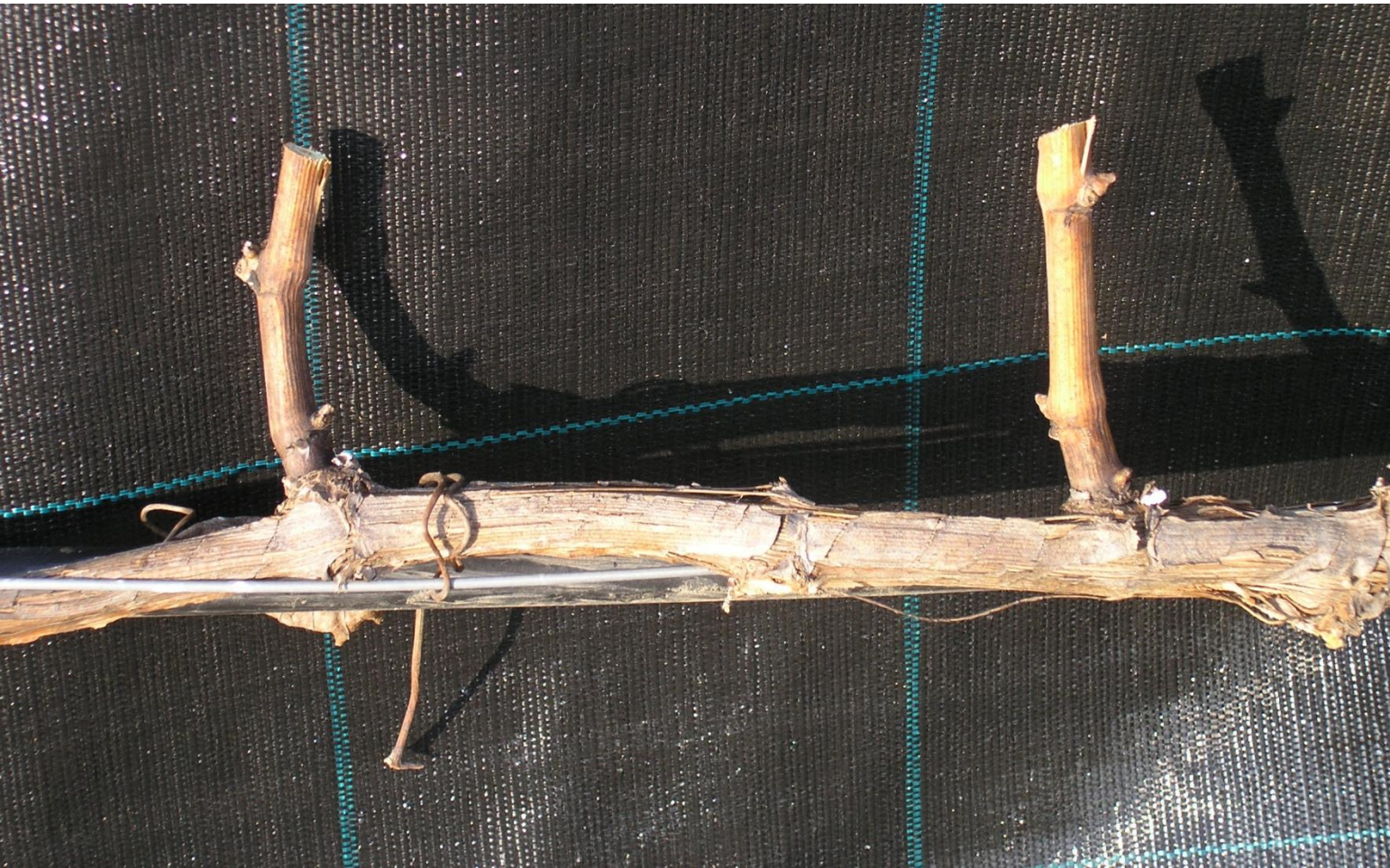
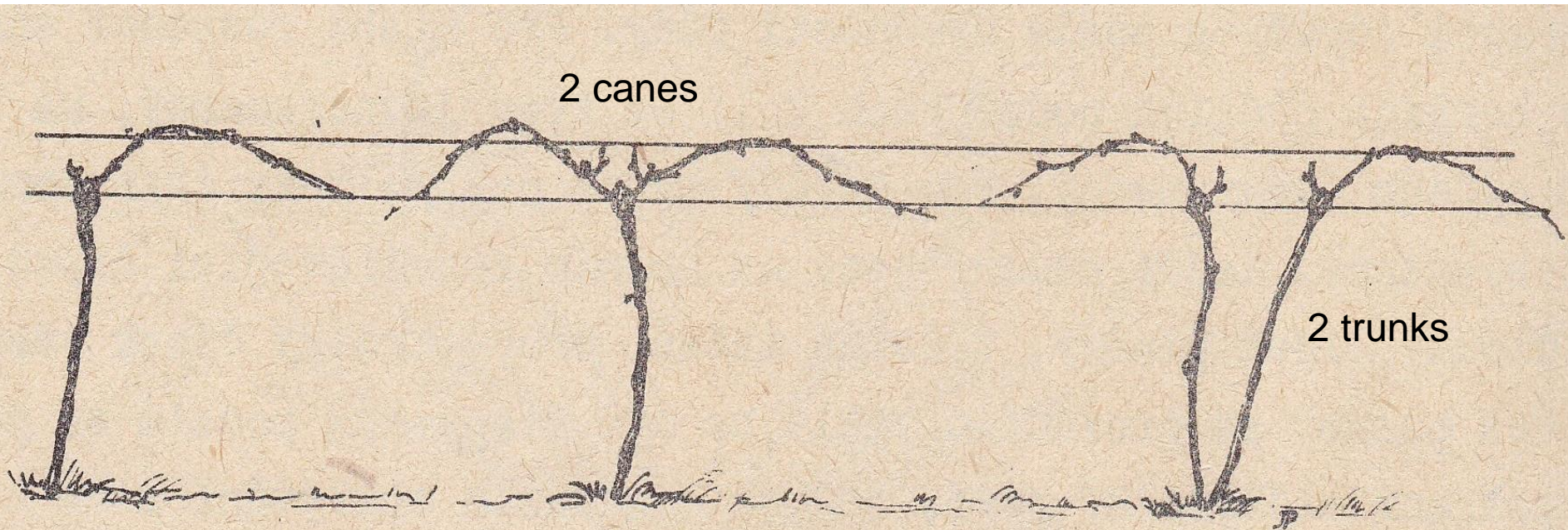


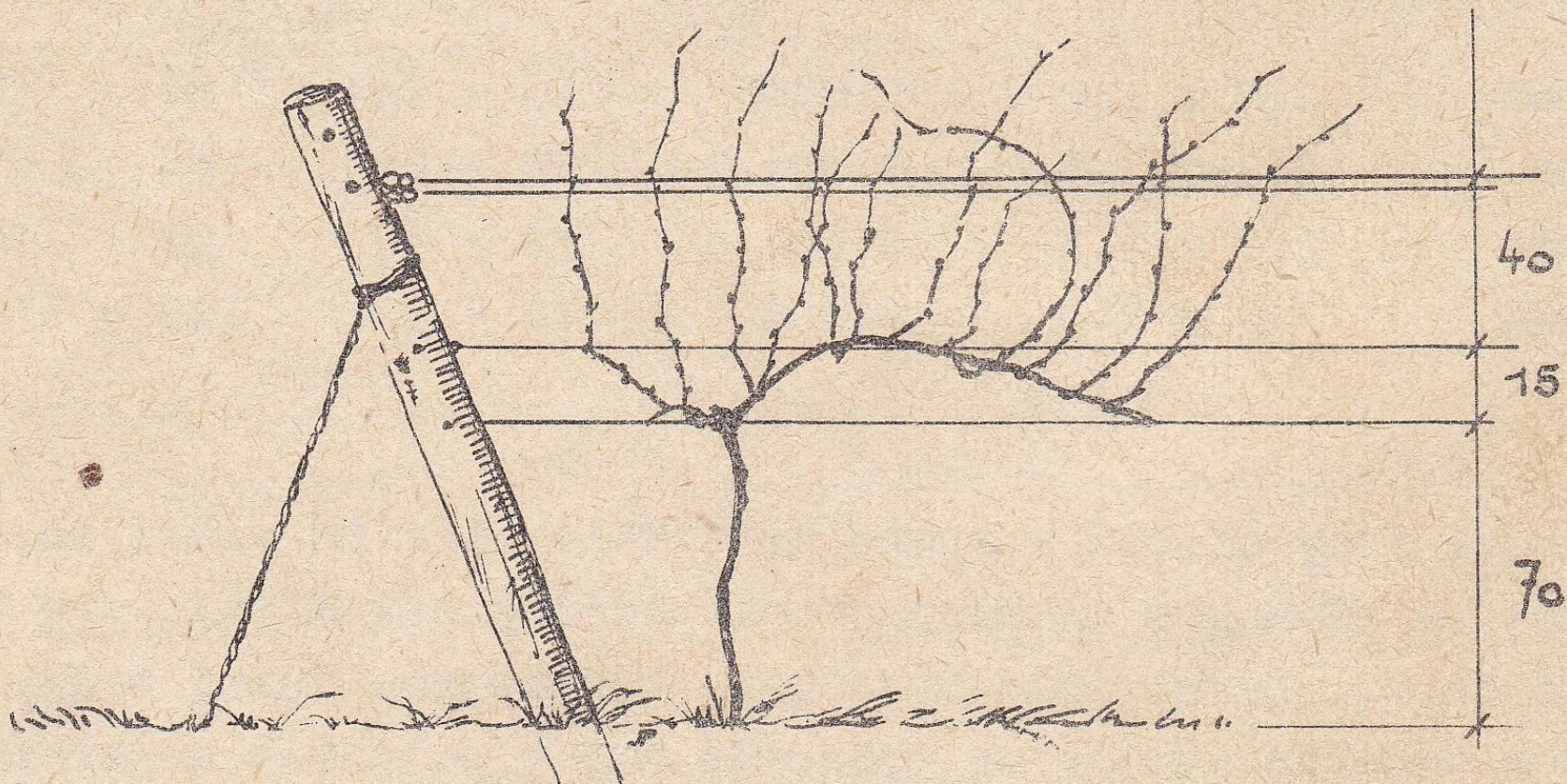
- Leave short spurs on the cordon
  - Remove every other annual shoot in varieties with short internodes (Sauvignon)



