Article 50 of Regulation (EC) No 1107/2009 sets out the regulatory requirements for performing the comparative assessment of plant protection products containing candidates for substitution.

Each Member State specifies the procedures for examining the dossiers in question on its territory. In line with this, the Ministerial Order of 23 July 2015 lists the information to be submitted in the case of products containing a substance that is a candidate for substitution, as well as the analysis steps leading to the substitution or not of the use in question.

This report has been drawn up for the specific case of implementing a comparative assessment in accordance with point 50.2 of the aforementioned Regulation, i.e. for an application not concerning a product containing one or more candidates for substitution. Member States may in exceptional cases apply these general provisions when non-chemical prevention or control methods exist and are in general use in the Member State. The analytical criteria of 50.1 are then applied to compare these methods and the products concerned.

Case in question and background

This report concerns the implementation of a comparative assessment for applications for new marketing authorisations (MAs) currently being examined, as well as applications for MA renewal, following renewed approval of the active substance glyphosate with effect from 16 December 2017.
In a letter co-signed by the Ministers of Agriculture, Ecology and Health dated 18 November 2018, ANSES was asked to implement the provisions of Article 50.2 and of Annex IV of Regulation (EC) No 1107/2009.
At the same time, on 13 November 2018, the National Institute for Agricultural Research (INRA) was commissioned by the Ministers of Ecology and Agriculture to produce a report presenting an examination of the alternatives, their uses, and the practical and economic disadvantages identified.
The current document has been drawn up for use in viticulture based on information from the references cited in the annex, mainly from INRA reports (INRA, 2017; INRA, 2019), additional information provided by marketing authorisation applicants (Glyphosate Task Force (GTF2, 2019)) and the presentations and discussions of the MA Monitoring Committee at its meetings of 26 September 2019 and 9 July 2020 (Minutes from the meetings of the MA Monitoring Committee on 26 September 2019 and 9 July 2020) (PV CSAMM).

Use designation, crops concerned and use status

According to the National Plant Protection Uses Catalogue in force, only one use corresponds to weed control in vines. The table shown below lists the situations concerned.

Name of use[1] (national catalogue)	**Scope of use (crops or crop groups covered)**	**Status of use**	**Description of use**
Vines*Weed control*Planted crops	Table-grape vines, wine-grape vines, rootstock nurseries, vine nurseries	Major	Destruction of weeds on the plot in the inter-row spaces and/or under the rows

Table 1 - Description of the use in question

[1] Guidance note DGAL/SDQPV/2015-253 of 10 March 2015. Certain uses or use designations are currently under review and will be adopted in future MA decisions.

Note: use for killing vine stocks is also possible. This practice is considered to be included in the "General Treatments*Destruction*Standing tree stumps" use of the National Plant Protection Uses Catalogue and will not be taken into account in this assessment. Destruction of vine stocks mainly serves to limit wood virus diseases (prophylaxis) (PV CSAMM; PV CSAMM; PV CSAMM).

Situation regarding glyphosate use on the crop

According to the INRA report (2019), the viticulture sector is a major glyphosate user for weed control of the crop. The quantity of the active substance glyphosate used in viticulture is estimated to be between 400 and 1,000 g/ha/year.
It is also reported that, according to the map of quantities per hectare drawn up by the General Commission for Sustainable Development, the areas consuming the most glyphosate (more than 1 kg/ha) largely correspond to wine-growing areas.

However, the proportion of the area treated in a plot during weed control varies greatly from one vineyard to another; the operation may consist of under-row application only, or under-row with every second inter-row, or "blanket" application (i.e. under-row and inter-row), which explains why the treatment frequency index (TFI[2]) for herbicides in viticulture is often less than 1 (INRA, 2019).

Examination of non-chemical alternatives under Article 50.2

1. Identification of non-chemical alternatives in general use

1.a. Do non-chemical methods of prevention or control exist for the claimed use?

The contributions were analysed and provided the following answers to the question posed:

- **Yes,** for the situations identified below (1.b.);
- **No**, in the following situations of technical deadlock:
    - situations where mechanisation is not possible/fragile situations with regard to the risk of erosion: vines on steep slopes/terraces and very stony ground (INRA, 2017), rootstock nurseries, untrellised vines with trailing shoots on the ground in France (PV CSAMM);
    - the need to control established perennial weeds that cannot be destroyed with other solutions that fail to limit their growth (INRA, 2017). In these situations, weed control can be limited to spot applications on the plants concerned.

