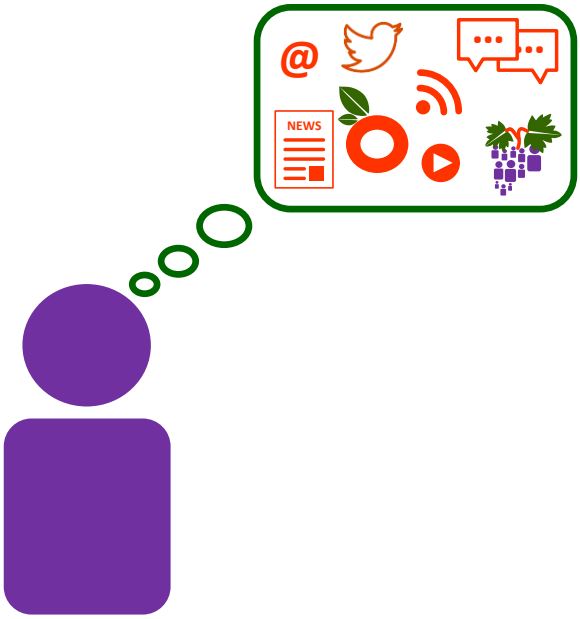
PEsticide Reduction using Friendly and Environmentally Controlled Technologies

LIFE/17/ENV/ES/000205



ACTION C3. Monitoring of behavioral change of Farmers

Deliverable C.3.1 Report of the results of the first survey questionnaire. *Identifying the level of knowledge of farmers about losses and exposure to pesticides and methods of reduction of pesticide impact prior to the project.*

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EXECUTIVE SUMMARY

The objective of this deliverable is to identify the level of awareness on the importance of adjustment and inspection of pesticide application equipment. Besides, monitoring of behavioural change of farmers in relation to the losses during the applications and the generated pollution. Furthermore, to disseminate the available tools and techniques for reducing the impact of pesticides, both on the environment and on operators. Moreover, thanks to the results of the present survey, we will be able to evaluate the perception on pesticides exposure risks by operators and farmers, and the adoption of protective behaviours.

A questionnaire was defined and implemented by the users of pesticides: citrus farmers and winegrowers. Once this questionnaire was filled by those target groups, we analysed the obtained data, to know the current situation and to be able to compare changes in the behaviour.

The questionnaire for citrus farmers was filled by 129 volunteers and in the case of winegrowers by 128. The sample shows the state of the art in reference to pesticide practices on the two studied crops. Specifically, a primary source of valuable data was obtained from 4 regions/countries: Piamonte/Italy, Catalonia/Spain and Midi/France in the case of winegrowers and Valencia/Spain for citrus.

This deliverable must to be understand as a state of art description. However, we have introduced some conclusions and comments in different questions. By this way, we want to highlight empiric and very important data to direct the dissemination and training actions. Due this deliverable and the actions involver are not isolated of the rest of actions, so they must to contribute to the general progress of the project.

Going beyond, we have compared between the general average of age and crop surface with the average of age and surface regarding key answers in all the questionnaires implemented. Highlighting these differences, we want to define different profiles (i.e. What type of farmers are answering what?). This second level of analysis is described only if we have found relevant differences between averages, if not, we assumed that these parameters (age/crop surface) had not relevant influence in the answers. This aspect can be very important to direct the dissemination activities and to maximise the impact of them.

As preliminary conclusion, we can establish that in terms of PPP application the situation in the studied regions is not the best. The conventional practices (not taking environmental aspects into account, been also anti-economical) are right now, yet, more common and have strong roots on farmers behaviour. Awareness-raising about more efficient and environmentally friendly practices should be intensely promoted, particularly by face to face meetings with the target groups. In this context we have a big challenge and it will be necessary an extra effort to convince the farmer communities, but also other operators about the advantages of using the tools and techniques of the PERFECT project.

1 INTRODUCTION

The present report was set in order to evaluate the project impact on the behaviour of operators and farmers. It is expected to obtain information in relation with the reduction of the environmental impact of pesticide applications and the use of protective equipment. So, it was necessary to obtain primary data of the current state of the art of the PPP (Plant Protection Products) application before the implementation of the project. Therefore, a survey to farmers was carried out.

The questions are very similar for both studied crops (citrus orchards and vineyards). However, both have some differences and have been reflected in this deliverable. Besides, both questionnaires have the same structure: A first part composed by control questions (age, gender and crop surface) and a second part composed by the questions related with PPP applications (25 questions).

The aim of the survey/questionnaire was to identify the level of awareness on the importance of adjustment and inspection of pesticide application equipment. The survey had questions in relation to the losses during the applications and the generated pollution, as well as, the available tools for reducing the impact of pesticides both on the environment and on operators. Moreover, this survey provided the data to evaluate the perception on pesticides exposure risks by operators and farmers, and the adoption of protective behaviours at the beginning of the project.

The obtained data shows the state of the art and meet the objectives set of the PERFECT Life project. Besides, the results of the present report will help all the partners involved in the project to their different dissemination activities, to promote communication strategies to specific farmers collectives that are not aware of the benefits of the project, and to increase the effectiveness of the communication effort.

2 IMPLEMENTATION

Three phases in the works were defined to implement this action:

1. To define the questionnaire.
2. To spread the questionnaire.
3. To analyse the data and to obtain results.

2.1 To define the questionnaire.

During the months of November and December 2018, two meetings were set between CACV (Cooperatives Agroalimentàries de la Comunitat Valenciana) and IVIA (Valencian Institute for Agrarian Research), to define the questionnaires for citrus and winegrowers.