## Modifications to a Rhine-Hessen training system:

- Two canes and two 2-bud renewal spurs; every cane is trained to a different side
- Two trunks may be established for vigorously growing varieties











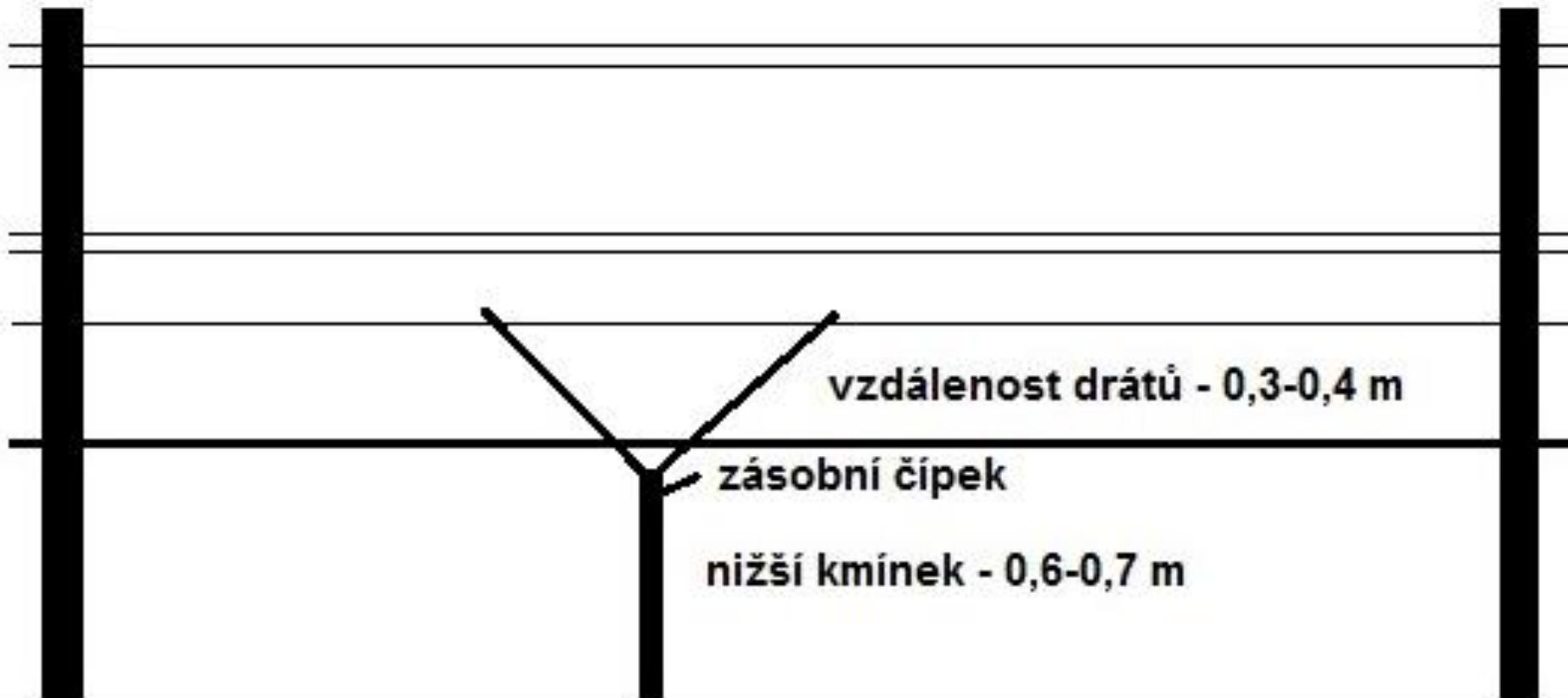






# Fan-shaped cane training

- Cane-pruned training, less tedious
- Two fruiting annual shoots with 4-6 buds + renewal spurs
- Mechanized preliminary pruning – costs saving
- Fruiting wood is not bent, only tied to the wires; this reduces risk of cane breaking





## Mechanized preliminary pruning





Additional manual  
pruning

Tying to the wires



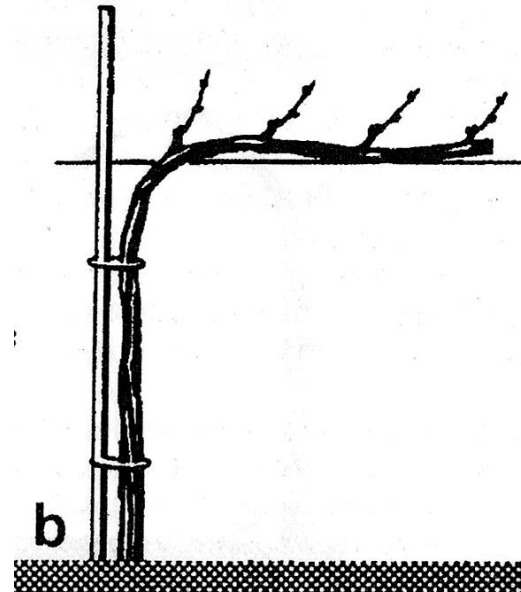




4

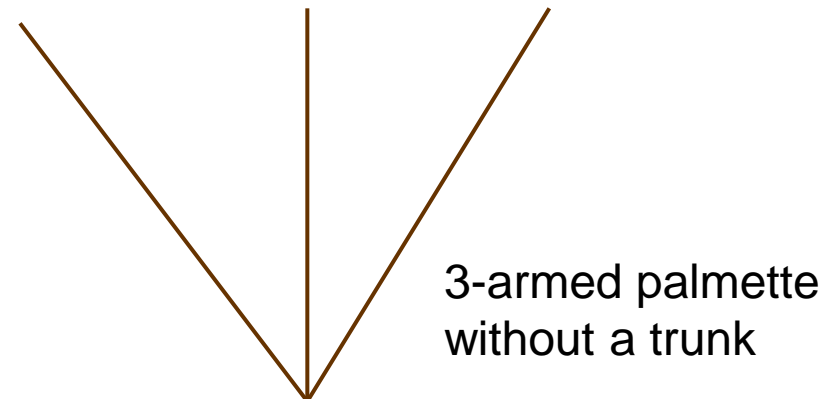
# Cordons

- Trunk and arm; cordons are classified according to the arm shapes
  - Horizontal
  - Semi-upright
  - Vertical
- Drawback: Too much old wood
  - Old wood must be renewed often
  - Too many cutting wounds
  - Yield drops



# Palmette

- Palmettes with no trunk, or with a 1 to 6-armed trunk
- Fruiting spurs:
  - Each fertile vine shoot has a renewal spur (for the upcoming growing season)
- Benefits: Optimum growth of vine shoots in the space





## HIGH TRAINING SYSTEMS

- Trunk height: More than 0.8 m, max. 2 m
- Trellis
- Spacing: 3.0-3.5 m x 1.2-1.3 m
- Vines per 1 ha: 2,400-3,300 pcs
- Vineyards with thin spacing and high trained vines
- Unsuitable for less vigorous varieties
- Good supply of water and nutrients
- Wide interrows allow for mechanization
- Mechanization decreases costs of manual work
- Green manure substitutes farm-yard manure

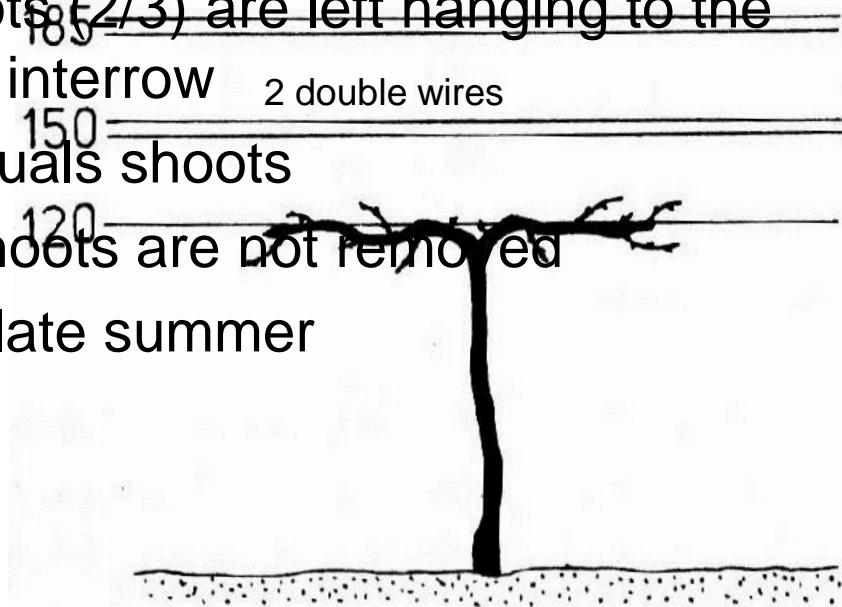
- Less manual work; limited use or complete elimination of:
  - Bending and tying of fertile vine shoots
  - Bending of annual shoots along the double wires
  - Removal of lateral shoots
  - Tipping of shoots in late summer – shortening of annual shoots
- Increase in trunk height decreases grape quality
  - Lower sugar content
  - Higher acid content

