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Growing methods for plants and history of Viticulture in Piedmont

PREHISTORY

In Piedmont grapevine is present from very early ages:

- **pollens** from **New Stone Age** (IV millennium B.C.) at Casalnoceto (AL);
- **pollens** of wild grapevines - **medium-late Bronze Age** (XIV – XIII century B.C.), at Alba (CN) - locality Moretta;
- **seed** (X-IX century B.C.) – end of Bronze Age - at Vislario (TO).

Northern Italy: from **Late Bronze Age wild grapevines** (*Vitis vinifera silvestris*) were grown and used as food (but not cultivated) perhaps to increase sugars, and than alcoholic grade, in fermented drinks from berries (dogwood = *Cornus mas*, elderberry = *Sambucus nigra*, blackberry = *Rubus fruticosus*) or fruits (service tree = *Sorbus domestica*).

Southern Italy: true grape cultivation (*Vitis vinifera sativa*) in **medium Bronze Age** (~ half millennium B.C.).

PREHISTORY & HISTORY

Until the start of Iron Age (IX century B.C.) **grape growing in Italy was substantially limited to central-southern Italy**.

After the VIII century B.C. climate changed (lower precipitations, progressive and consistent increase of t° in interme diate seasons, mitigation of lowest t° in winter seasons) favoring grape growing diffusion also in northern Italy.

Grapevine pollens and seeds found at Castelletto Ticino (NO) in deposits of the so called Cultura di Golasecca (800 – 400 B.C.) are clues of grapevines presence.

Commercial traffics between the Mediterranean region and central Europe with probable use of wood barrels are other important clues of the importance of grape growing and enology in Piedmont.

Etruscan amphorae of 500 B.C. at Castelletto Ticino reinforce the hypothesis of the existence of a wine commerce.

Findings of seeds near Tortona (AL) are other clues of grape growing and enology in Piedmont.

HISTORY

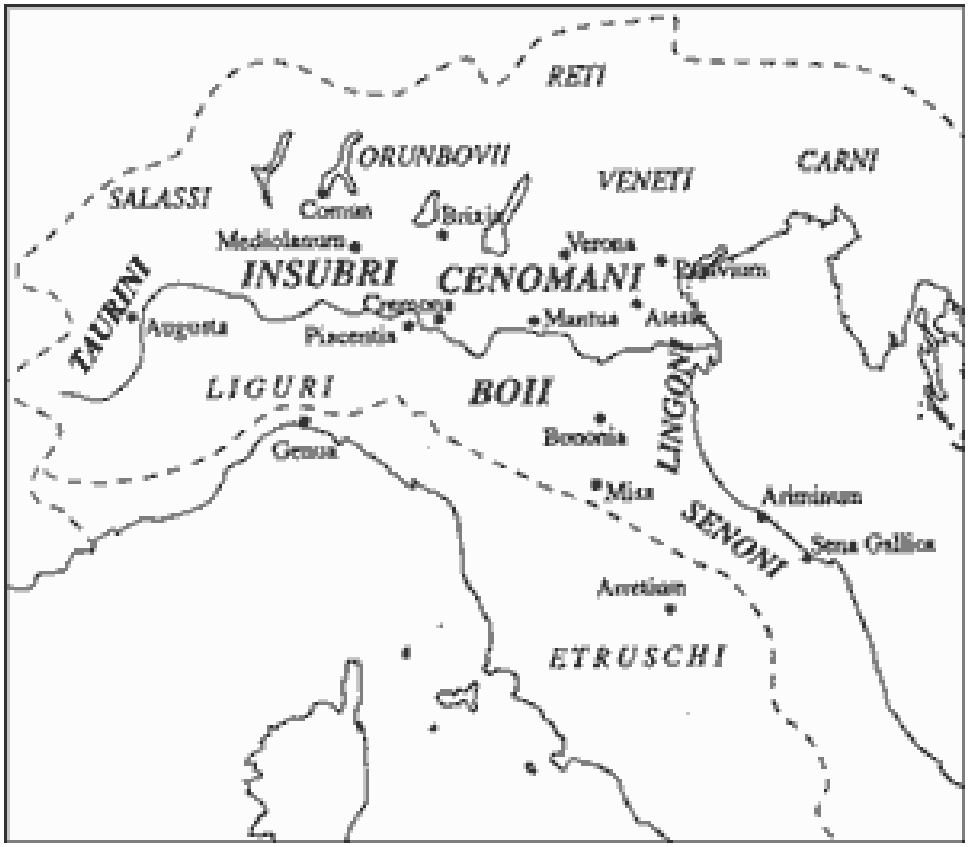
Seems that in the *"Novariensis agricola"* area (Plinio) **grapevines were trained on live trees with very long canes** (classic technique of ***arbustum gallicum***) with a production of very tannic wines. Someone says that the actual vineyards of 'Prunent' (local name for 'Nebbiolo') of Val d'Ossola, with vines trained to pergolas, are a memory of this old viticulture.

In conclusion viticulture in Piedmont was influenced by:

- Galli (Celtic populations),
- Etruscans,
- Contact with Greek colonies (Massaglia = Marsiglia) established from 600 B.C. .
- Romans after the submission of Celtic and Celtic-liguri tribes with the fusion of viticultural and enological knowledge of all these peoples.