The questionnaire had to define all the aspects related with the PPP application and, by this way, to offer an entire vision of the state of the art. Obviously from a sample of farmers, but representative of the reality. To obtain real primary data will be fundamental to compare at the end of the project, if farmers change their behaviour trough a better environmental and economical approach in their use of PPP.

After the initial meetings, a questionnaire draft was defined and sent to the rest of partners involved in the action C3, especially IFV (Institut Français de la Vigne et du Vin), UPC (Universitat Politècnica de Catalunya BarcelonaTech) and DISAFA (Dipartimento di Scienze Agrarie, Forestali e Alimentari) to introduce improvements. After that consultation the final version of the questionnaire was approved in January 2019.

The final versions of the questionnaires (see annex 1 and 2) were composed by two parts and for both crops (vineyards and citrus orchards). The first part defined control questions (personal information): age, gender, crop surface, status (associated or independent) and, dedication (questions from 1 to 5). The second part of the questionnaire was directed to show how, when, and why the farmers use the PPP applications, this part contained 25 questions, 30 in total.

That second part was structured like closed questionnaire (for most of the questions) with a set of direct questions, where the farmers had limited options to answer. In some questions the selection was, furthermore, multiple choices, i.e. more than one answer was possible. See annex 1 and 2.

2.2 To spread the questionnaire

Once the questionnaire was defined, the number of answers (completed questionnaires) were established for each crop:

- Winegrowers: At least 120
- Citrus farmers: At least 120

CACV proposed to each one of the partners involved in this part of the action C.3.1 a pre-fixed number of completed surveys

- CACV: 120 Citrus farmers
- DISAFA: 60 Winegrowers
- UPC: 20 Winegrowers
- IFR: 40 Winegrowers

Furthermore, it was established a calendar for sending back the completed surveys to CACV, the deadline was the last week of May 2019.

CACV established two restrictions or indications about the implementation results:

1 The partners had to obtain results before the deadline was established. After that, the implementation to tabulate a high number of answers was necessary. Besides, to respect the deadline established was critical to complete this deliverable on time.

2 The partners had also to obtain representative data, as much surveys as possible. But, not only the final number was important, also try to obtain data from different geographical areas (if possible), from different age, from different crop surfaces, etc. Those aspects were fundamental to be representative of the actual situation.

2.3 To analyse data and to obtain results

Once the implemented questionnaires were sent back to CACV (included the surveys made by CACV itself), the results were tabulated to set the analysis. The number of questionnaires to analyse were:

- 129 Citrus farmers' questionnaires.
- 128 winegrowers' questionnaires.

The results can be seen in the following links:

- Citrus farmers: **https://tinyurl.com/y3xjuhz2**
- Winegrowers: **https://tinyurl.com/y2hg4mj9**

The analysis of results was developed at 3 levels. The first one was a direct analysis, i.e. direct conclusions easily obtained from the tabulation of results. The second one at geographical level, i.e. highlighting if the geographical origin of the answers were generating relevant differences. The third level was a descriptive analysis, i.e. if some answers, were influenced by control questions, like age

or crop surface. This descriptive approach tried to define behaviour profiles. Profiles that were defining, therefore, special target groups for dissemination and training actions.

The next section of the present report shows question by question and the obtained results.

2.4 Winegrowers: Data obtained, and analysis made.

2.4.1 Gender.

More than 90% of the farmers were male.

2.4.2 Age

The average was 45 (45.01) years old. Without relevant differences between regions.

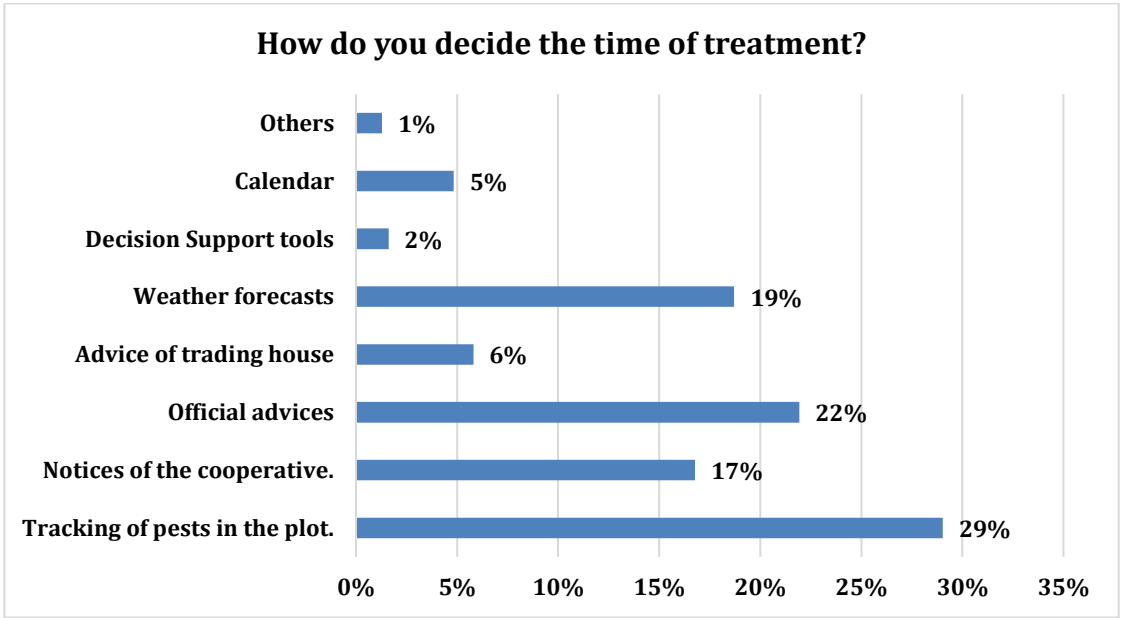
2.4.3 Crop surface

Descriptive analysis: The average was 29.84 Ha. However, this average was different in each region, Catalonia: 34.15 Ha, Italy 14.53 Ha and France 40.84 Ha. These differences will have an impact on the results of the rest of the questionnaire.