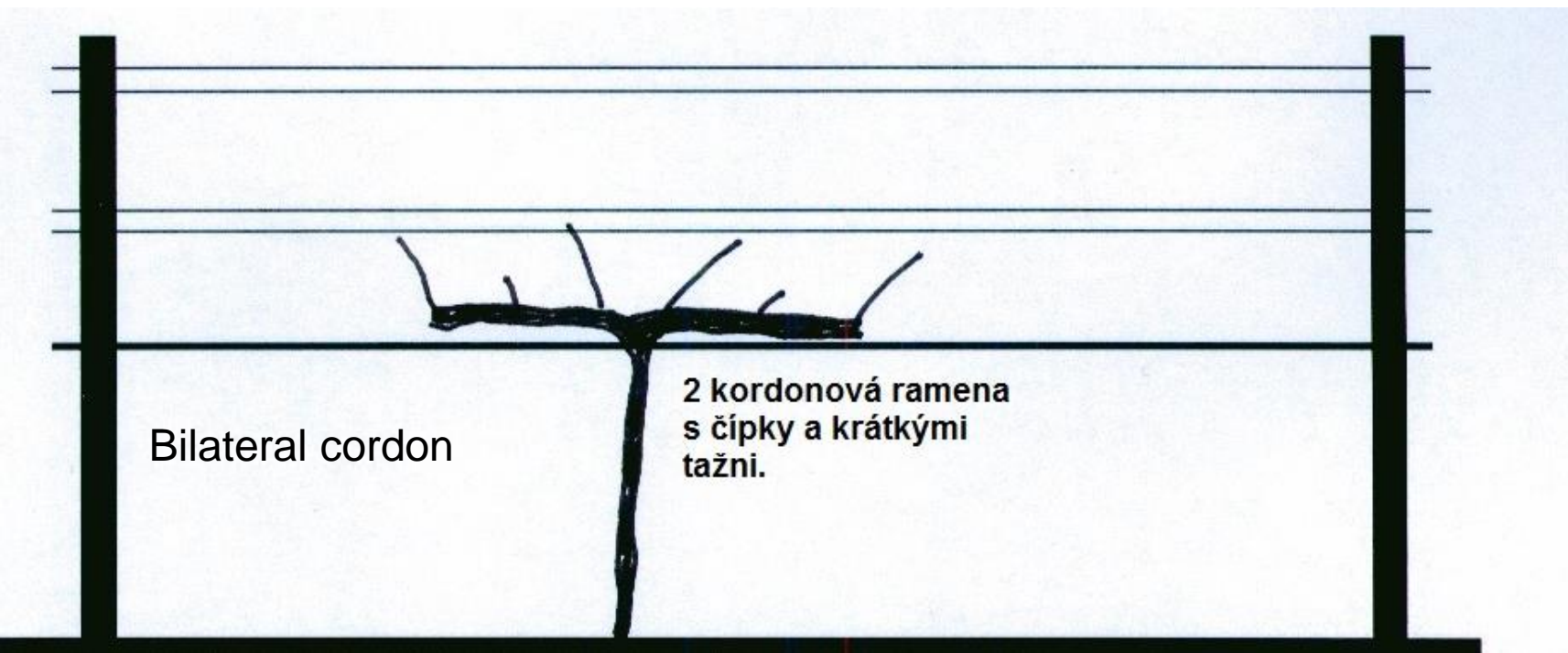
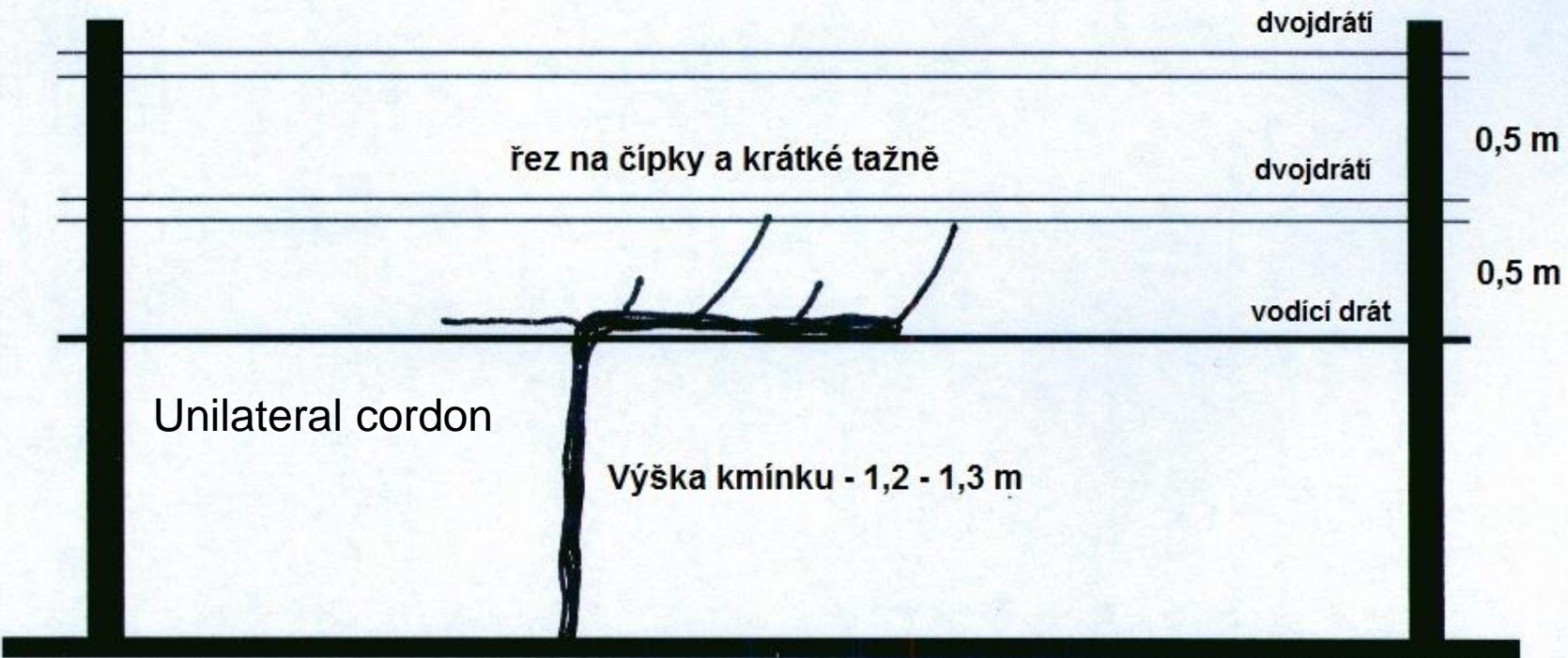
## High training systems classification:

- Cordons
- Palmettes
- Pergolas
- High training system was implemented in Czech viticulture in 1950s as the so called Moser high culture training

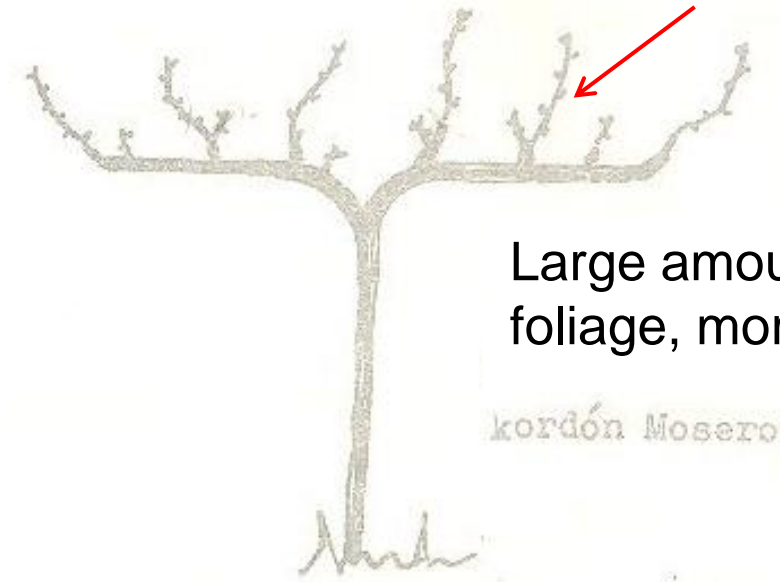
## Moser high training system

- Austria, winemaker Lenz Moser
- High training, unilateral or bilateral cordons with a trellis
- Support wire is 110-130 cm high, two double wires above the support wire, 35 cm apart
- PRUNING: Each fertile 5-bud spur retains a 1-2-bud renewal spur, semi-long cane at the end of the cordon (7 buds)
- Fertile vine shoots are not tied
- Only annual shoots growing upright above the cordon are tied to the double wire (1/3), other annual shoots (2/3) are left hanging to the left and right off the vine into a wide interrow
- Desuckering of all unnecessary annuals shoots
- Lateral shoots growing on annual shoots are not removed
- Annual shoots are not shortened in late summer