There are attestations on wine trade in Piedmont at the time of the Roman Emperor Publio Elvio Pertinace (193 A.C.) .

HISTORY



Peoples living in northern and central Italy in old times

HISTORY

Etruscans: vines trained on live poles (trees: Poplars: *Populus spp.*, Elms: *Ulmus spp.*, Maples: *Acer spp.*, etc.) and long cane pruned, these are systems that allow a mixed cultivation (grapevines and cereals grown together). These systems come from old populations of this area (Padana flat).

Greeks: vines trained to low trunk with (or without) stakes (head training=alberelli=Goblet=small trees), short pruned.

When Romans arrived they found grapevines trained on live poles (married to trees) = '*arbustum gallicum*'

The Romans diffused training systems based on low trunks, stakes (permanent or not) and short pruning (learned from Greeks) and introduced some of their cv.

Greek viticulture = quality

Etruscan viticulture = quantity.

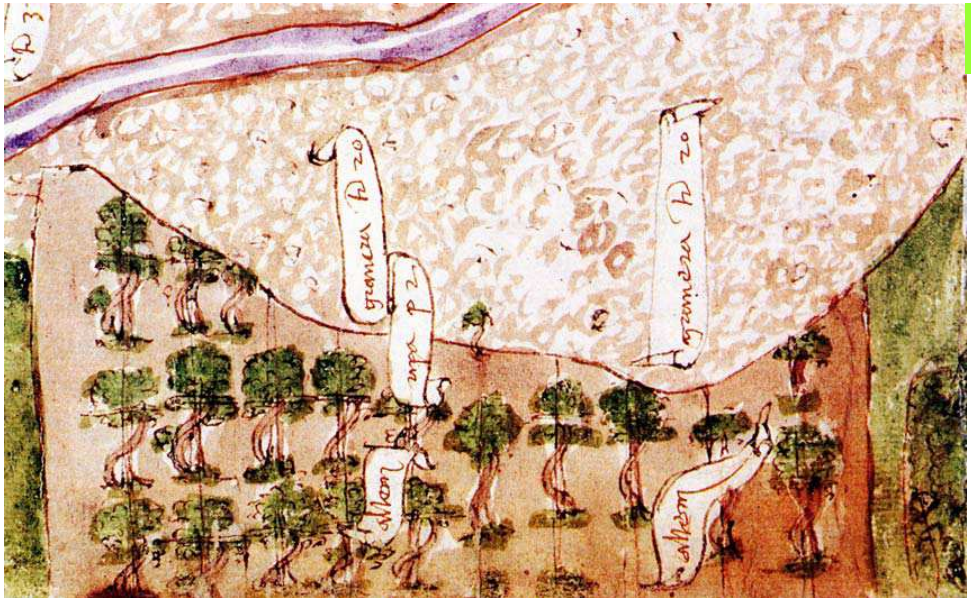
Galli: wood barrels, bigger and more fit to northern climates containers, than the Mediterranean amphorae.

MIDDLE AGES

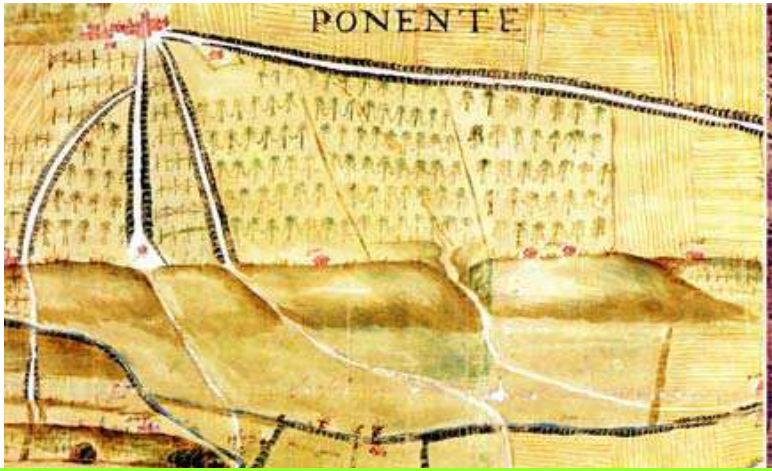
After the year 1.000 A.C. (XII, XIV e XV century): testimony on viticulture in Piedmont (**municipality statutes** on grape growing and on wine production and marketing).

- **On hillside the 'vigna' (vineyard):** vines trained to low bushes (alberelli) or to vertical trellis made with vertical stakes and smaller horizontal stakes to which canes were tied by means of wicker or Spanish brooms (between row cultivations of wheat, vegetables, etc.);
- **On flats or on less slopes hillsides the 'alteno'** (perhaps derived from *arbustum gallicum*): vines with high trunks, supported by trees (Elms, Maples, Willows: Salix spp., etc.) and distance between rows bigger than in the 'vigna' so to made it possible to grow wheat, vegetables, legumes even with the help of working animals.