2.4.4 Agricultural dedication

All of them were full time winegrowers.

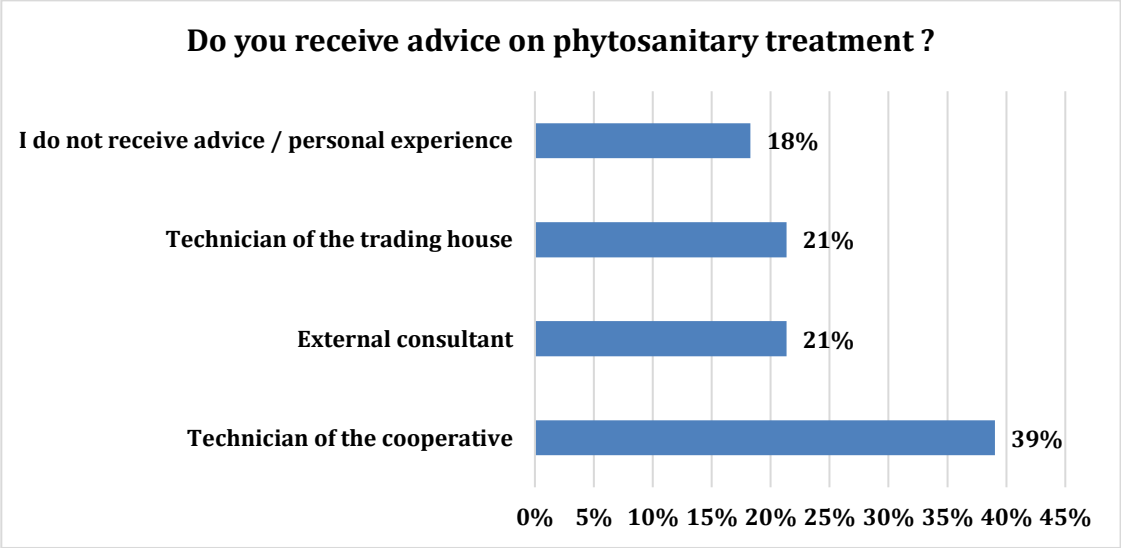
2.4.5 How do you decide the time of treatment?



Source: Prepared by the authors

Descriptive analysis: We can highlight the low percentage of "Decision support tools", but also that the more used system is "Tracking of pest in the plot", i.e. the sector relies on traditional and very unsophisticated systems.

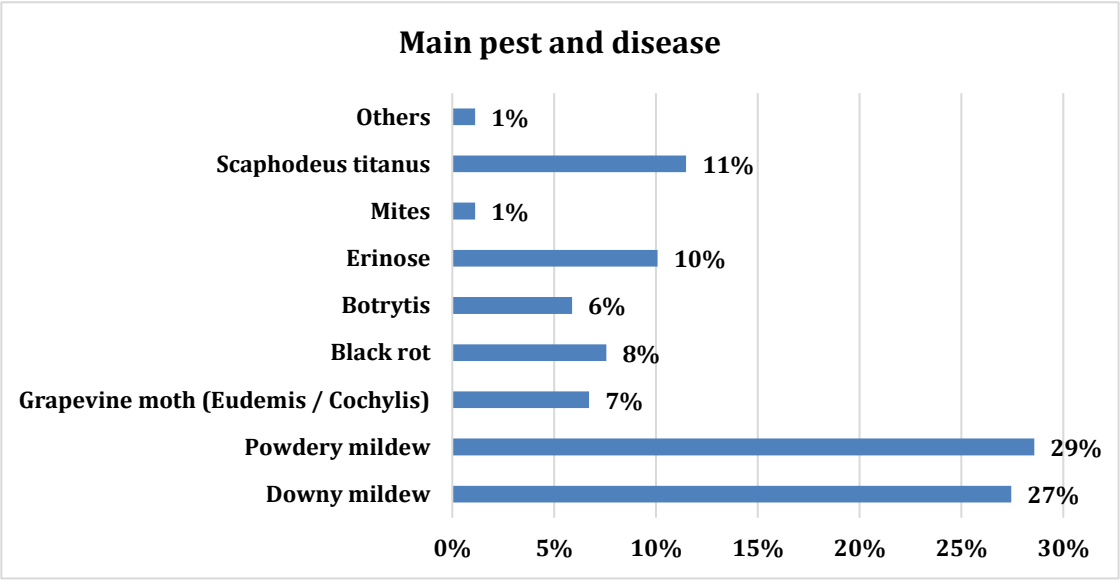
2.4.6 Do you receive advice on phytosanitary treatment?



Source: Prepared by the authors

Descriptive analysis: Until a 18% of winegrowers did not receive advice. This percentage was so high. The winegrowers just trust in themselves or technicians very close to them (29% are technicians of cooperatives).