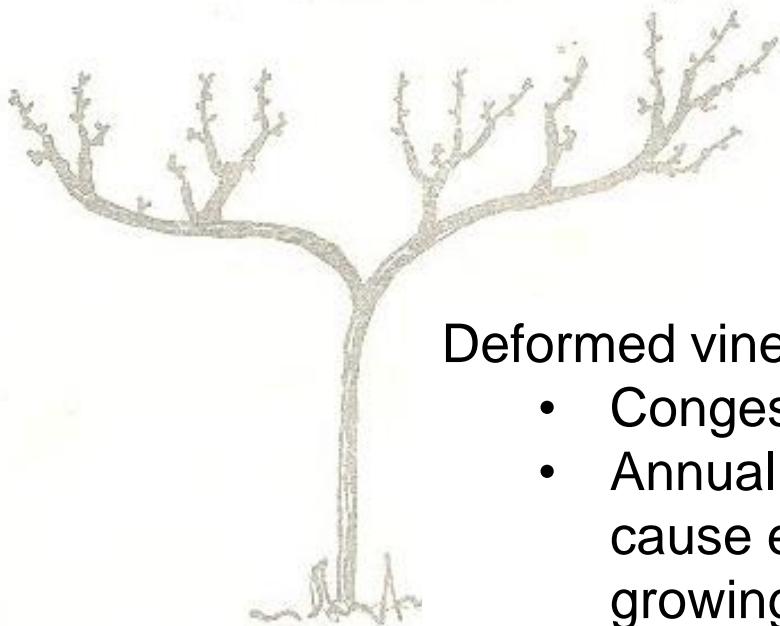


5-bud spur with a 2-bud renewal spur



Large amount of old wood, dormant buds break, thick foliage, more cutting wounds on old wood

kordón Moserova vedení



Deformed vine after several years of training:

- Congested canopy
- Annual shoots growing from renewal spurs cause excessive shading to annual shoots growing on fertile spurs and semi-long canes
- Fruiting wood on cordons grows and congests the vine

## Modifications to commercial cultivation of high training systems:

- Unilateral cordon with a regulation cane
- Unilateral cordon with improved Sylvos pruning
- Cordon renewal pruning

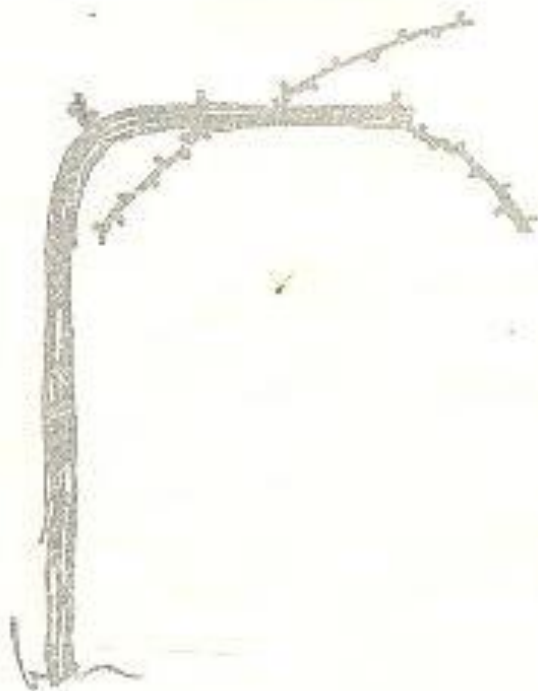
## Unilateral cordon with a regulation cane

- Unilateral cordon provides for better vine growth and productiveness
- Cordon cannot be too long, optimum: 0.4-0.5 m
- Vines bear fruits on semi-long spurs

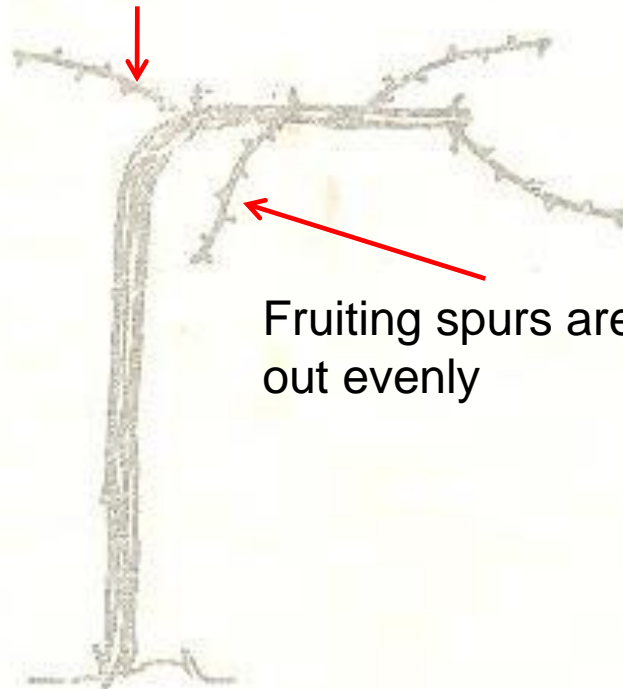




# Unilateral cordon with a regulation cane



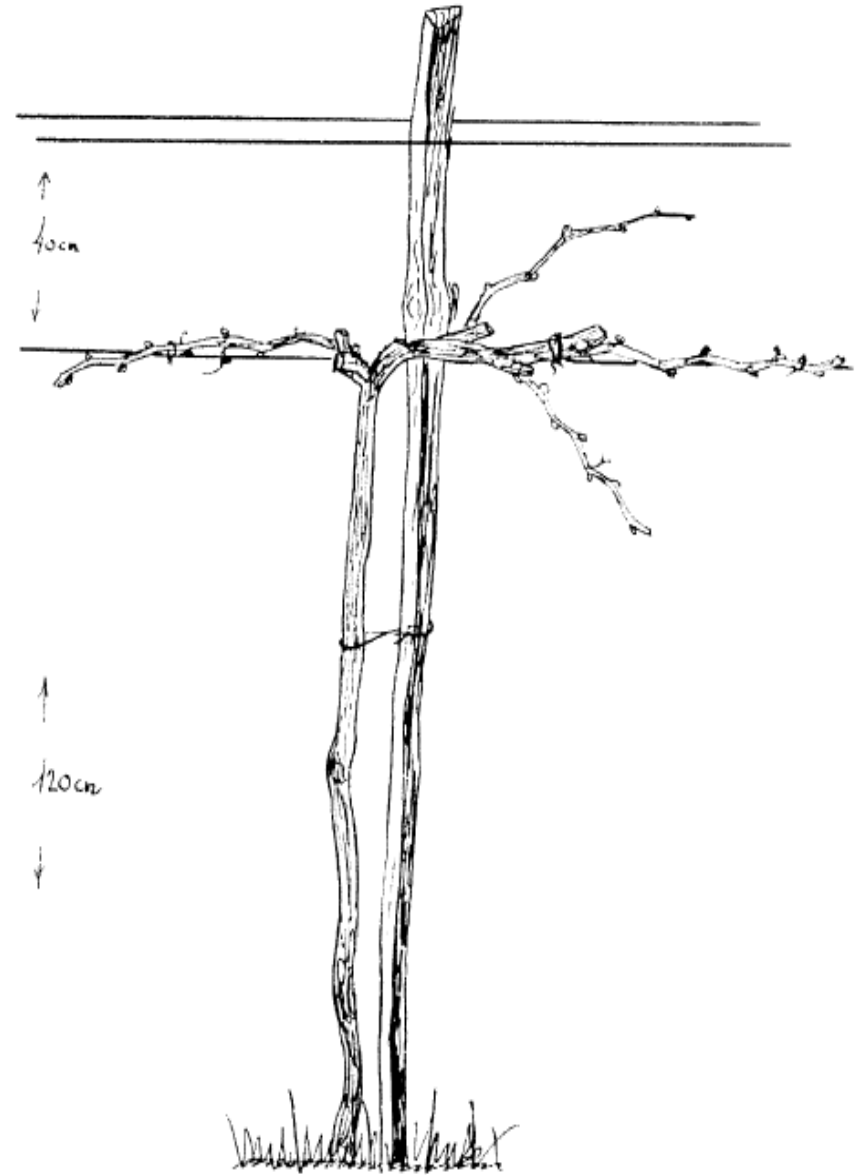
Regulation cane grows in an opposite direction to the cordon