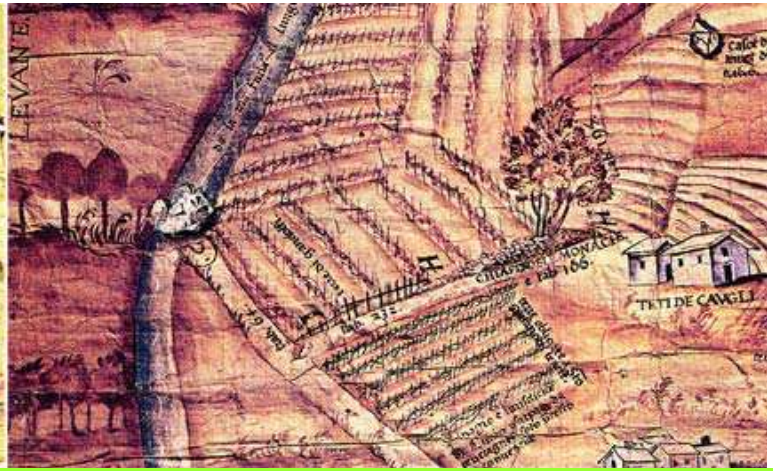
MIDDLE AGES



Grapevines to alteno near Pinerolo



Vigne (vineyards) and *alteni* near Marene in a map of 1565.



Vigne of Oltre Gesso Cuneese in a map ofl 1566.

FROM MIDDLE AGES TO XIX CENTURY

Between the end of XVI century and the first years of XVII century the importance of vine and wine in Piedmont is emphasized by books like that of Croce (1606): “Della eccellenza e diversità dei vini che sulla collina di Torino si fanno”.

From the first half of XVIII century glass bottles and corks were used and the Nobility took interest and invested money in viticulture.

In this century, under the King Vittorio Amedeo II, a survey on surface dedicated to all the agricultural cultivations was made (Perequazione generale).

The grapevine (Statistica Generale, 1750) was on an area of 299.157 giornate (113.979 ha) one half of all the plowed soil; the surface of ‘alteni’ was higher than that of the ‘vigna’.

In 1813 a survey made under Napoleon (French Empire) gave a production of 1.069.266 hl of wine; but only 40.697 hl were of premium wines.

After the fall of the French Empire the Kingdom of Savoia was reestablished and there was an increase of viticulture to satisfy the increased demand of wine and the surface dedicated to grapevine was over 250.000 ha.

XIX CENTURY

From the **half of XIX century** also in Piedmont viticulture undergoes a big change when Oidium = Powdery mildew (1851), Phylloxera (1879) and Peronospora = Downy mildew (1880) arrived.

Training systems were modified to allow a better control against Powdery mildew (sulfur) and Downy mildew (copper=Bordeax mixture).

To control Phylloxera (an insect) it is necessary to graft *Vitis vinifera* on resistant rootstocks = planting new vineyards.

The new vineyards were planted with new training systems (usually vertical trellis) using iron wires instead of small beams or canes as horizontal supports for vegetation.

Traditional, very old, but not fit to mechanical soil cultivation or fungicide treatments, training systems disappeared.

XIX – XX CENTURY

In the **new vineyards**, made after Phylloxera, only cv considered of good quality and with good affinity with resistant to Phylloxera rootstocks were used while the other cv were almost abandoned so **reducing biodiversity**.

Today three cv: Barbera (35%), Moscato (22%) and Dolcetto (14%), cover 71% (33.541 ha) of total surface followed by Nebbiolo, Cortese, Brachetto, Freisa and Grignolino (all together 21% of surface);

The first, non autochthonous cv, is Chardonnay (2,09% e 995 ha).

Between the 20, more important cv, only 4 are allochthonous (Chardonnay, Pinot nero, Cabernet Sauvignon and Merlot) for a total of 3,05% of grape surface.

Viticulture in Italy & in Piedmont.

Wine quality (as % of VQPRD wines) increased in last years and now Piedmont is overcame only by Trentino A.A. while Italian average is ~ 20%.

Years	Piedmontese wine total production (hl)	VQPRD (DOC & DOCG)	
		hl	%
1985	3.929.315	1.196.328	30,4
1995	2.708.700	1.563.264	57,7
2006	3.228.961	2.712.327	84,0

In Piedmont wine production is important but, comparing the data of last century (next slide) **with the last ones, it is possible to see that, while till 50^{ties} it was > 10%, now is ~ 5% of the Italian wine production.**

Wine production in **Piedmont** & in **Italy** (.000 hl) - 1888÷2008

Regioni	1888	%	1927	%	1953	%	1980	%	2008	%
Abruzzo	4.419	10	1.310	4	1.383	3	3.477	4	3.054	7
Puglia			**2.855**	8	**9.093**	18	**12.595**	15	**6.949**	15
Campania	5.120	16	3.328	9	2.128	4	3.004	4	1.768	4
Sicilia	**6.067**	19	**2.448**	7	**6.814**	14	**10.982**	13	**6.180**	13
Marche	2.925	9	1.162	3	1.577	3	2.612	3	871	2
Toscana	3.419	10	4.347	12	4.654	9	5.731	7	2.800	6
Emilia R.	1.586	5	**6.243**	18	**2.950**	6	**12.811**	15	**6.340**	14
Piemonte	**3.257**	10	**4.085**	11	**6.399**	13	**4.777**	6	**2.480**	5
Lazio	1.873	6	1.729	5	3.270	6	6.073	7	1.797	4
Lombardia	898	3	2.564	7	3.188	6	2.516	3	1.250	3
Veneto	**1.280**	4	**2.114**	6	**4.207**	8	**11.207**	13	**8.119**	18
Friuli V.G.*	---	--	374	1	413	1	1.444	2	1.014	2
Trentino A.A.*	---	--	448	1	897	2	1.482	2	1.140	2
Sardegna	1.248	4	492	1	542	1	2.361	3	582	1
ITALY	**32.511**	100	**35.650**	100	**50.312**	100	**84.750**	100	**46.245**	100

