Traditional agroforestry vineyards, sources of inspiration for the agroecological transition of viticulture

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Book of abstracts

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A unique "terroir" can be found in southern Bolivia, which combines the specific features of climate, topography and altitude of high valleys, with the management of grapevines staked on trees. It is one of the rare remnants of agroforestry viticulture. A survey was carried out among 29 grapegrowers in three valleys, to characterize the structure and management of these vineyards, and identify the services they expect from trees. Farms were small (2.2 ha on average) and 85% of vineyards were less than 1 ha. Viticulture was associated with vegetable, fruit and fodder production, sometimes in the same fields. Molle trees were found in all plots, together with one or two other native tree species. Traditional grapevine varieties such as Negra Criolla, Moscatel de Alejandría and Vicchoqueña were grown with a large range of densities from 1550 to 9500 vines ha^{-1}. From 18 to 30% of them were staked on trees, with 1.2 to 4.9 vines per tree. The management of these vineyards (irrigation, fertilization and grapevine protection) was described, the most particular technical operation being the coordinated pruning of trees and grapevines. Three types of management could be identified in the three valleys. Grapegrowers had a clear idea of the ecosystem services they expected from trees in their vineyards. The main one was protection against climate hazards (hail, frost, flood). Then they expected benefits in terms of pest and disease control, improvement of soil fertility and resulting yield. At last, some producers claimed that tree-staking was quicker and cheaper than conventional trellising. It can be hypothesized then that agroforestry is a promising technique for the agroecological transition of viticulture. Its contribution to the "terroir" of the high valleys of southern Bolivia and its link with the specificities of the wines and spirits produced there remain to be explored.

Keywords: agroforestry, ecosystem services, native trees, criollo grapes, agroecology

2nd ClimWine Symposium
terclim
July 3 – 8, 2022 | Bordeaux, France
XIVth International Terroir Congress

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A unique *terroir* can be found in southern Bolivia, which combines the specific features of climate, topography and altitude of high valleys, with the management of grapevines staked on trees. It is one of the rare remnants of agroforestry viticulture in the world. Winegrowers attribute several ecosystem services to trees in these vineyards. Surveys were carried out in the valleys of Cinti, Cotagaita and Paicho to characterize 29 of these winegrowing systems.

Field and aerial vew of a vineyard with grapes staked on trees in the Valley of Cinti (credit: P. Oliva Oller and Google Maps)

Structure and management of agroforestry vineyards in southern Bolivia

Farms were small (2.2 ha on average) and 85% of vineyards were less than 1 ha. Viticulture was associated with vegetable, fruit and fodder production, sometimes in the same fields. Molle trees were found in all plots, together with one or two other native tree species. Traditional grapevine varieties such as Negra Criolla, Moscatel de Alejandría and Vicchoqueña were grown with a large range of densities from 1550 to 9500 vines ha^{-1}. From 18 to 30% of them were staked on trees, with 1.2 to 4.9 vines per tree.

Tree and grapevine densities in vineyards located in 3 high-valleys of southern Bolivia

	Cinti	Cotagaita	Paicho
tree density (no./ha)	240-440	330-950	640-1020
vine density (no./ha)	3050-9500	5100-7200	1550-6650
tree-staked vines (%)	18	30	28
no. vines/tree	2.3	4.9	1.2

Frequency of tree species, grape cultivars (local names) and farming practices over 29 agroforestry vineyards. Several tree species and grape cultivars could be grown in the same plot.

Tree species	No.	Grape cultivars	No.	Farming practices	No.
Molle (*Schinus molle*)	29	Negra criolla	26	Irrigation	29
Chañar (*Geoffroea decorticans*)	10	Moscatel de Alejandria	17	Winter pruning	29
Taco (*Prosopis alba*)	6	Vicchoqueña	12	Green pruning	29
Algarrobo (*Ceratonia siliqua*)	4	Pedro Ximenez	1	Tree pruning	29
Churqui (*Acacia caven*)	2	Cabernet	1	Manure supply	29
Peach tree (*Prunus persica*)	1			Pesticide appl.	27
Nogal (*Juglans australis*)	1			Tillage	7
				Mineral fertil.	2

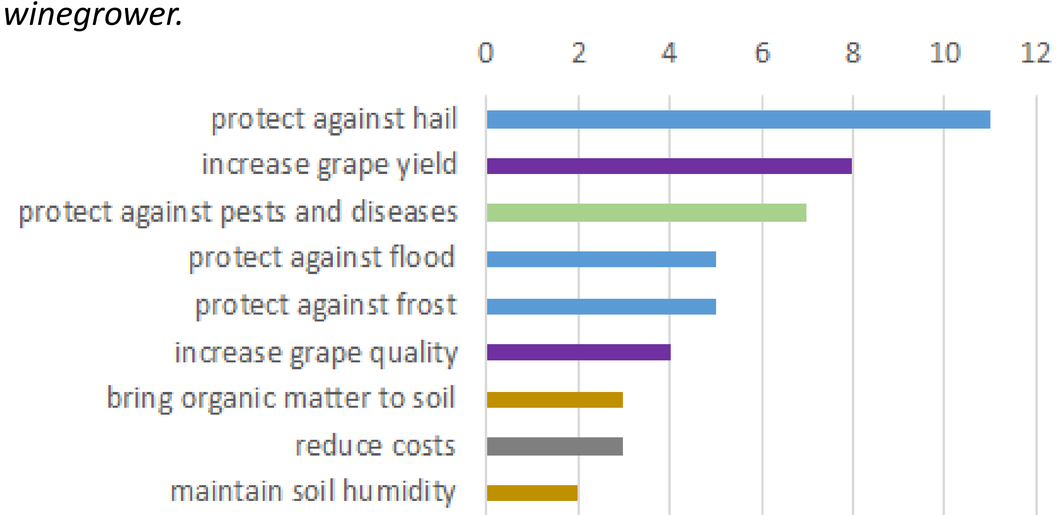
The management of these vineyards (irrigation, fertilization and grapevine protection) was described, the most particular technical operation being the coordinated pruning of trees and grapevines. Three types of management could be identified in the three valleys.

Ecosystem services expected by winegrowers from trees in their vineyards

The main ecosystem service expected from trees by grape growers was the protection against climate hazards (hail, frost, flood). Then they expected benefits in terms of pest and disease control, improvement of soil fertility and resulting grape yield. At last, some producers claimed that tree-staking was quicker and cheaper than conventional trellising.

It can be hypothesized then that agroforestry is a promising technique for the agroecological transition of viticulture. Its contribution to the “terroir” of the high valleys of southern Bolivia and its link with the specificities of the wines and spirits produced there remain to be explored.

Frequency of services expected from trees by winegrowers over 29 agroforestry vineyards. Several services could be expected by the same winegrower.



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