Fruiting spurs are spaced out evenly

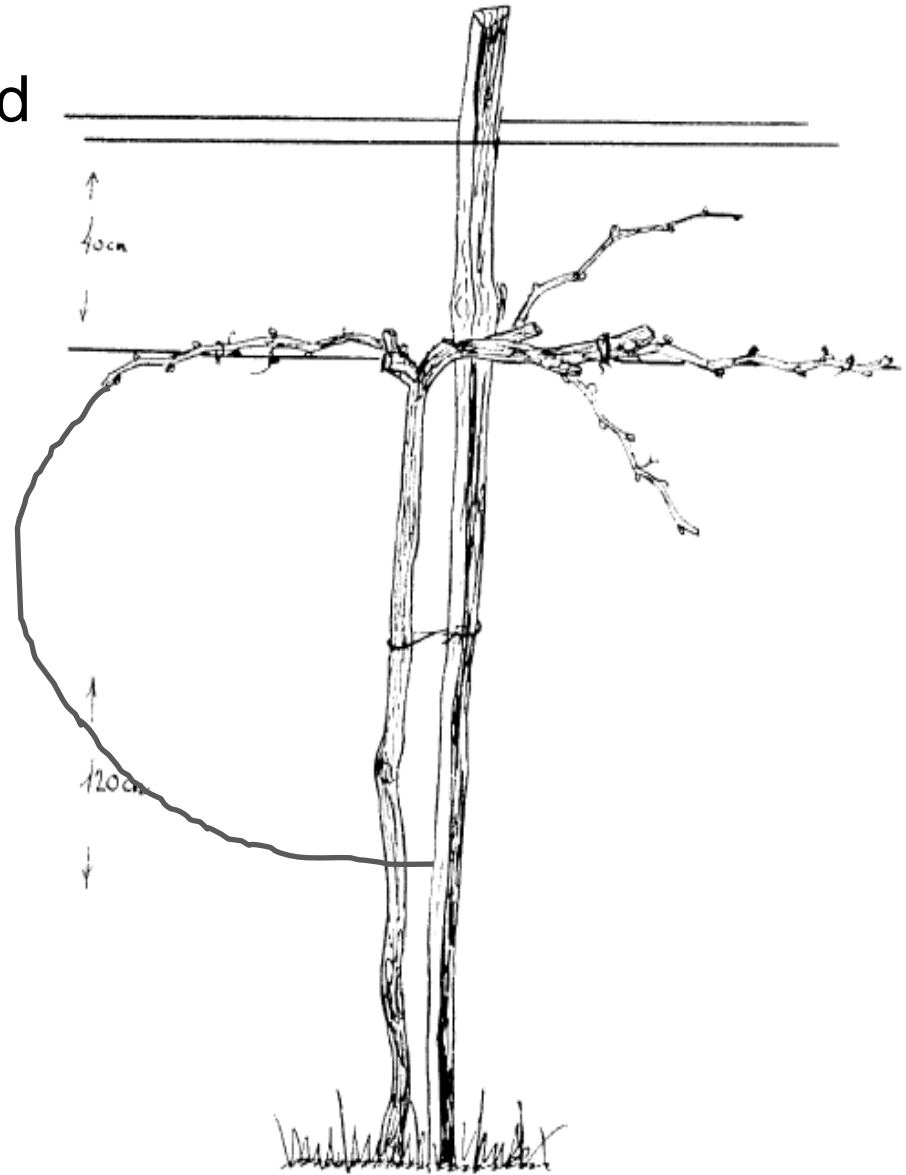
## Optimum (medium) vine vigour

- 4 semi-long canes: 3 canes grow alternately to the left and to the right on a horizontal cordon, slightly bent to the ground or in a horizontal position; the fourth, regulation cane grows in an opposite direction to the cordon and is tied to the wire support, a renewal spur grows close to the regulation cane
- 3 semi-long canes have 1-2 renewal spurs with 1 bud, and are located on the upper side of the cordon



## Vigorous vines

- Long cane is retained instead of a semi-long cane, and is bent downwards and tied to the trunk



Less vigorous vines

No regulation cane (fourth cane), only a renewal spur

Benefits of a unilateral cordon with a regulation cane:

- No need to tie the fruiting cane to the wires after pruning
- Semi-long canes are left to grow freely
- Suitable for the following varieties: Muller Thurgau, Green Veltliner, Welschriesling, Chasselas blanc, Chasselas rosé, Portugal, Panonia Kincse

## Cordon renewal pruning

Vine Institute at VŠZ Lednice na Mor.: Renewal pruning for old cordons trained in the Moser system

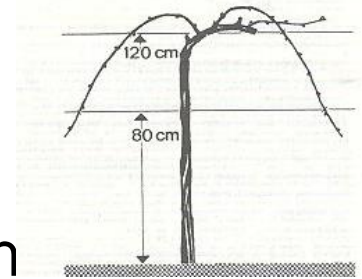
Trunk height: 1.2 m

Short cordon: 0.15-0.20 m

Two long canes and renewal spurs at the cordon

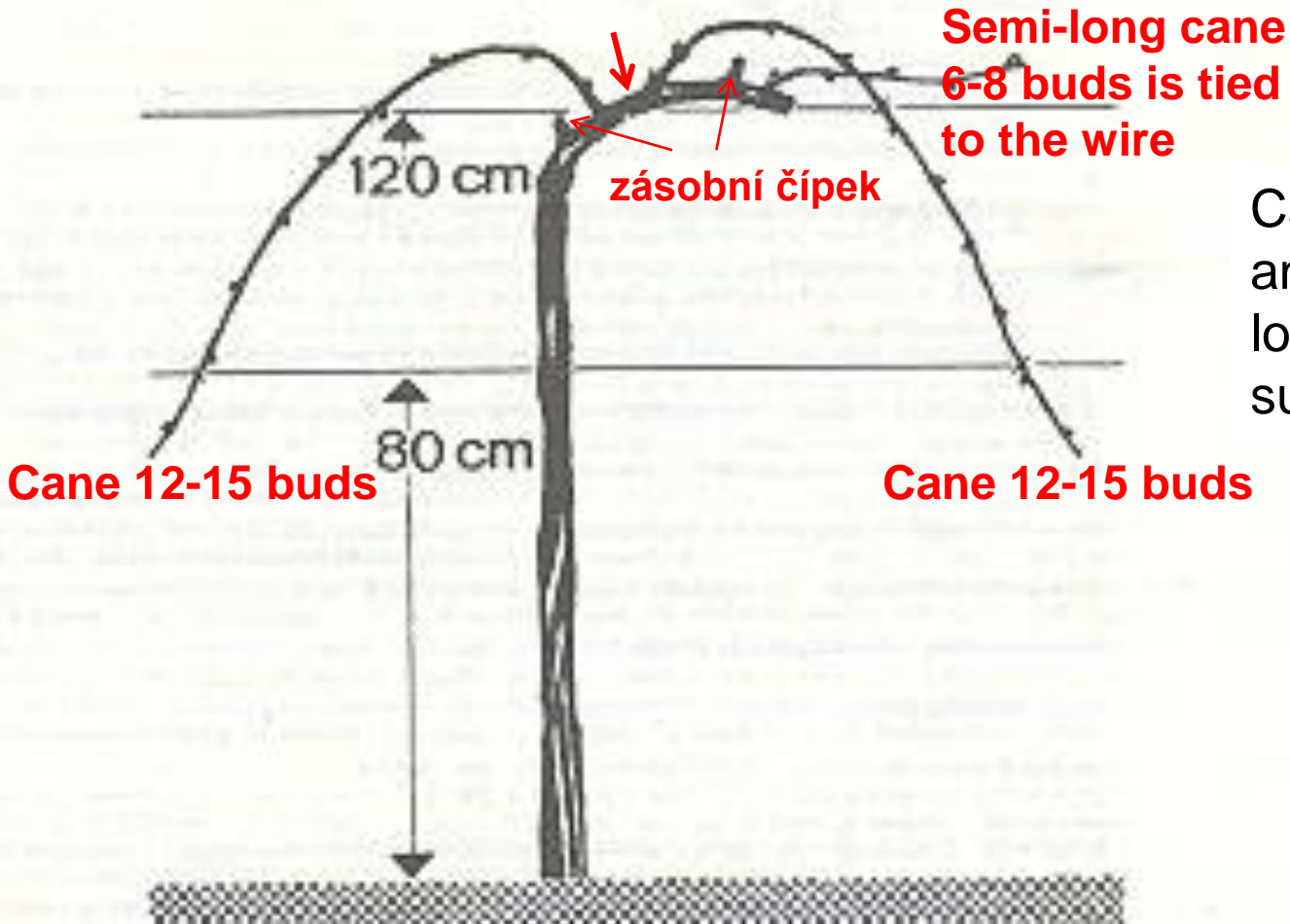
At the end of the cordon: Third semi-long spur (with a renewal spur) which is shorter and is trained horizontally to the support wire at 1.2 m

Trellis wire is located 0.4 m below the support wire, two long canes are trained down to the trellis wire below the cordon