2.4.7 Main pest and disease



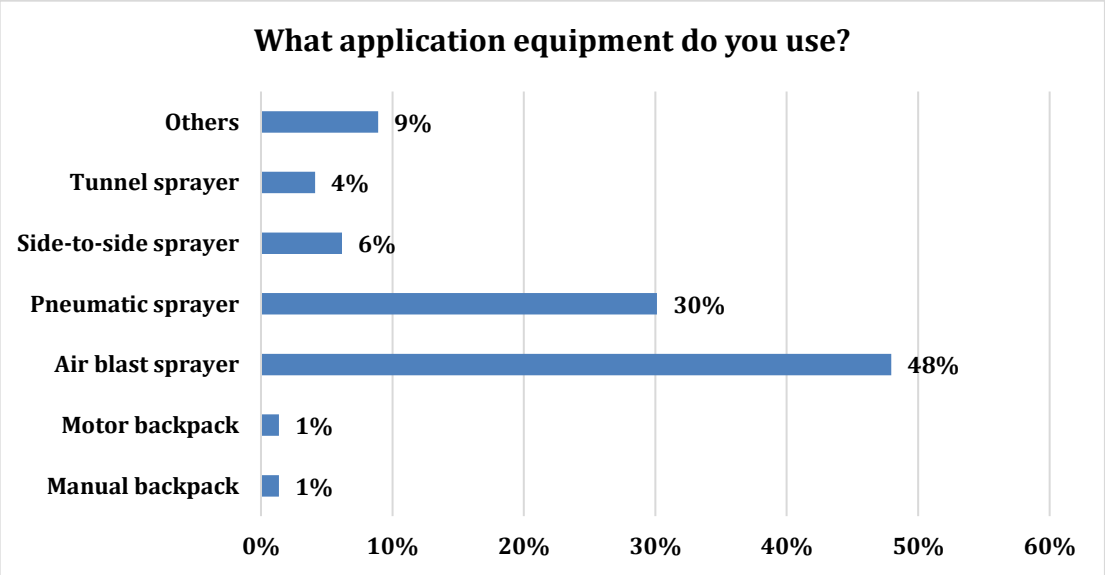
Source: Prepared by the authors

Descriptive analysis: The most important pest was the mildew (56%). So, if the results we are looking for are useful to reduce this pest, the farmers will be very interested. Therefore, it would be interesting to highlight this aspect in the dissemination and training actions.

2.4.8 How many treatments do you do per year?

The average was 7.93. With an average of 6 for Catalonia, and a 10.11 for Italy.

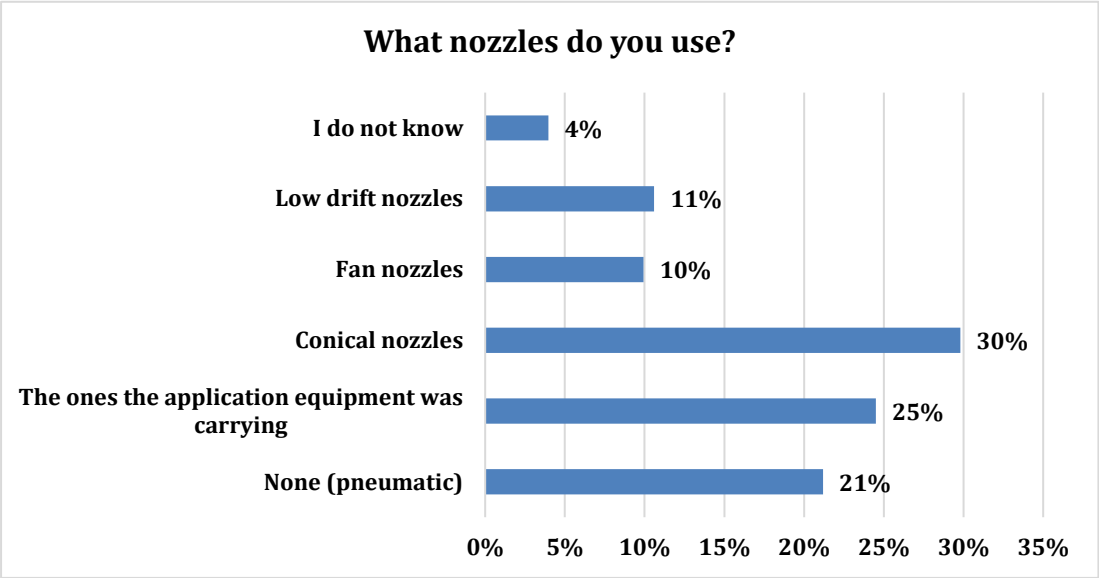
2.4.9 What application equipment do you use?



Source: Prepared by the authors

Descriptive analysis: Almost 50% of the winegrowers were using "Air Blast sprayer". In Italy this percentage was 70% but in France just a 20%. In France was the "Pneumatic sprayer" with a 53% the most used system.

2.4.10 What nozzles do you use?



Source: Prepared by the authors

Descriptive analysis: Being a low percentage (4%) who did not know what type of nozzles were used. Analysing by countries the results were: 7% for Spain/Catalonia and 8% for France. Low drift nozzles just represented a 11%, but a 17% in France.

We want to emphasise the age influence in this aspect. The age average of winegrowers using low drift nozzles was considerably low, 38.92 years old in front of the general average, 45 years old.

If we check the influence of "crop surface" we find that the average crop surface for vineyards was 29.84 Ha, but the winegrowers that use low drift nozzles had an average of 50.31 Ha. So, youngest and with larger crops winegrowers were who used low drift nozzles.

2.4.11 Do you change the nozzles according to the treatment?

The 68% of the winegrowers did not change the nozzles.

2.4.12 Do you know the low drift nozzles?

71% knew the low drift nozzles.

2.4.13 Do you orient nozzles or diffusers depending on the shape and size of the canopy?

Yes, for an 83%. 96% in Catalonia.