1.b. If so, which ones? Are they in general use?

With regard to non-chemical methods of weed management, **a distinction needs to be made between management of the inter-row space and of the row itself** (i.e. the *cavaillon*, the line running between the vine stocks). The most difficult area to manage without herbicides is the row, also known as the "under-row" area.
Various management methods are presented in the INRA report (July 2019): total chemical weed control, total mechanical weed control and mixed weed control, which combines chemical and mechanical weed control.

[2] The plant protection treatment frequency indicator (TFI) monitors the use of plant protection products (pesticides) at the level of a farm or group of farms. The TFI records the number of reference doses used per hectare during a crop season.

The non-chemical weed control solutions mentioned in the INRA reports (September 2017 and July 2019) include mechanical weed control, thermal weed control and grassing (total grass cover, i.e. row and inter-row). The most commonly used solution is mechanical weed control. For mechanical weed control under the row, there are several categories of tools:

- ploughs that turn over a strip of soil and bury the weeds. These tools have a long history of use in vineyards, for managing the grass cover of the *cavaillons* before herbicides came to be used;
- rotary tools that uproot and disperse the weeds;
- bladed hoes that pass between the vine stocks and cut and break up a strip of soil at shallow depths, and may be supplemented with rotary tillers.

In the "mixed" management system, inter-row weed management primarily relies on mechanical weed control and/or grass cover with mowing, while under-row weed control uses a chemical herbicide with possibly a reduced dose (INRA, 2019).

Non-chemical methods requiring technological development are not listed in the table below (example: robotisation).

Non-chemical methods		General use	Sources
Management of the entire area (inter-row + under-row)	**Mechanical weed control over the entire area**	**Yes, in certain situations (*)**	(INRA, 2019)
	Mechanical weed control under the row with mowing of grass cover in the inter-row spaces	No	(INRA, 2019)
	Total grass cover with mowing	No	(INRA, 2019)
	Mulch/plant cover under the row	No	(GTF2, 2019)
Management of the inter-row	**Mechanical weed control (tillage)**	**Yes**	(INRA, 2019)
	Grass cover with mowing	**Yes**	(INRA, 2019)
	Thermal weed control	No	(GTF2, 2019)
	Sheep grazing (eco-grazing)	No	(GTF2, 2019)

Table 2 - Non-chemical alternatives and situation regarding their use

(*) INRA states that practices "without chemical weed control" account for an area varying from 4 to 35% depending on the wine-growing regions considered (see Table 2 of the INRA report, 2019).

2. Consideration of major practical or economic disadvantages

For each of the non-chemical prevention or control alternatives in general use identified in point 1, the practical and economic disadvantages were examined to analyse whether the obstacles to making them available to all the farmers concerned could be considered to be major, and to set out the specific conditions for substituting glyphosate use by this alternative.

Do the identified non-chemical alternatives in general use have major practical or economic disadvantages?

Non-chemical methods in general use: entire surface managed by fully mechanical weed control (tools go in the inter-row and under-row areas)	
Practical disadvantages compared to total chemical weed control	- Risk of agro-equipment companies having insufficient supply capacity to meet increased demand in the short term for mechanical equipment suitable for under-row weed control. According to AXEMA[3], a transition phase of at least 5 years would be needed, starting from when glyphosate is no longer authorised for use, with regard to production capacity and its quantified growth (combination of current production and estimated growth). With French companies' current production capacities, it would take about 15 years to equip producers on the French market. End-user support and training are also fundamental points not to be overlooked (AXEMA, 2020); - Difficulty carrying out mechanical weed control under the row in situations with narrow vines (narrow spacing between rows) or on vineyards with drip irrigation on the ground (INRA, 2017); - Feasibility varies depending on climate conditions (Parliamentary fact-finding mission, 2019); - Increased number of passes (e.g. in the narrow Burgundy-Beaujolais vineyards, an increase from 2 with "all chemical" weed control to 6.7 on average in "all mechanical" control) (INRA, 2019); - Disrupted organisation of the work schedule, with work concentrated between April and July during the wire-lifting and plant protection treatment periods (INRA, 2019); - Risk of injury to the vine stocks and disorganisation of the root system, which can lead to a loss of yield (5 to 20% in extreme cases - IFV oral communication) and an impact on crop longevity; - Less effective weed control: ➢ 5 to 25% of weeds not controlled at harvest time (mainly perennials); ➢ lower effectiveness on grasses; ➢ lower effectiveness, or even risk of spread of perennials with rhizomes; ➢ possible risk of presence of uncontrolled toxic plants (*Solanum nigrum*); ➢ less effective weed control in vineyards considered to be firebreaks (GTF2, 2019); - Increased erosion risk in "hillside" vineyards (INRA, 2017).
Economic disadvantages compared to total chemical weed control	- Additional labour costs due to working time (increase in the number and duration of passes) and qualification (training needed for maintaining and driving machinery used for working under the row); - Additional cost due to the need for specific equipment (under-row weed control) and extra equipment to cover the entire area of the farm, as well as its maintenance; - Additional cost due to extra fuel consumption; → Estimated overall additional cost of €210/ha (wide inter-row spaces) and €408/ha (narrow inter-row spaces) (INRA, 2019).
Uncertainties	- Compatibility with the National Low Carbon Strategy (SNBC)* [Ministry of Ecological and Inclusive Transition (MTES, February 2020)], particularly in terms of: ➢ impact on greenhouse gas production (no quantified data) related to the increased number of passes, with higher fuel consumption of between 24 and 64 L/ha, depending on the vineyards (INRA, 2019); ➢ and impact on the possible disruption of soil biological activity.

