

Reducing Herbicide Use With Cover Cropping And Tillage

Dissemination and bottlenecks in different European grapevine-growing regions

Christian Gary and Marc Fermaud, INRA, France



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In viticulture, the alternatives to herbicide use are cover cropping and tillage. However, these techniques are very classical (they were the usual way of managing the soil surface before the invention of herbicides), and herbicides are still used in the majority of European vineyards on either part or the whole soil surface.

A large range of technical options is available. Inter-rows can be covered with either weeds or mono- or plurispecific stands of annual or perennial herbaceous species. They can be tilled with various types of equipment (such as a mulcher, para-plough, rotating harrow, depth loosener, or grubber etc). One can alternate cover cropped and tilled inter-rows. Under the rows, more specific equipment must be used to maintain the soil surface either bare or covered.

Benefits and disadvantages of cover cropping:

- > Cover cropping limits runoff and the resulting soil erosion and transport of pollutants (pesticide spread and/or residues on the soil) in surface water.
- > Cover cropping increases water infiltration. In winter, it can be used as a catch crop and legumes can be a source of nitrogen.
- > Because this vegetation competes for soil resources (water, nutrients) with grapevines, particularly in dry regions and/or shallow soils, this may generate yield and/or quality losses.
- > Cover cropping reduces the vegetative vigour of grapevine and its susceptibility to grey mould and downy mildew.
- > Cover cropping contributes to a better soil structure, and to an increase in the content of organic matter and in soil biological activity.
- > Cover cropping improves trafficability in wet conditions.

Benefits and disadvantages of tillage:

- > Tillage improves soil aeration and water infiltration and eliminates weeds; consequently the availability of water and nitrogen is higher for the grapevine.
- > Tillage incorporates organic matter in the soil, and stimulates its decomposition.
- > Tillage favours soil erosion in rainy conditions and in steep-slope vineyards.
- > Tillage reduces trafficability in wet conditions.

Prerequisites for reducing herbicide use

- > Specific equipment is needed for sowing and maintaining cover crops and for tilling. Different equipment is needed for soil surface management in the inter-rows and under the grapevine rows.
- > The topography of the vineyard should enable mechanisation; steep-slope viticulture presents specific difficulties.

Factors affecting the efficacy of cover cropping and tillage

- > The relative soil surface allotted to cover cropping (for example, every inter-row, one inter-row out of two etc) and the type of flora (grass versus legumes, root depth, duration of vegetative cycle) affect the intensity and dynamics of the competition for soil resources with the grapevine.

> The management of cover cropping and/or tillage affects competition for soil resources, the soil protection and trafficability in wet conditions.

Factors influencing the decision of growers to adopt cover cropping or soil tillage

Agronomic factors:

- > Cover cropping and tillage generally improve the soil's physical and biological properties.
- > Finding a trade-off between the benefits and disadvantages of cover cropping is difficult in regions with severe summer drought, low availability of soil resources (shallow soils), and high inter-annual rain variability.
- > Fermentation for making white and red wines does not share the same sensitivity to nitrogen deprivation.
- > On steep slopes, mechanisation may be impossible.
- > Under conditions of high grapevine vigour, cover cropping is an efficient means for growers to reduce yield, and optimise grape quality.

Economic factors:

- > Maintaining a cover crop or tilling is more costly (specific equipment, more time and energy consumption) than applying herbicides, particularly under grapevine rows where special equipment is needed.
- > Abandoning herbicides is a condition for moving to organic viticulture; more generally, the environmentally positive image of reducing herbicide use can be used for marketing purposes.

Bottlenecks for reducing herbicide use in different European regions

		Competition with cover crop for soil resources	Limited mechanisation	Soil erosion after tilling	Limited trafficability after tilling	Increase in labour and energy expenses for tilling
Central and Northern Europe	Shallow soils	++			+++	+++
	Steep slopes	+	+++	+++	-	-
	Other				+++	+++
Mediterranean regions	Shallow soils	+++		+	++	+++
	Steep slopes	++	+++	+++	-	-
	Other	++		+	++	+++

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How to promote the reduction of herbicide use in Europe

- > Better marketing on environmental practices, certification (at present, only certification for organic agriculture has an impact on consumers' preferences).
- > Design and diffusion of decision support systems (DSS) to manage and optimise cover cropping.
- > Improvement of specific equipment for tilling and/or maintaining cover crops in zero-herbicide strategies.
- > Selection of original species for cover cropping, with low growth rate and low resource demand.
- > Development of biological control of weeds.
- > Payment of subsidies to farmers conditional on compliance with environmental targets (agri-environmental measures).
- > Limitation of the number of available registered herbicides.

For further information please contact:

France: Christian Gary (gary@supagro.inra.fr)

Germany: Christoph Hoffmann (christoph.hoffmann@jki.bund.de)

Hungary: Viranyi Ferenc (Viranyi.Ferenc@mkk.szie.hu)

Italy: Laura Mugnai (laura.mugnai@unifi.it)

Switzerland: Pierre-Henri Dubuis (pierre-henri.dubuis@acw.admin.ch)

About ENDURE

ENDURE is the European Network for the Durable Exploitation of Crop Protection Strategies. ENDURE is a Network of Excellence (NoE) with two key objectives: restructuring European research and development on the use of plant protection products, and establishing ENDURE as a world leader in the development and implementation of sustainable pest control strategies through:

- > Building a lasting crop protection research community
- > Providing end-users with a broader range of short-term solutions
- > Developing a holistic approach to sustainable pest management
- > Taking stock of and informing plant protection policy changes.

Eighteen organisations in 10 European countries are committed to ENDURE for four years (2007-2010), with financial support from the European Commission's Sixth Framework Programme, priority 5: Food Quality and Security.

Website and ENDURE Information Centre:

www.endure-network.eu

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