Surface and production (2008 & 2009)

Provinces	ha	q	q/ha	hl
Asti	**16.860**	**1.483.680**	**88**	**1.038.576**
Cuneo	**16.220**	**1.240.000**	**76**	**869.000**
Alessandria	**13.420**	**1.060.200**	**79**	**794.900**
Torino	**1.850**	**138.750**	**75**	**103.958**
Novara	**647**	**37.500**	**58**	**26.250**
Biella	**341**	**23.540**	**69**	**16.478**
Vercelli	**211**	**11.935**	**57**	**7.433**
Verbano C. O.	**37**	**2.479**	**67**	**1.559**
PIEDMONT 2009	**49.586**	**3.998.084**	**81**	**2.858.154**
PIEDMONT 2008	**50.155**	**3.558.248**	**71**	**2.479.633**
ITALY 2009	**703.440**	**67.046.000**	**95**	**47.236.000**

In Piedmont only wine viticulture.

TRAINING SYSTEMS

The training and pruning systems now more diffused descend from Guyot, but even though they respect its basic characteristics (past, present and future cuts), reckon with other traditional training and pruning systems.

Basically are vertical trellis mixed pruned and are "traditional" but not "ancient": they date back to the end of XIX century when industrial production of iron wire started and its use in viticulture was diffused.

The reinforced concrete poles (long-lasting but very heavy) can be considered "traditional" in Piedmont.

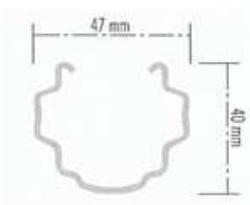
Today exist good alternatives to concrete poles (usually prestressed concrete poles):

- wood poles (the oldest but more perishable material)
- zinced iron or steel poles (now available and employed).

Wood poles may be treated against deterioration or are made of tropical hardwoods.