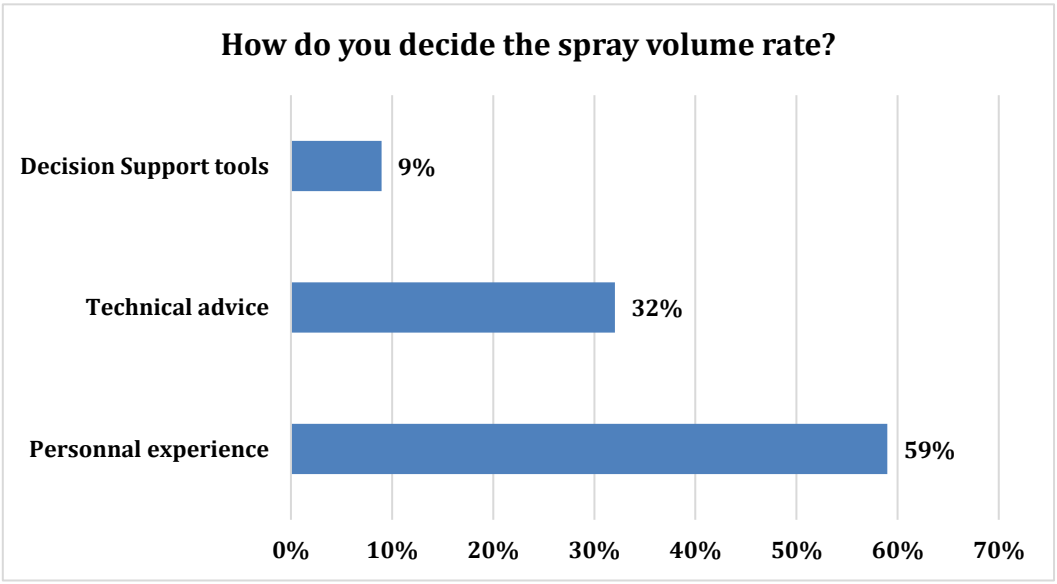
2.4.14 Do you close some nozzles or diffusers depending on the shape and size of the canopy?

Yes, for an 92%.

2.4.15 Do you adapt the air speed to the shape and size of the canopy?

Just for a very low percentage, 29%.

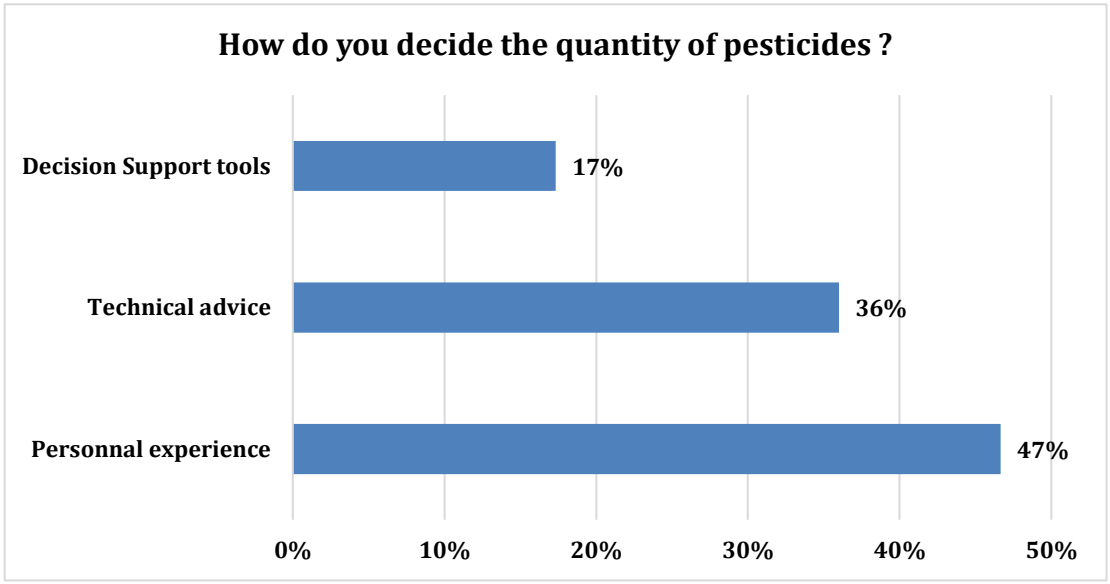
2.4.16 How do you decide the spray volume rate?



Source: Prepared by the authors

Descriptive analysis: In a similar (but increasing %) way to the question 2.3.2 (Do you receive advice on phytosanitary treatment?) a 59% of the winegrowers were trusting in their own experience. Decision support tools was used only for an 9%.

2.4.17 How do you decide the quantity of pesticides?



Source: Prepared by the authors

Descriptive analysis: 47% of the winegrowers were trusting in their own experience. Decision Support tools was used just for an 17% of the sample. However, this percentage was almost double than spray volume. (Question 2.4.16)

At the same time, the age average showed interesting data: "Decision support tools" was chosen by younger farmers, (average 38.83 years old in front of 45, average of the sample). Also, "Personal experience" was chosen by farmers with larger extension crops (average surface 47.03 Ha, in front of 29.84 average of the sample).