[3] AXEMA: Agricultural equipment industry association

Non-chemical methods in general use: inter-row managed by mechanical weed control or grass cover with mowing	
Practical disadvantages compared to total chemical weed control	- The need for sufficient availability of equipment, which depends on agro-equipment companies having enough supply capacity to meet increased demand in the short term; - Feasibility varies depending on climate conditions (Parliamentary fact-finding mission, 2019); - Increased number of passes (e.g. in the narrow Burgundy-Beaujolais vineyards, an increase from 2 with "all chemical" weed control to 4.7 on average in "mixed" mode without grass cover) (INRA, 2019); - Disrupted organisation of the work schedule (with work concentrated between April and July during the wire-lifting and plant protection treatment periods) (INRA, 2019). Less effective control of perennial weeds; - Less effective weed control in the inter-row spaces of vineyards considered to be fire-breaks in the event of inter-row mowing (GTF2, 2019); - Less effective weed control in situations of mandatory control regulated by prefects (ragweed, creeping thistle).
Economic disadvantages compared to total chemical weed control	- Additional labour costs due to working time (increase in the number and duration of passes); - Additional cost due to extra fuel consumption; → Estimated overall additional cost of €69/ha (grassing 1 row out of 2), €75/ha (inter-row grassing) and €161/ha (without inter-row grassing) (INRA, 2019).
Uncertainties	- Compatibility with the National Low Carbon Strategy (SNBC)[4] (MTES, February 2020), particularly in terms of: ➢ impact on greenhouse gas production (no quantified data) related to the increased number of passes: higher fuel consumption can range from 25 to 33 L/ha, depending on the vineyards (INRA, 2019); ➢ and impact on the possible disruption of soil biological activity (if there is mechanical tilling in the inter-row spaces).

Table 3 - Disadvantages of alternatives in general use

In view of the information presented in Table 3, it seems that:

- the practice of mechanical weed control or grassing over the entire area has major practical disadvantages related to under-row weed management (mainly regarding availability of equipment and specialised labour) as well as economic disadvantages, compared to total chemical weed control, thereby limiting its availability for all farmers concerned. Substituting glyphosate by this solution may result in less effective weed control in situations with flora that are difficult to manage;

- the practice of mechanical weed control or grassing in the inter-row spaces with chemical weed control under the row has disadvantages that are not considered to be major.

[4] SNBC - points A2 and A4: With regard to agriculture, priority A2 stipulates reducing CO_2 emissions associated with fossil fuel consumption and developing the use of renewable energies, and priority A4 stipulates stopping the current release of carbon from agricultural soils and reversing the trend, in connection with the "4 per 1000, soils for food security and climate" initiative.

3. Consideration of minor uses and management of resistance

Is the use concerned:	Yes/No	Justify
by a minor use situation?	No	The use is major within the meaning of the National Plant Protection Uses Catalogue in force.
by management of resistance?	No	As it concerns non-chemical alternatives for prevention and control, an analysis of the chemical diversity of the active substances is not appropriate.

Table 4 - Minor uses and resistance

4. Risk comparison

Are the identified alternatives significantly safer for human or animal health or the environment?