# Cordon renewal pruning

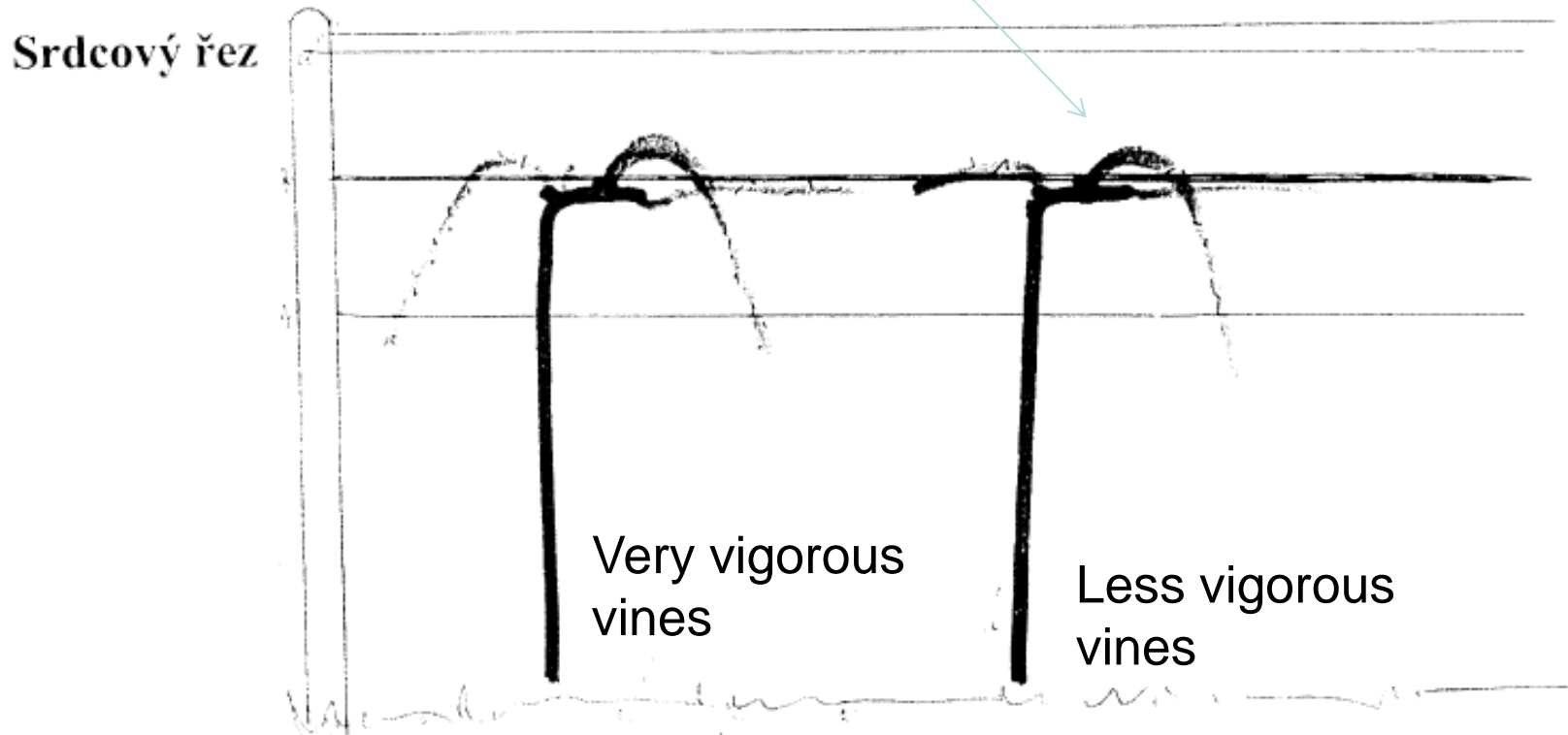
Short cordon: 0.15-0.20 m



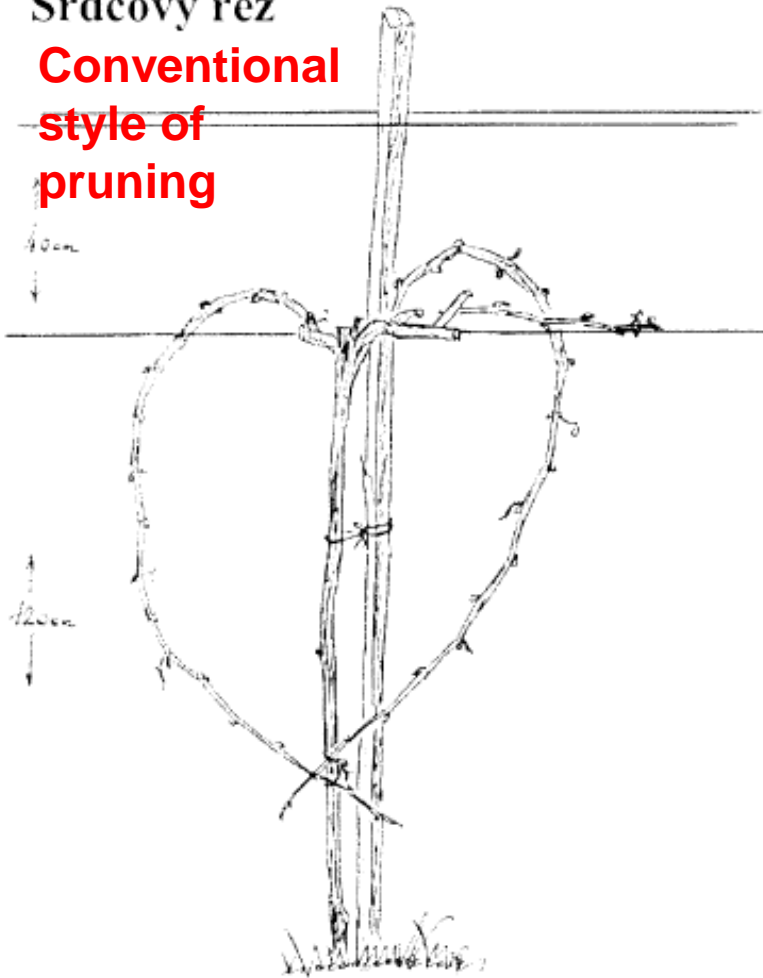
Canes are bent down and tied to the wire located 40 cm below the support wire

Cordon renewal pruning allows for good growth and productiveness control by adequate loading and cane training:

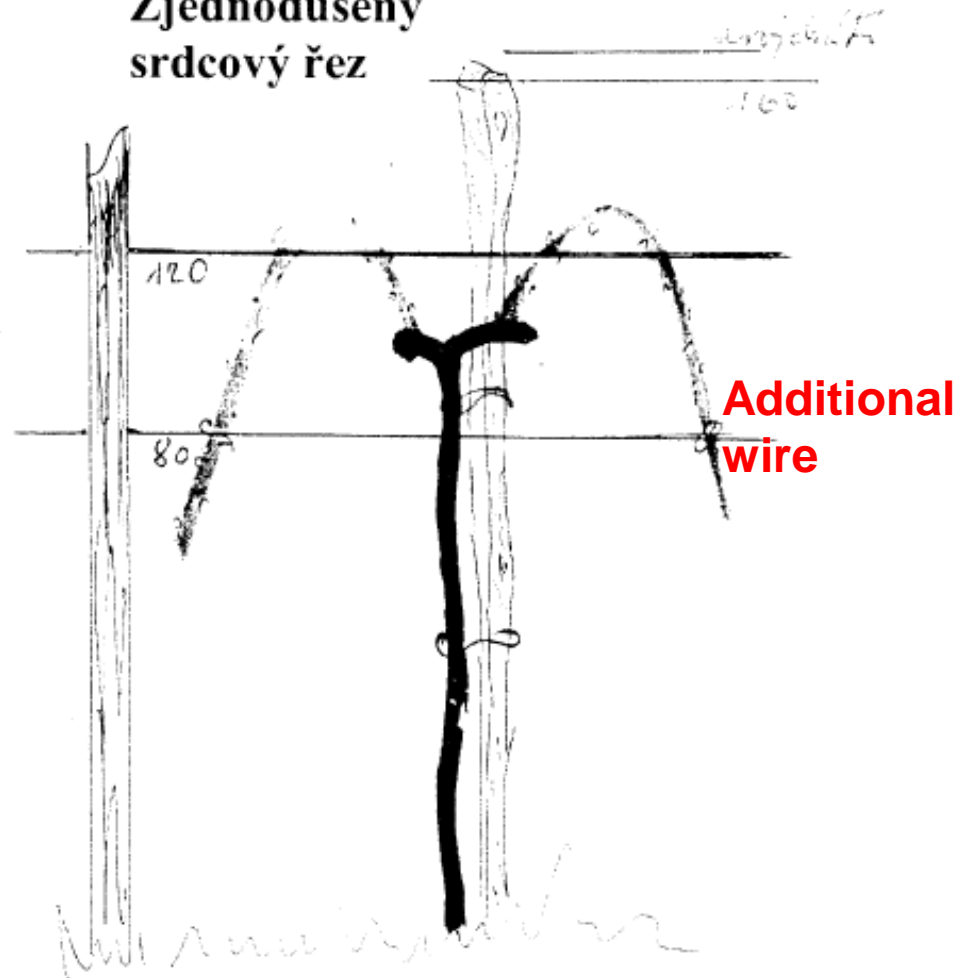
- Less vigorous vines: Two semi-long canes are trained horizontally and only one cane is trained downwards
- Vines with lowest vigour are trained with only two horizontal semi-long canes