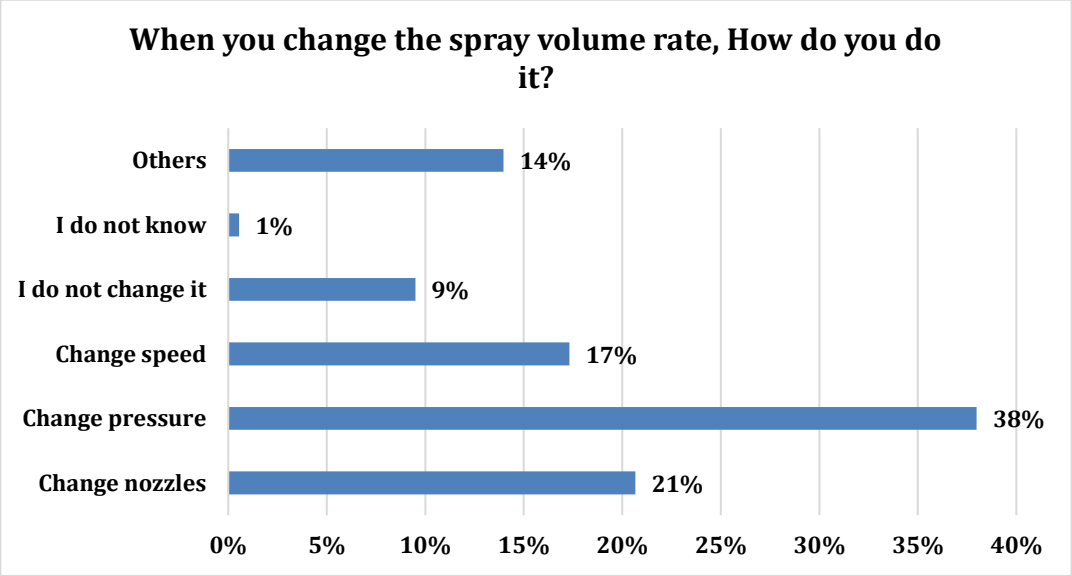
2.4.18 Do you know any computer tools for calculating the spray volume rate?

Just an 16% knew these tools. It will be necessary an intense dissemination work in this sense.

2.4.19 What range of spray volume rates do you usually use?

Descriptive analysis: The average was 304 Vol/Ha, but the data was very different depending on country/region. 449 Vol/Ha in Catalonia, 344 Vol/Ha in Italy and a 120 Vol/Ha in France.

2.4.20 When you change the spray volume rate, how do you do it?



Source: Prepared by the authors

Obviously, it depends on the type of application system used, but, a 9% did not change the spray volume rate.

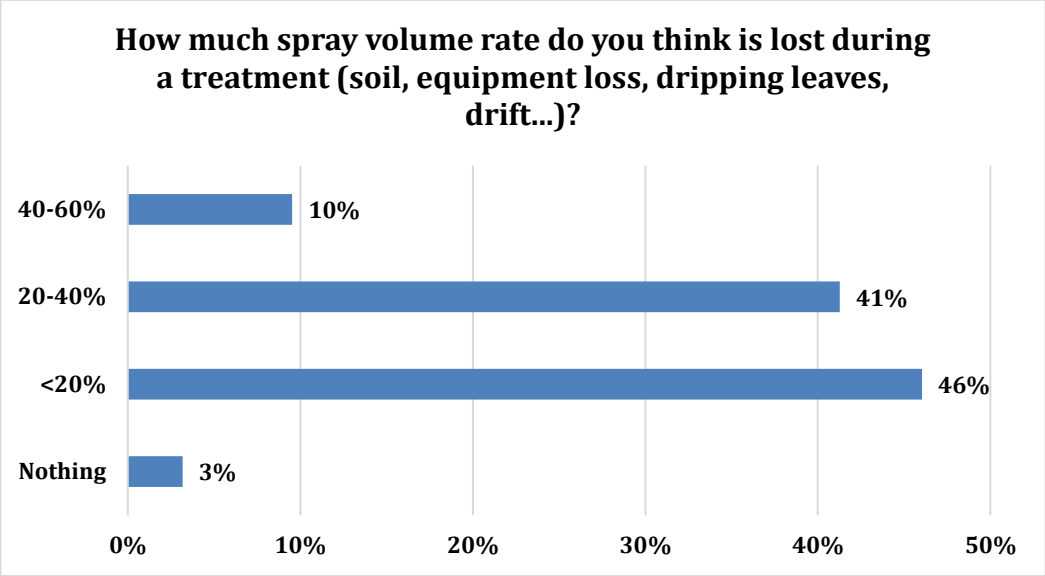
2.4.21 What range of pressures do you use?

Descriptive analysis: Average was 9.03 bars. However, in Catalonia was almost 14 bars, while France was just 4.15 bars. These differences were related with the type of application tool.

2.4.22 What range of forward speeds do you use?

Descriptive analysis: Average was 5.27 km/h. Very similar in all the studied regions.

2.4.23 How much spray volume rate do you think is lost during a treatment (soil, equipment loss, dripping leaves, drift...)?