Regulation (EC) No 1107/2009 stipulates that the identified alternatives are significantly safer if a significant difference in risk has been established between the substitutable product and these alternatives for the use in question. Annex IV to this Regulation sets out the methodology for carrying out this risk comparison.

This annex gives the following indications:

"The properties of the active substance and plant protection product, and the possibility of exposure of different population subgroups (professional or non-professional users, bystanders, workers, residents, specific vulnerable groups or consumers) directly or indirectly through food, feed, drinking water or the environment shall be taken into account [by the competent authorities]. Other factors such as the stringency of imposed restrictions on use and prescribed personal protective equipment shall also be considered. For the environment, if relevant, a factor of at least 10 for the toxicity/exposure ratio (TER) of different plant protection products is considered a significant difference in risk."

This shows that the idea of Regulation (EC) No 1107/2009 really is to assess and compare plant protection products. All the application guidance documents concern plant protection products, irrespective of the nature of the chemical or biological active substance (chemical, micro-organism, etc.). Although non-chemical alternative methods are cited in the Regulation, no method is given for assessing the risks associated with their use.

ANSES does not therefore have the tools or validated methodology needed for conducting an assessment to determine whether the non-chemical alternatives are significantly safer for human or animal health or the environment than a plant protection product.

5. Summary table

Can the use of glyphosate be substituted by an alternative non-chemical method?	Yes / No	Justify
For use over the entire orchard area (inter-row + under-row)	No	⇨ Technical deadlocks identified in the following situations: - Situations where mechanisation is not possible, such as vines on steep slopes or terraces, on very stony ground, or rootstock nurseries; - Control of established perennial weeds; ⇨ Identified non-chemical alternatives considered to be in general use: - Fully mechanical weed control (tools going in the inter-row spaces and under the rows) ⇨ For these alternatives, the practical disadvantages related to under-row weed management are considered to be major: - Mainly regarding availability of equipment and specialised labour
For inter-row use only	Yes	⇨ Identified non-chemical alternatives considered to be in general use in the following cases: - Mechanical weed control or grass cover with mowing ⇨ For these alternatives, practical and economic disadvantages were identified but are not considered to be major.

Table 5 - Summary table of the comparative assessment

General conclusion

In vineyard plots identified as involving technical deadlocks, for which there is no non-chemical alternative:

- in the case of plots where mechanisation is not possible, **substitution is not adopted**. It is therefore not proposed to apply any restrictions on use in terms of areas treated;
- with regard to control of established perennial weeds, they can be managed in both mechanisable and non-mechanisable situations while complying with the maximum authorised rate and using spot applications only.

Apart from these rare situations of technical deadlock, non-chemical alternatives exist for inter-row weed management. Insofar as this can be considered a practice in general use and does not have any major practical disadvantage in viticulture, **the substitution of glyphosate by non-chemical alternatives is possible between rows of vines**.

On the other hand, for under-row weed control, **substitution is not possible**, given the major disadvantages identified.

Therefore, **regarding the "weed control in vines" use**, a restriction of the maximum glyphosate application rate per hectare is recommended, to take into account substitution on the inter-row spaces and maintaining chemical weed control under the rows over the smallest possible area.

From an agronomic point of view, restricting the treated area to no more than 20% of the plot area would still enable under-row weed management. **This 80% reduction in the area treated means that the annual quantity of glyphosate is limited to 450 g of active substance per hectare per year.**

Authorisations would therefore be granted for uses with a favourable conclusion after assessment.

Uses	Maximum rate and conditions of use
Vines* Weed control* Planted crops	**Product rate to be calculated according to the glyphosate content of the product based on a maximum rate of 450 g of glyphosate per hectare**
	Conditions of use: Do not apply between rows. Do not apply to more than 20% of the plot area. Do not exceed the annual rate of 450 g of glyphosate per hectare.
	Product rate to be calculated according to the glyphosate content of the product based on a maximum rate of 2,160 g of glyphosate per hectare (see glyphosate opinion of 8 October 2004[5])
	Conditions of use: Only in situations where mechanisation is not possible: vines on steep slopes or terraces, stony soils, rootstock nurseries. Do not exceed the annual rate of 2,160 g of glyphosate per hectare.

[5] Opinion to all holders of marketing authorisations for commercial products containing glyphosate (or N-(phosphonomethyl)glycine), French Official Journal No. 235 of 8 October 2004

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