Srdcový řez  
**Conventional  
style of  
pruning**



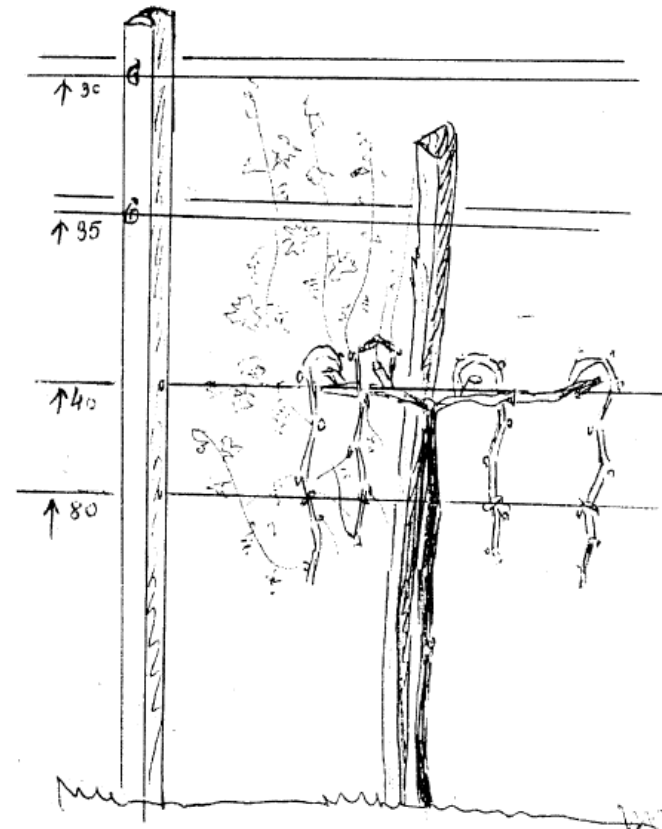
Zjednodušený  
srdcový řez





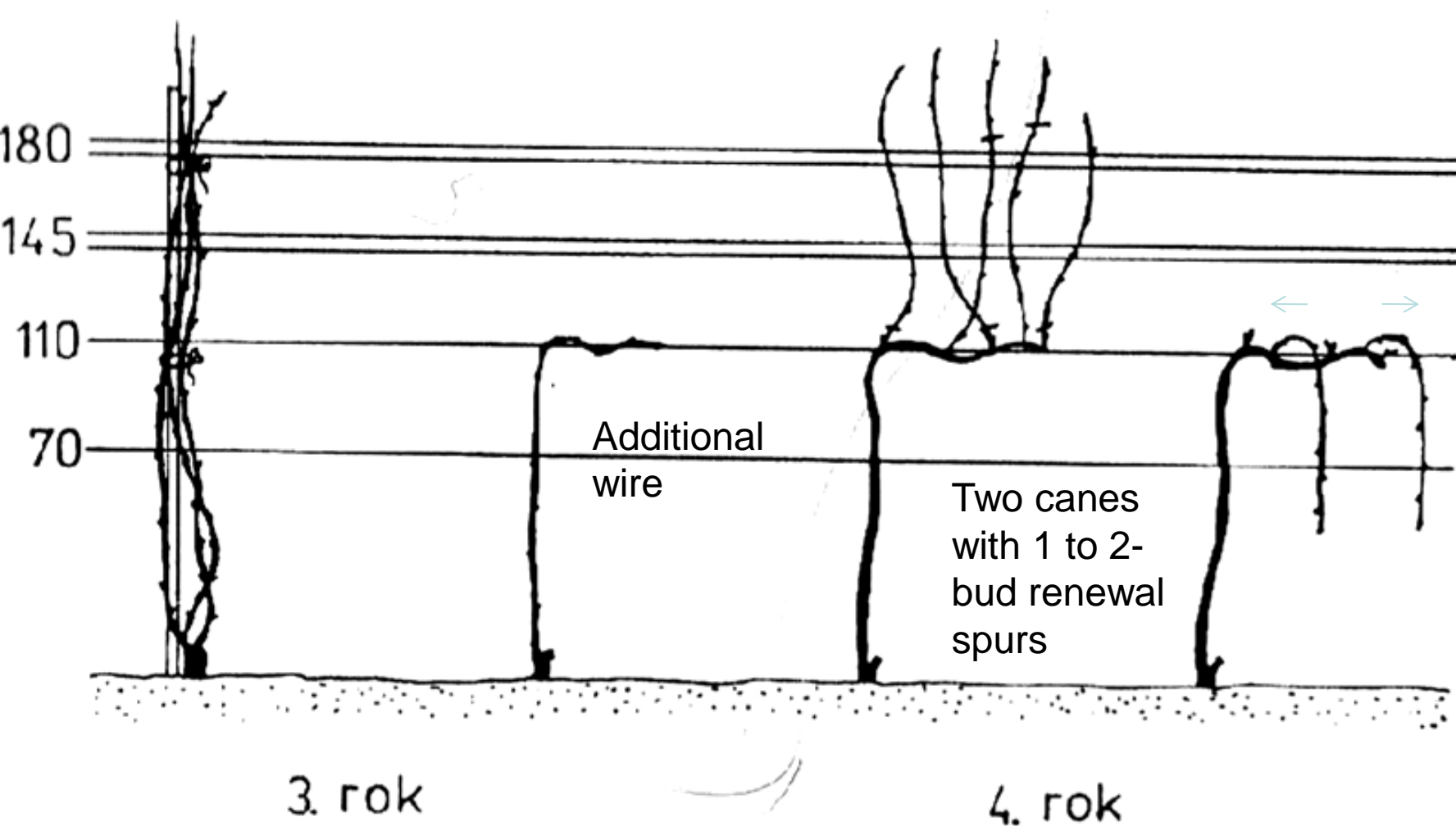
## Unilateral cordon with Sylvos pruning

- Savoy region: France, protection against spring frosts
- Unilateral, horizontal, long cordon: Several parallel canes, 0.30 m apart
- First, canes are trained upwards, terminal buds break (no risk of spring frost damage), lower buds break only a bit, and therefore are not damaged
- After spring frosts are over, canes are trained downwards below the cordon - this suppresses terminal buds growth



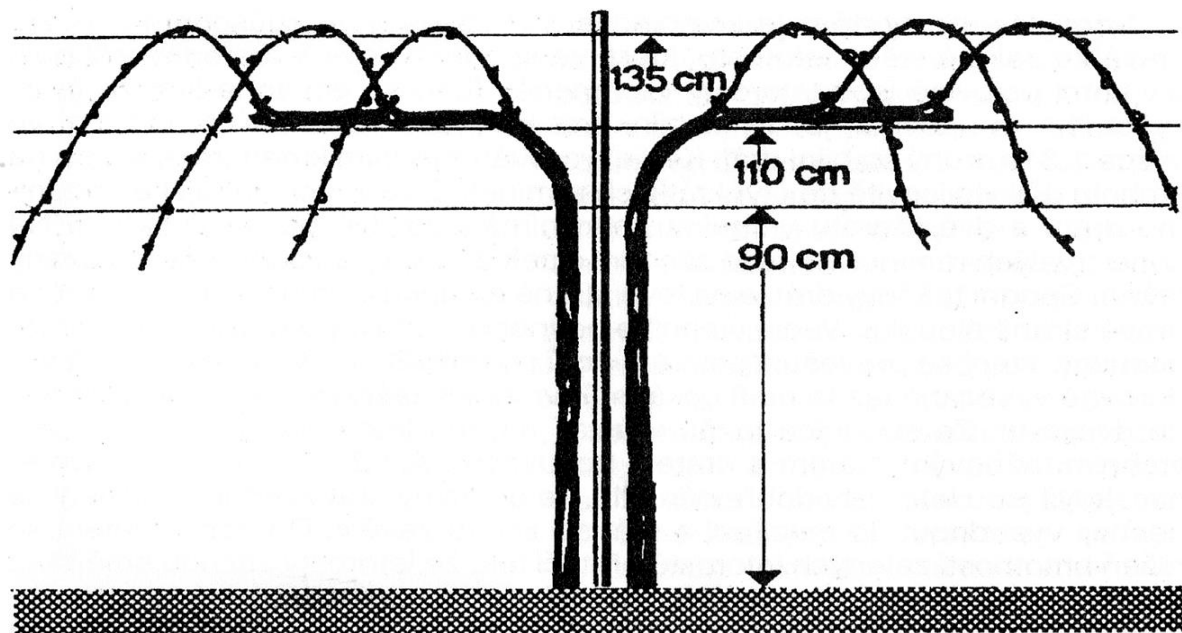
# Unilateral cordon with Sylvos pruning

Frost-damage protection, trained later  
– after late spring frosts

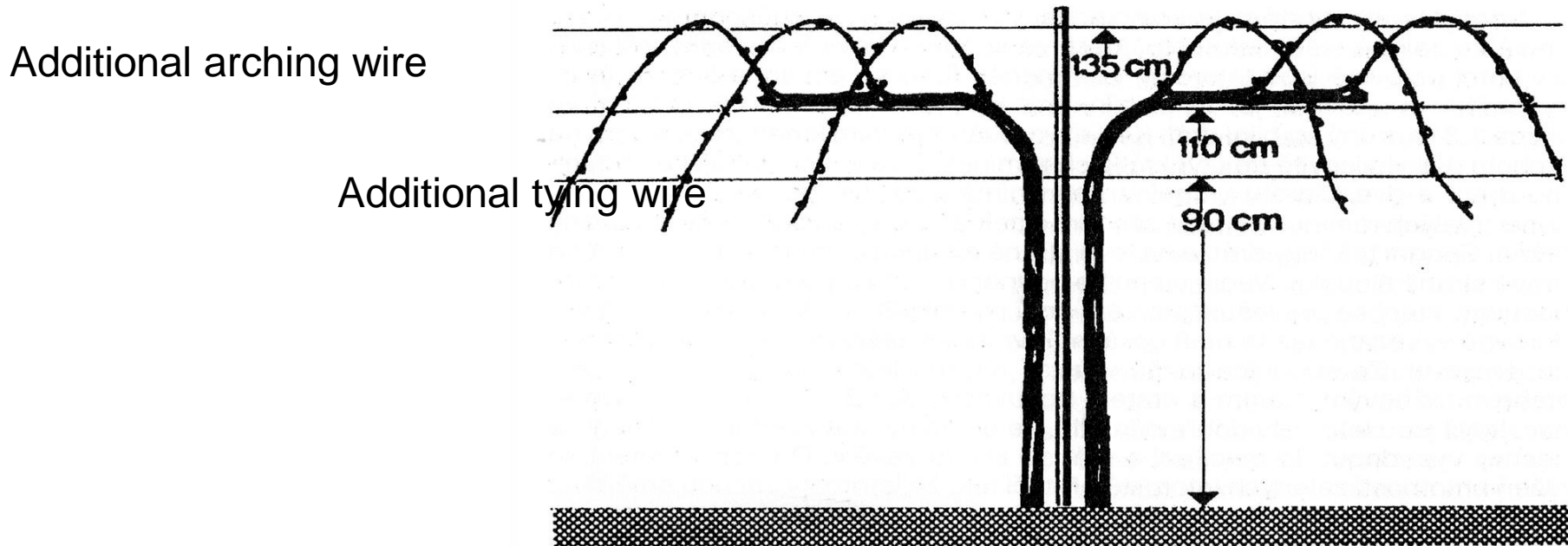


# Unilateral cordon with improved Sylvos pruning

- Better for cultivation in CR:
  - Reduce the cordon
  - Reduce amount of canes
  - Change the cane training and pruning method
- Optimum cordon length: 0.5-0.6 m
- Horizontal cordons are trained 1.1 m high



