, which are applied at different times.
- These actions can be performed in different combinations or as one process, simultaneously.
- There is an old saying: “prune early prune wood, prune late prune fruit”.
- In cultivars which are susceptible to delayed bud break, it is advisable to prune late, and simultaneously to clean prune and final prune.
- There are producers who pre-prune and clean prune early, and then do final pruning late, just before budbreak. This combination of actions cause the water shoots to bud first as the buds on the spurs are still dormant; even untrained labour can then be used to sucker away everything which has already budded.
- All the abovementioned pruning actions require trained labour and the scarcity thereof means that all these guidelines cannot always be applied timeously.

1.2 Mechanical pruning in South Africa:

- In the warmer and higher producing viticultural areas of South Africa, mechanical pruning is becoming quite common. In the cooler and less vigorous viticultural areas, use is mainly made of mechanical pre-pruning only.
- The mostly good quality soil with irrigation and resulting strong vigour in areas like Orange River, Olifants River, Bredekloof, Worcester, Robertson and the Little Karoo, make the vineyards in these areas extremely suitable for mechanical pruning.

- Partial mechanisation of pruning such as the use of pneumatic and battery pruning shears is also applied locally.
- Pneumatic shears have the disadvantage that the compressor supplying the pressure must be connected to a tractor, which in the winter rainfall areas can result in adverse soil compaction. In addition, the speed at which the tractor moves forward is dictated by the pruning tempo of the slowest pruner in the team. Another disadvantage of the system is that when the trigger of the shears is pulled, it cannot be stopped. Fingers and wires can thus fall victim to the shears.



Figure 1. Mechanically pruned vineyard. (Photo: Robert Stolke)

- Battery shears which are worn on the body of the individual pruner and are charged overnight, are currently very popular. Every pruner can therefore dictate his own pace. A further advantage of the electrical mechanism is that the pruner has control over the cutting action. As soon as resistance such as a wire is detected, the trigger can be released, which prevents damage. Some producers send people ahead with these shears to trim the thick canes and arms which are hard to cut with hand shears. These shears are also becoming more popular, as they increase the productivity of the pruner by 40 %.
- Trials in South Africa have shown that alternative pruning methods such as mechanical, minimum and non-pruning have resulted in great savings on the cost of labour and have thus considerably decreased the production costs of wine grapes. The vigour of all the cultivars in the three different trials was weaker. However, although the berry mass, volume and bunch size in all the alternative pruning systems were smaller, there were more bunches, which increased the production, compared to the hand pruning treatment. The quality of this higher production was the same and even better. However, there are cultivar differences. Cabernet Sauvignon, Pinotage and Chardonnay adapted best to the alternative pruning methods. On the other hand, Sauvignon blanc and Merlot adapted less well – they prefer cooler ripening conditions. The performance of Chenin blanc, Colombard, Shiraz and Ruby Cabernet was acceptable. This makes them good candidates for alternative pruning, especially if the economy is taken into account.
- With these pruning systems it was also found that the trellis posts should not be more than 6 metres apart. Due to the greater amount and smaller size of bunches, this system also requires mechanical harvesting.

1. 3 Mechanical pruning in the rest of the world:

- About 65 % of Australian wine grapes are pruned mechanically. Originally wide movable trellising systems of 0.9-1.2 m wide were used, which were harvested with vertical harvesters using a shaking action. Because these systems were not well adapted to mechanical pruning, they were later converted to trellis systems with vertical shoot positioning. They were replaced with a high single wire, small T system or a high double wire vertical training system with two or even four lateral cordons. The height of the cordon wire is a minimum 1.2 m above the ground and often two cordon wires are used together to carry the greater weight of the system.
- Mechanical pruning in Australia is limited to two types:
 1. Hedge pruning – where the vine is pruned in a horizontal and vertical plane relatively close to the cordon. This action can be propelled by a to-and-fro Pitman action (lucern cutter) or by circular saw blades driven by hydraulic motors. In this case about 120 to 500 buds are allowed per vine. It is in many cases followed up by a hand cleaning action which according to literature is unnecessary.
 2. Minimum pruning – with a high (≥ 1.2 m) one or two wire vertical system. With this method the winter shoots are cut back 30-40 cm above the ground (often just above the dripper wire) to ease mechanical harvesting. In this case between 1 000 and 1 500 buds are allowed per vine. The length of the bearers varies from very short spurs to long bearers of 1-14 nodes.
- There are Italian systems which can be fully mechanically pruned without using any hand actions. The double curtain and COMBI systems are examples thereof. The so-called free cordon and classic short bearer cordon can both be pruned mechanically. Vineyards which are not mechanised, require 400-500 man hours/ha per year, of which 80-90 % is spent on harvesting and pruning. In contrast, in more modern cultivation systems, 300-350 man hours/ha per year are required of which 60-70 % is utilised for harvesting and pruning. Full mechanisation of harvesting and pruning decreases the hand labour required to only 50 man hours/ha per year and then an additional 100 man hours/ha per year is required for suckering, leaf thinning and bunch thinning.