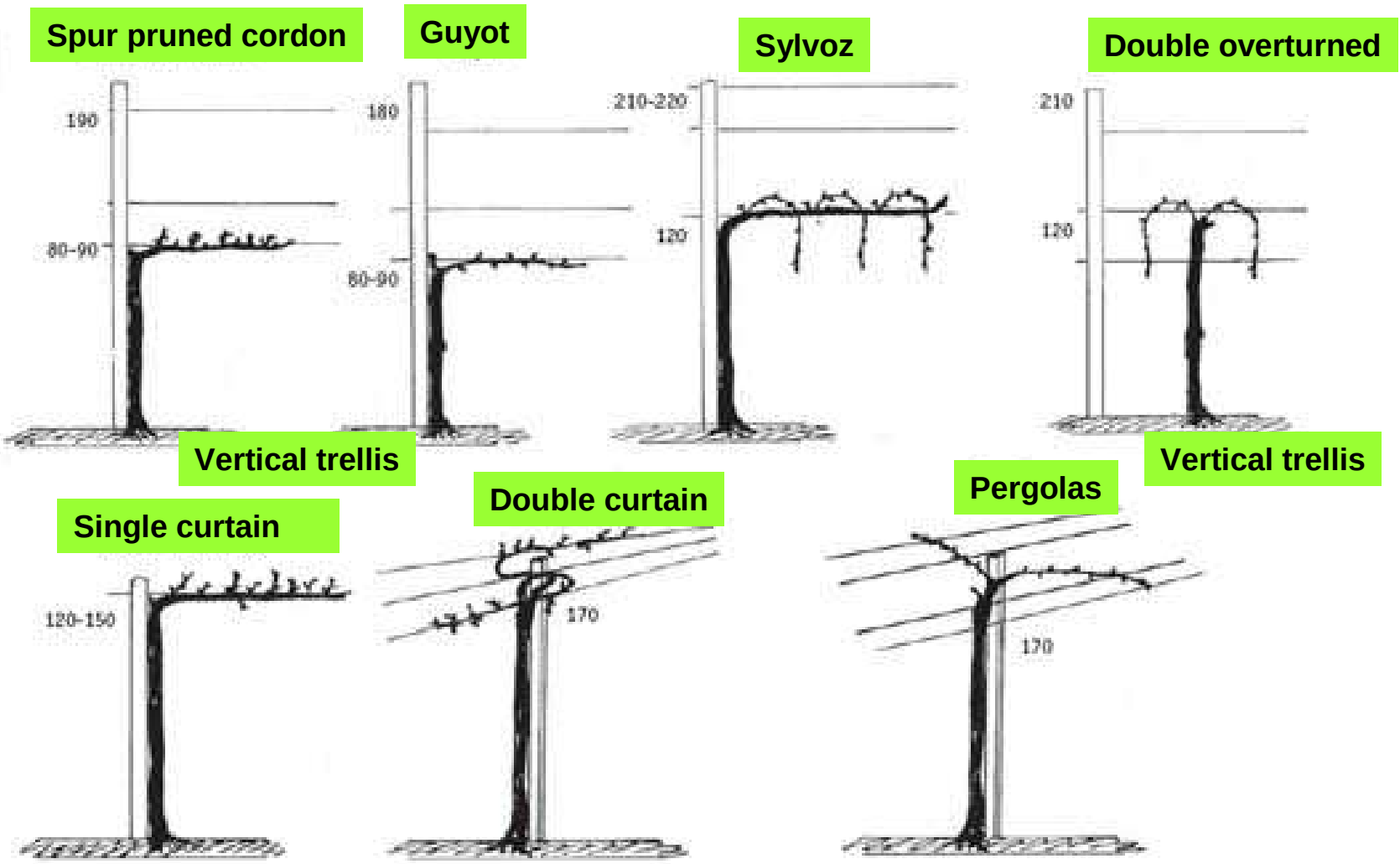
Reinforced concrete poles

Wood poles



Zinced iron poles

Steel poles



Grapevine training systems .

VERTICAL TRELLIS

Today the more diffused training system in Piedmont is **vertical trellis mixed pruned (Guyot)** or **cane pruned;** advantage: possibility of obtaining full crops on varieties (cv) whose buds are sterile near the base of the canes (like Nebbiolo).

Vertical trellis (vertical shoot positioning): **always upward vegetation**.

Recently, to make possible a greater vineyard mechanization (mechanical winter pruning), **vertical trellis cordon-trained spur-pruned** have been tested.

Planting distances:

Between rows: 2,20 ÷ 2,50 m;

Between vines on the row: 0,80 ÷ 1,00 m;

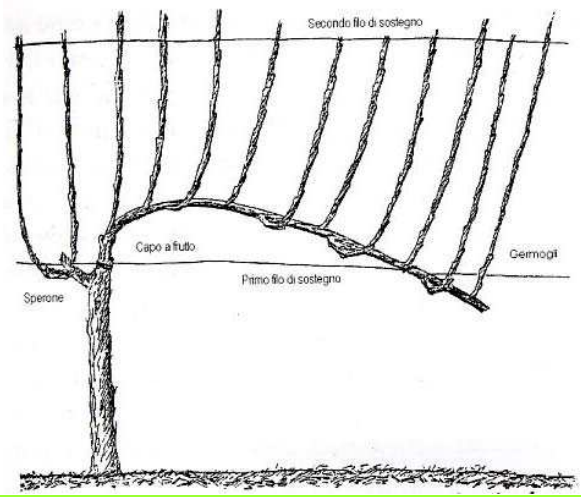
Vines/ha: ~ 5.600 ÷ 4.000

Vertical trellis height: 1,70 ÷ 2,00 m.

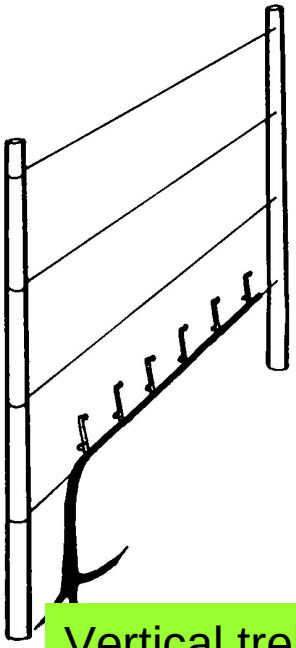
TRAINING SYSTEMS

Casalese: vines perpendicular to row.

Long chains of old wood carrying fruit canes on ‘Nebbiolo’.



Vertical trellis Guyot pruned (mixed pruned)

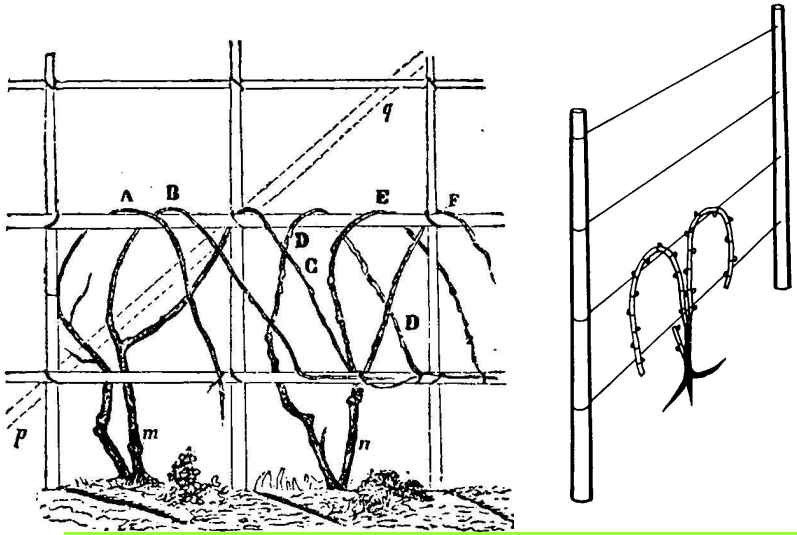


Vertical trellis cordon pruned (spur pruned)

