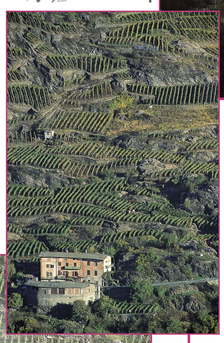
VALTELLINA (*SONDRIO*, NORTHERN ITALY): THE SECOND MOST IMPORTANT *TERROIR* FOR *NEBBIOLO* GRAPE IN THE WORLD

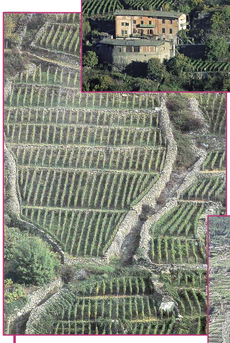
Mazzoleni G.[3],Aldighieri B. [4],Conforto A.[3], Mariani L.[2],Murada G.[1], Rizzotti T., Scienza A.[2], Sfondrini G.[3]

1 Fondazione Fojanini di Studi Superiori, Sondrio, Italy; 2 Dipartimento di Produzione Vegetale - Università degli Studi di Milano, Italy; 3 Dipartimento Scienze della Terra "Ardito Desio" - Università degli Studi di Milano, Italy; 4 Consiglio Nazionale delle Ricerche - Istituto per la Dinamica dei Processi Ambientali - Sez. Milano, Italy.

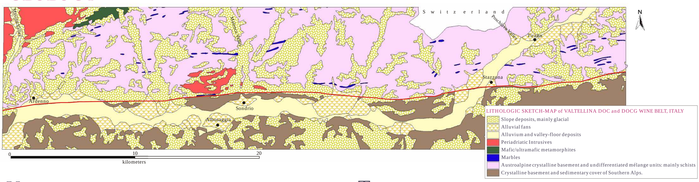
Valtellina belongs to one of the northernmost provinces in Italy, close to Switzerland border.

It is located at 46° 10' N latitude and represents a typical man-made landscape in Alpine environment. It could be chosen as the best italian "type locality" for terraced slopes.





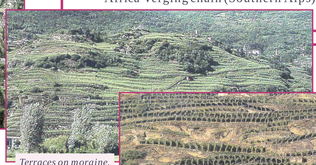
GEOLOGY



Valtellina is a main longitudinal valley in the Alpine chain, deeply cut by *Adda* river, tributary of *Como* lake, the latter being one of the deepest canyons due to Messinian erosion.

The E-W trending part of the valley is tectonically controlled, running parallel to the Periadriatic Lineament, the main trascurrent fault of the entire Alpine edifice, separating the Europe-verging chain (Alps s. s.) from the Africa-verging chain (Southern Alps).

The DOC and DOCG area in *Valtellina* forms a narrow belt, which extends from *Ardenno*, to the West, up to *Tirano*, to the East: in this area, the bedrock is represented by strongly deformed metamorphic units, showing a clear East-West banding and succession. This belt is located at southern boundary of the formerly called "root-zone of the Alps" and consists of both middle Austroalpine (*Languard*), upper Austroalpine (*Tonale*) and Southalpine (*Morbegno Gneisses*, *Edolo Schists*) units. These mainly include silicate rocks, with minor inclusions of marbles.



Terraces on moraine.

Terraces on "roche moutonnée".

GEOMORPHOLOGY

Valtellina slopes are steep, with acclivity ranging between 27° and 70°. The strong vertical relief (about 2,000 meters), from the alluvial plain of the *Adda* river to the adjacent mountain ridge, is produced by a combination of structural control, fluvial erosion and glacial overexcavation.

There is a strong difference between the opposite slopes: the southern one, named *Orobico*, has a northwards exposure, while the northern one, named *Retico* (Rhaetian), has generally a southwards exposure and enjoys a strong solar radiance.

In the wide Valtellina wine belt, the exposure varies from 120° to 220°.

Glacial erosion widened the valley, smoothed the bedrock and left widespread, thin and discontinuous deposits. They are mainly glacial, partly covered by coarse alluvium and talus. Huge alluvial fans join the slope base and the valley floor.

Thin soil on main morphostructural terrace, downwards limited by bedrock.

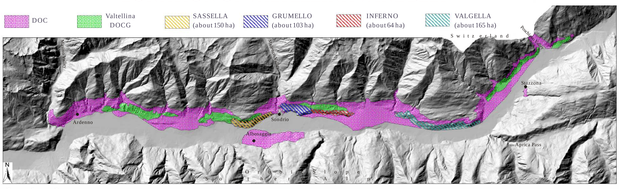
Thick soil formed on main morphostructural terrace.

PEDOLOGY

From valley floor up to the lowest rhaetian slope, different geomorphology based landscape units can be seen. Each unit allowed a characteristic soil evolution, the latter being controlled by substratum nature and drainage, inclination and exposure.

Most soils have very high permeability, low hydraulic storage, pH ranging between 4,5 and 5,5, a generally good equilibrium of assimilable oligo-elements with few local exception regarding Mg and B.

ZONATION OF VALTELLINA WINE BELT



The meaning of Italian Quality System appellation acronims, from lower up to highest level is as follows: Typical Geographic Indication (IGT); Appellation of Controlled Origin (DOC); Appellation of Controlled and Guaranteed Origin (DOCG).

Vine-growing in *Sondrio* province is devoted to both local consumption (as for instance in *Valchiavenna*) and IGT-DOC-DOCG production. The DOC and DOCG qualified area is limited to Rhaetian side of *Valtellina*, with the unique local exceptions of *Albosaggia* and *Stazzona* areas.