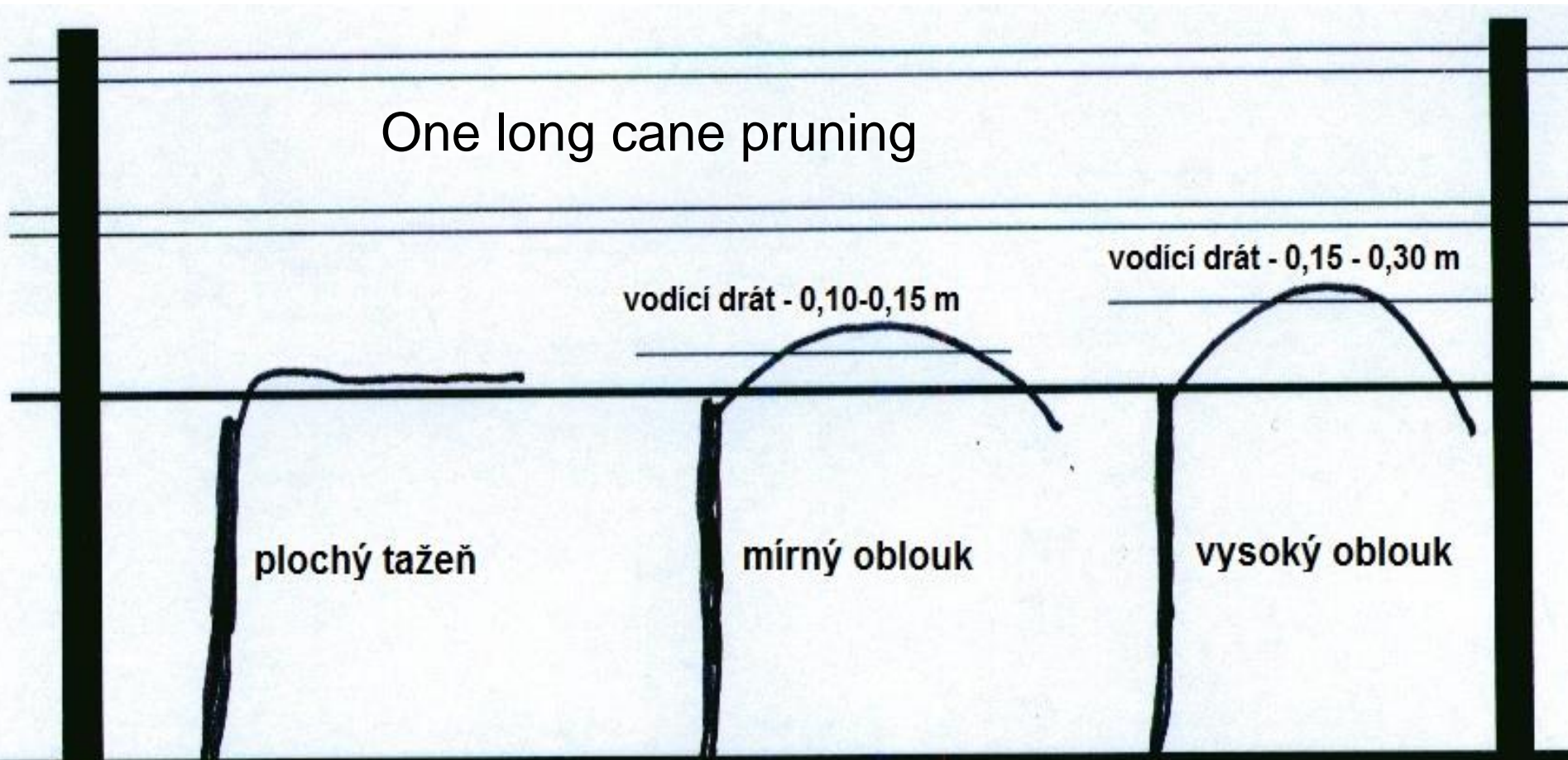
- Canes are trained in high arches
  - Additional support wire is stretched 0.25 m above the original support wire, which helps train the canes
- Canes are first trained upwards to the additional support wire and then gently arched downwards so that terminal part of the cane is directed downwards
- Circular arching of the canes enhances growth of annual shoots in the first third of the cane



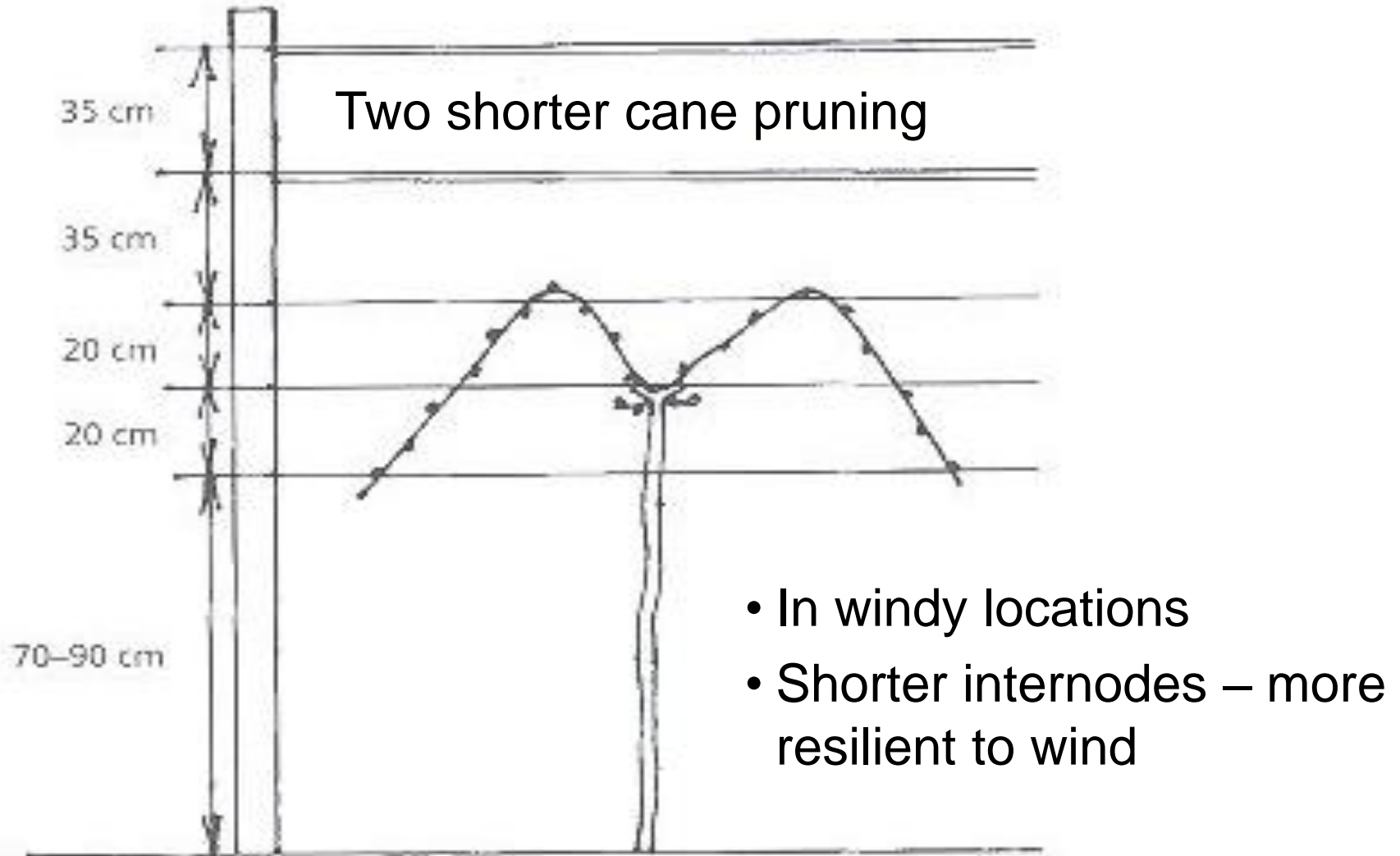
- In order to prevent necrosis of tissues on the cordon, only canes and 2-bud renewal spurs, growing from short old wood growths facing upward, are trained
- Cordon is smooth and wound-free; good water and nutrient supply for all three canes

# High training system with Guyot cane pruning

- Similar to the so called Rhine-Hessen training
- Trunk height: 0.9-1.1 m
- Spacing: 3-3.5 m x 1.1-1.3 m



# High training system with Guyot cane pruning



# Curtain training systems

- Higher trunk – more old wood, higher from the ground = higher frost-damage resistance
- Single cordon with semi-long pruning and short renewal spurs