Source: Prepared by the authors

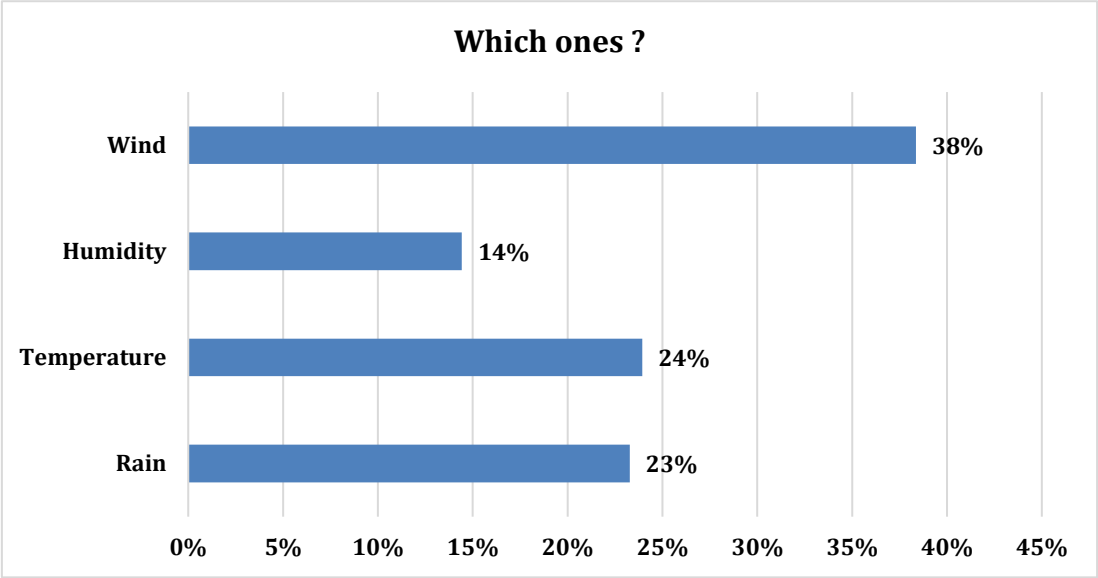
Descriptive analysis: More than 50% thought that 20% or more of the sprayed pesticide was lost. Avoiding the loss of that amount of pesticides should be one of the main focuses of the dissemination actions. Evidently it was a consequence of the lack of knowledge of computer systems that allow control volume and the good cost-benefit relation of these systems in front of the misuse of pesticides.

Regarding the influence of age and surface: The youngest and smallest farmers were the majority who have answered "Nothing" (age average 31 years old and 13 Ha of surface in front of 45 years and 29.84 Ha average of the sample). In the same way, the farmers with larger farms were who lost more, 40.42 Ha of average in front of 29.84 average of the sample.

2.4.24 Do you consider the weather conditions to make the treatment?

Descriptive analysis: An average of 94% considers the weather. In Italy a 12% did not consider this aspect.

2.4.25 Which ones?



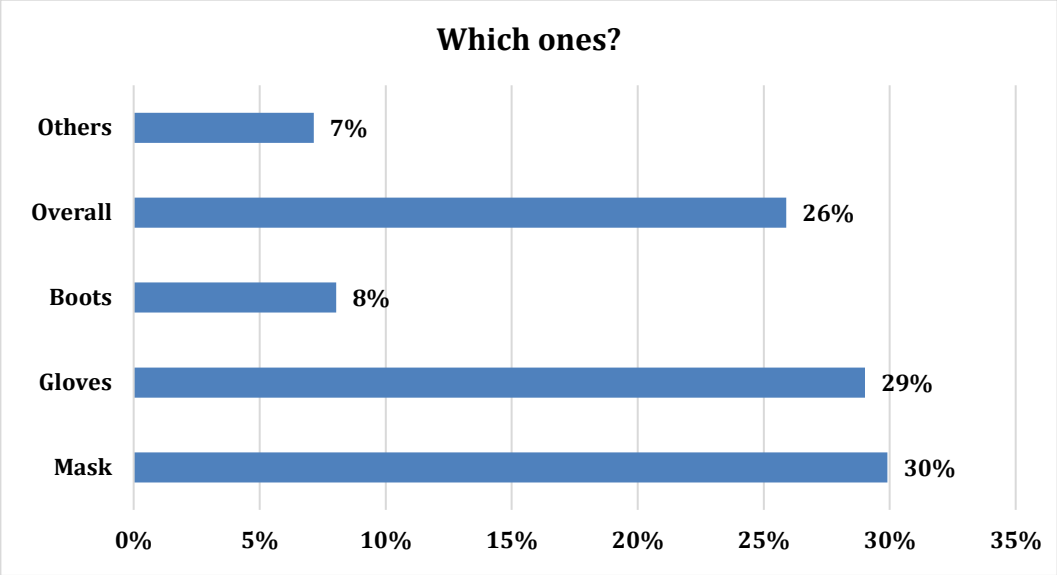
Source: Prepared by the authors

Descriptive analysis: Wind was the most important weather factor. In any case it was a question with multiple possible answers.

2.4.26 Do you use any type of personal protection equipment during the application of phytosanitary products?

Descriptive analysis: Only a 20% did not use protection. Mainly in Italy with a 34%. This 20% was represented by the smallest farmers, 17.26 Ha in front of 29.84 Ha (average of the sample).