The belt spreads itself from 9°40' to10° 15' East longitude along 70 km, over a 1,200 hectares area. 852 hectares are registered for DOC and DOCG appellation; estates are more than 3,000 with an average area slightly larger than 3,000 square meters. The qualified DOCG area corresponds to "*Valtellina Superiore*" appellation and is exclusively located on the rhaetian slope.

The individual areas are "*Valtellina*" DOCG, which covers most of wine belt from *Ardenno* to *Tirano*, and some minor, more precisely located areas, which are, from West to the East, "*Sassella*", "*Grumello*", "*Inferno*" and "*Valgella*". The latter four areas share almost the same substratum geological nature, which mainly corresponds to mylonitic mica schists (*Scisti di Edolo*); only in the highest, northern "*Grumello*" area, some scattered *Triangia* granodiorite outcropping can be seen.

CLIMATE

Valtellina physiographical features directly influence the climate. This wide valley can be seen as an elongated amphiteatre, between a northern high mountain ridge (main Alpine chain, elevations ranging between 3,000 and 4,000 m a.s.l.) and a southern ridge (Southern Alps, up to 3,000 m a.s.l.). Both ridges, especially the northern one, act as a protection barrage from cold winds. The vine growing area reaches a maximum altitude of 700 m a.s.l. *Como* Lake, not far from wine belt western end, acts as a thermal regulator and mitigator.

Climate main features are resumed as follows:

faithful and regular ventilation; moderate precipitation (average 850 mm/year); high air brightness; insolation over 1,900 hours per year; high thermal gradient during april-october vegetative period (5 to 32 °C); moderate values of relative moisture (65 to 85%); further, appreciable increase of thermal gradient, due to huge mass of rocks and stones in the terraces (air temperature always 4 to 5 °C higher than valley floor); remarkable daily thermal range, particularly during the delicate ripening period, september/october (8 to 15 °C); terrace ubication acting as a protection from early spring frosts (which are very common in valley floor); autumn fogs almost absent.

CULTIVATION METHODS

The vines are cultivated on steep sunny slopes, in narrow terraces (*ronchi*) supported by stone dry walls. Calculated total lenght of walls in *Valtellina* wine belt is about 2,500 km, more than the entire length of Italian peninsula.

In traditional cultivation, vines had grapes at limited height (about 70 cm from the floor); the rows were parallel to maximum gradient (*ritocchino*) in order to enjoy the highest sun radiation. Vine density ranged between 3,700 and 4,500 plants per hectare and the pruning method were modified *guyot* or *silvoz*. In latest years (where soil is deep enough), the geometry of some vineyard has changed to horizontal rows (*giropoggio*), mayor grape distance from the floor (up to 150 cm), higher vine density (up to 7,500 plants per hectare) and *spur guyot* pruning. Irrigation for yielding purposes is not permitted.

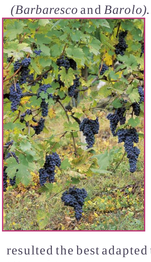
Withering Nebbiolo Grapes for Sforzato.

THE GRAPES

Valtellina vine growing mainly devote itself to red berried grapes: white wines always stay at lower appellation level (IGT) and are predominantly made from red berried grapes, vinified by white wine method.

Valtellina DOC and DOCG wines are made of minimum 90% *Nebbiolo*; appellation laws enable the employ of some other autochtonous, not aromatic red berried grapes as *Pignola*, *Rossola* and *Brugnola*.

Nebbiolo, one of the noblest italian grapes, was probably set in the Alpine valleys by Benedectine monks, about X[th] and XI[th] century; it later reached more famous Piedmont areas of *Langhe* and *Roero* (*Barbaresco* and *Barolo*).



Nebbiolo grape offers some of finest and long-lived wines in the world, which have a typical exquisite *bouquet* ranging from *goudron* to violets to rose.

Nebbiolo historical, local name "*Chiavennasca*" has been recognized as a phenotype; a careful clonal selection was carried out in latest decades; *Riparia x Rupestris* 420/A rootstock resulted the best adapted to local soil characteristics.

IGT white wines are partly made of "international" white berried grapes, as *Sauvignon* and *Chardonnay*.

THE WINES

Following May 9th 2002 hearing, *Valtellina* appellations are as follows:

SFORZATO di VALTELLINA DOCG
VALTELLINA SUPERIORE DOCG
ROSSO di VALTELLINA DOC
TERRAZZE RETICHE di SONDRIO IGT

IGT are both red and white wines.

Sforzato wine is made of tardy vintage (2[nd] to 3[rd] ten days of October up to 1st ten days of November) *Nebbiolo* grapes, which undergo about a 30% natural dehydratation. To obtain it, when October weather is favorable, the branches bearing ripe grapes are partly cut and left on the vine for about 25 days. Traditionally, grape withering occurred in home wooden-beam floors; at present time, dedicated rush matting are set in well ventiled rooms.

Mature grapes have an average 18-20% sugar contents; after withering and shrinkage, the sugar concentration in the juice reaches 26-27%, being ideal for ageing in small oak barrels. Grapes for *Sforzato* come from vineyards which are cultived for low yield (60-70 q/ha). Only the best grapes (generally up to 40-50 q/ha) are chosen for *Sforzato*. Minimum ageing: 20 months, first 12 in oak barrels; minimum alcohol contents: 14%.

Production data per year between 1998 and 2002 vintages:

	GRAPES	WINE
Sforzato	7,000 q	3,500 q
Valtellina Superiore	26.000 q	18,000 q