Vines at Barbaresco (Nebbiolo)

VERTICAL TRELLIS

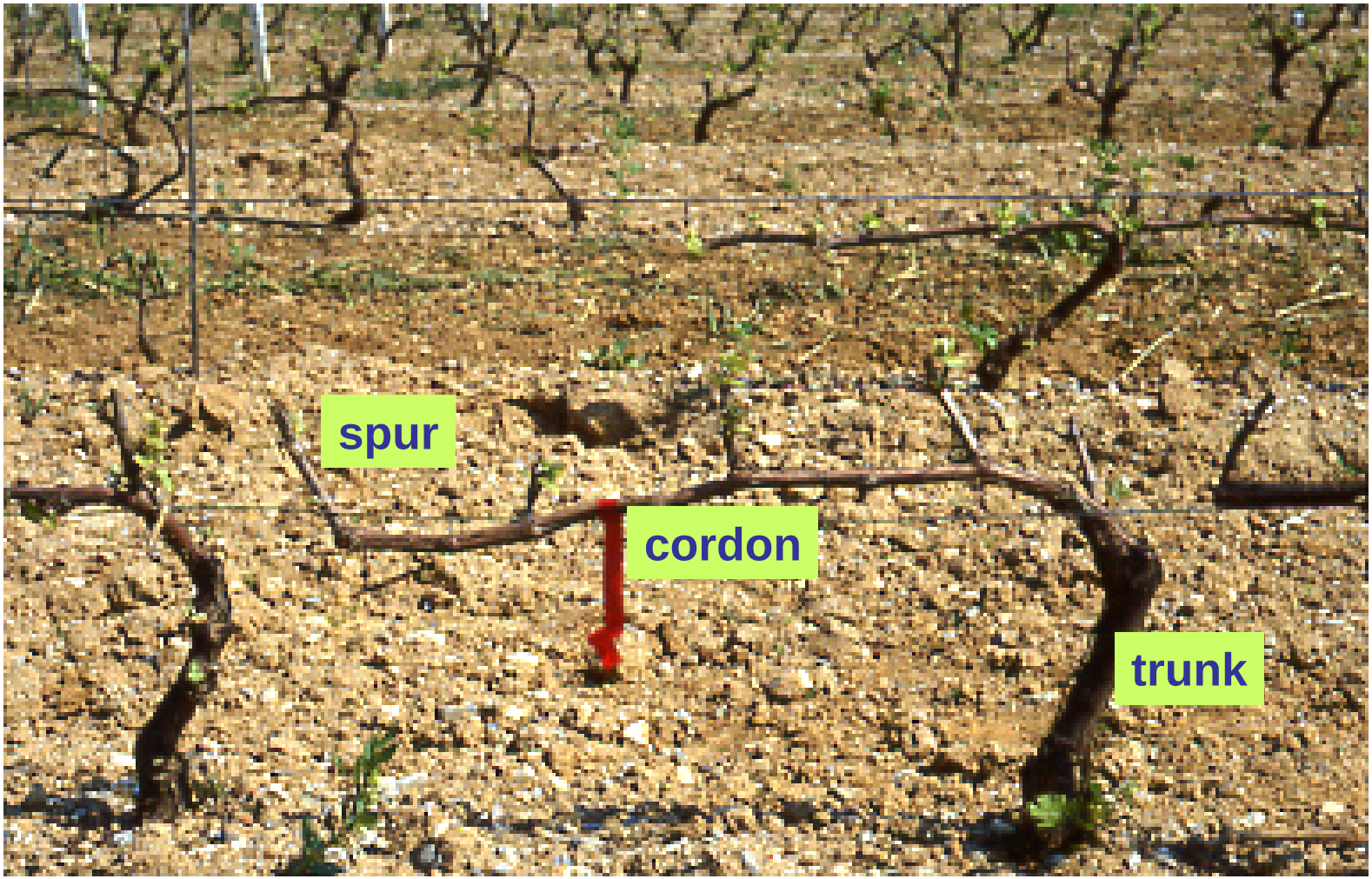
Arched fruit cane of Langhe.



‘Taragna astigiana’ and its evolution.

Modified Guyot (arched canes).

Vertical trellis pruned to horizontal spur pruned cordon.



Vines at Carema

(pergolas, locally called ‘Topie’).

New training systems: CURTAINS

Since seventies Curtains (always downward vegetation) were tested to:

- Eliminate palissage;
- Reduce management cost;

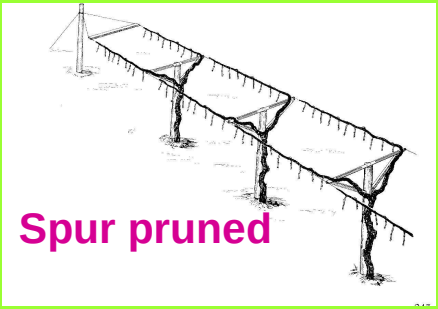
Double curtains: if short (spur) pruned winter pruning mechanization (integral vineyard mechanization)

Plant spacing:

Between rows: 3,00 ÷ 3,20 m;

Between vines on the row: ~ 1,00 m.

Vines/ha: 3.300 ÷ 3.000



Spur pruned

Cane pruned

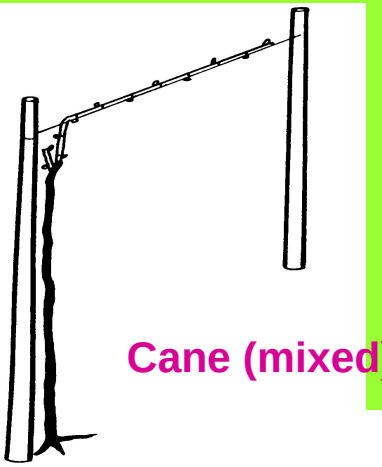
Single curtains: if short pruned winter pruning mechanization (integral vineyard mechanization).

Plant spacing:

Between rows: 2,70 ÷ 3,00 m;

Between vines on the row: ~ 1,00 m.

Vines/ha: 3.700÷ 3.300



Cane (mixed) pruned

New training systems: CASARSA

End of Seventy: Casarsa was tested always trying to lower manpower use (but winter pruning can be mechanized only in part: prepruning).

Casarsa.

It is not necessary to tie fruiting canes or make shoot palissage but problems because grapes are covered with leaves and there are difficulties to have good replacement wood.

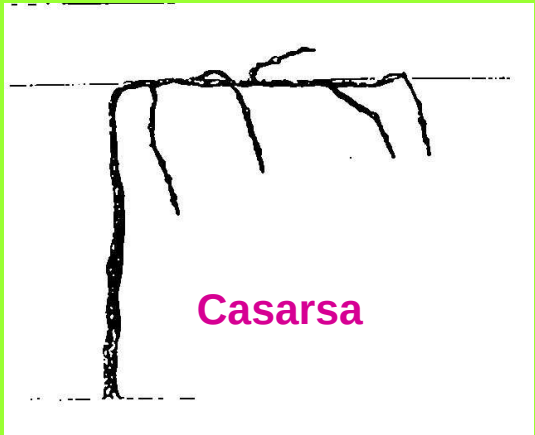
Important: strong poles and support wire of big diameter for trellis stability.

Plant spacing:

Between rows: 3,50 m;

Between vines on the row: 2,00 m;

Vines/ha: 1.400 ÷ 1.500.



New training systems: LIRAS

Studied to have a better quality increasing light intercept.

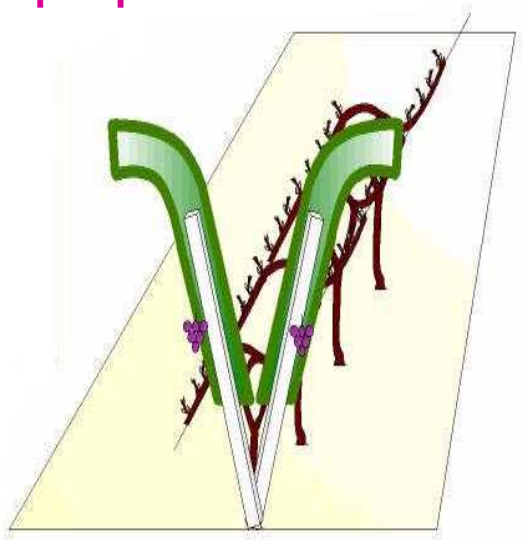
Plant spacing:

Between rows: 3.00 ÷ 3.50 m;

Between vines on the row: 1.00 m;

Vines/ha: 3.300 ÷ 2.800.

Spur pruned Lira



Old trellis system of Vercelli & Novara

CONSIDERATIONS ON TRAINING SYSTEM & PRUNING

Double curtains:

- Big difference from present training system (landscape change),
- Complexity of trellis structure (specially with rows following level curves),
- Low number of vines/ha,
- Strong production,
- Lower quality compared with vertical trellis,
- Winter pruning: good opportunities to complete mechanization (if short = G.D.C.),
- Green pruning: no palissage (shoots tying), easy topping, “combing” necessary,
- Long – mixed cane pruning (Duplex) difficulty to have good new fruiting canes,
- Manual harvesting sometime uncomfortable,
- Mechanical harvesting by special machinery (vertical shakers).

CONSIDERATIONS ON TRAINING SYSTEM & PRUNING

Single Curtains:

- Big difference from present training system (landscape change),
- Complexity of trellis structure (but a little less than Double Courtain),
- Low number of vines/ha,
- Sometimes lower quality compared with vertical trellis,
- May favor grape diseases (molds),
- Winter pruning: good opportunities to complete mechanization (if short),
- Green pruning: no palissage, easy topping,
- Long – mixed cane pruning difficulty to have good new fruiting canes,
- Manual harvesting sometime uncomfortable,
- Mechanical harvesting by special machinery (vertical shakers) but possible also by horizontal shakers.

CONSIDERATIONS ON TRAINING SYSTEM & PRUNING

Casarsa:

- Big difference from present training system (landscape change),
- Complexity of trellis structure (± like Single Curtain),
- Low number of vines/ha,
- Sometimes lower quality compared with vertical trellis,
- Winter pruning: impossible complete mechanization (only prepruning),
- Manual harvesting sometime uncomfortable,
- Mechanical harvesting possible by horizontal shakers.
- Easy tillage under the row (> distance between vines).

CONSIDERATIONS ON TRAINING SYSTEM & PRUNING

Liras:

- Big difference from present training system (landscape change),
- Complexity of trellis structure (specially with rows following level curves),
- High quality,
- Winter pruning: possible mechanization (if short),
- Green pruning: palissage and topping necessaries (to have 2 vegetative walls),
- For winter pruning, green pruning and harvesting it is necessary to use specific machinery.

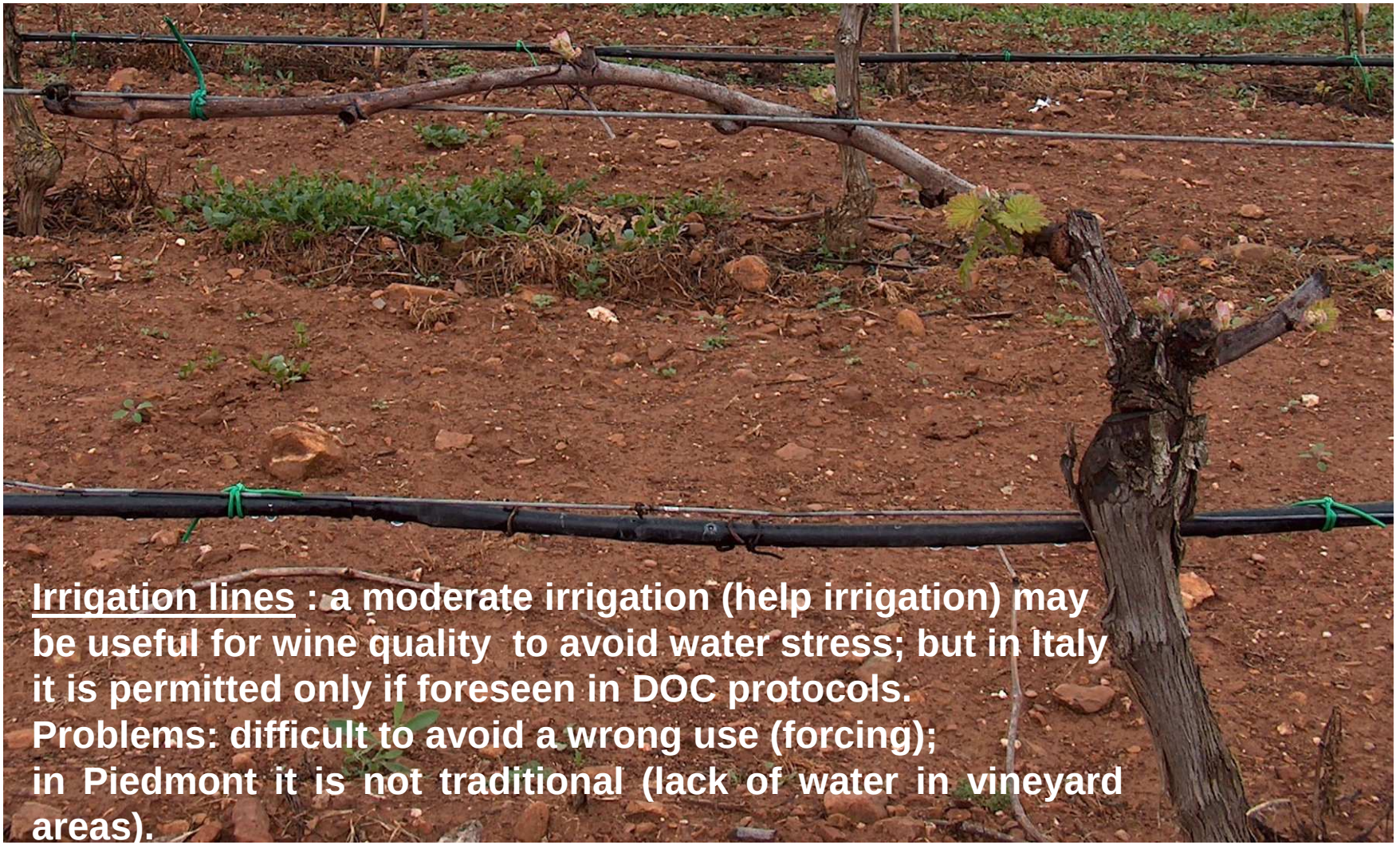
CONSIDERATIONS ON TRAINING SYSTEM & PRUNING

Vertical trellis:

- Landscape unchanged,
- Simple trellis structure,
- High quality,
- Winter pruning: good opportunities to complete mechanization (if short),
- Green pruning: palissage and topping necessaries,
- Mechanical harvesting by horizontal shakers (many models of different builders),
- Many models of machinery for green pruning (generally not complicated).

Today very popular and, perhaps, the best vine trellis system for Piedmont.

Final considerations



Final considerations

In Piedmont vineyards are planted on hillsides with steep slopes so mechanical harvesting is very difficult and also mechanical winter and summer pruning are difficult.

Final considerations

Usually in the vineyards of Piedmont the rows follow ± the level curves (to limit soil erosion).