2.4.27 Which ones?



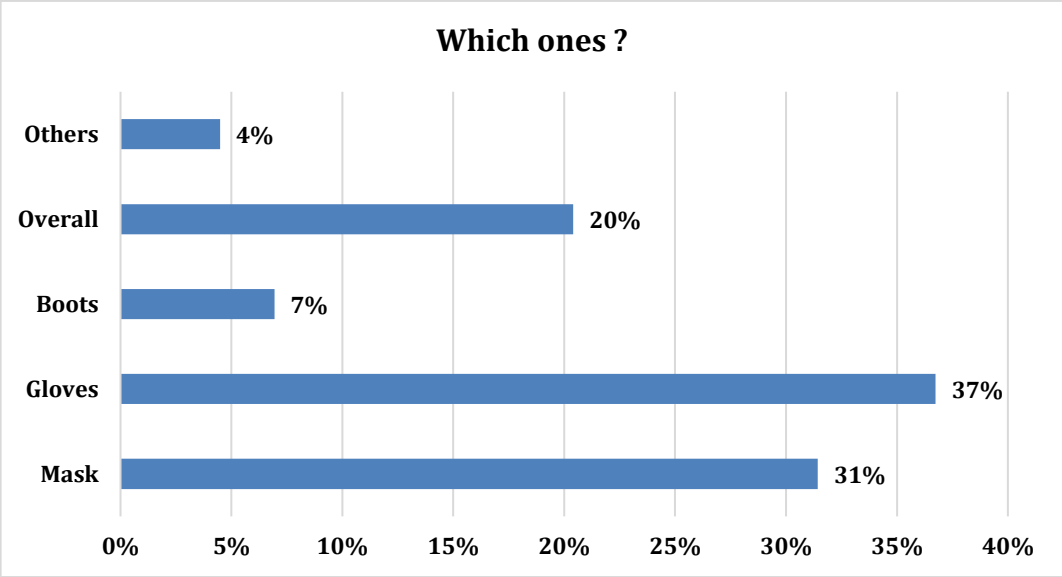
Source: Prepared by the authors

Descriptive analysis: This was a question with multiple choices. Mask and gloves were the most selected but very close to Overall. In any case, only a 26% used all the protection equipment.

2.4.28 When you prepare the mixture for spraying, do you use any protective equipment?

Descriptive analysis: Only 7% did not use protective equipment. This 7% is represented by the smallest farmers, 16.5 Ha in front of 29.84 Ha (average of the sample).

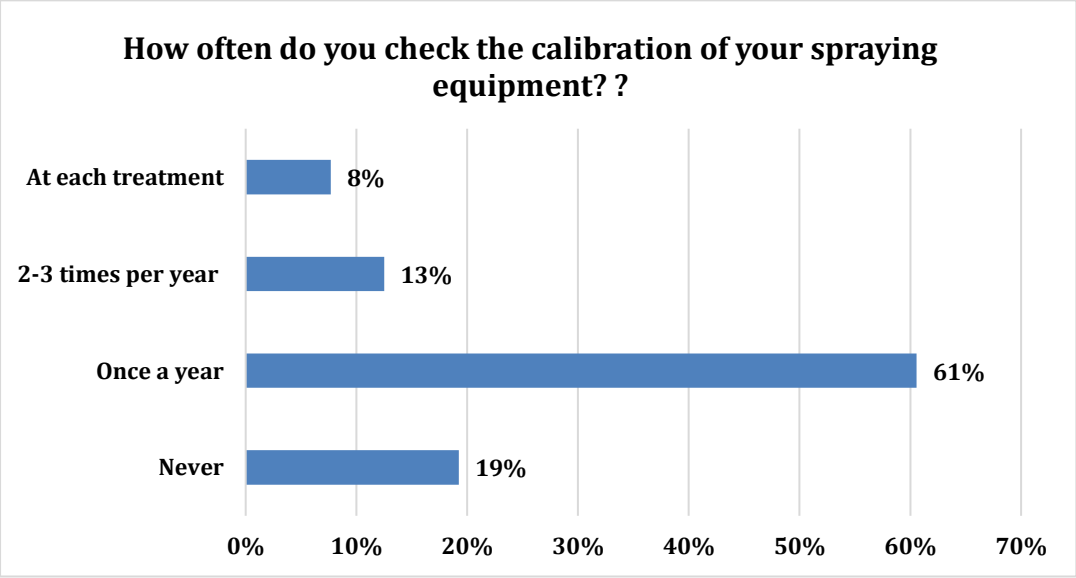
2.4.29 Which ones?



Source: Prepared by the authors

Descriptive analysis: In this case only a 20% was using overall equipment. Gloves and mask were the most used protective equipment.

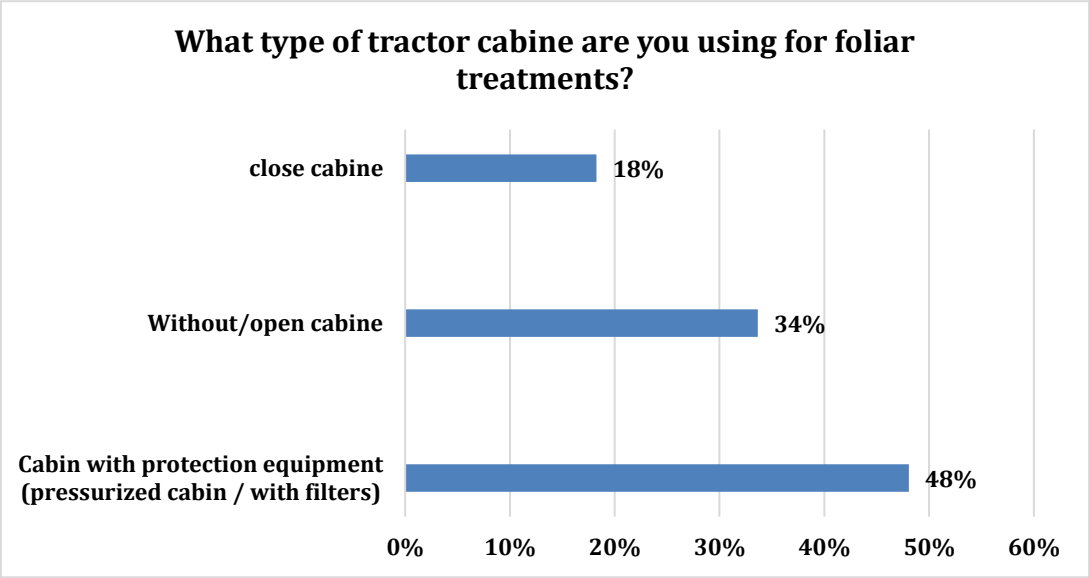
2.4.30 How often do you check the calibration of your spraying equipment?



Source: Prepared by the authors

Descriptive analysis: More than 60% of the sample calibrated the spraying equipment once a year and never a 19%. Obviously, did not exist a culture of "equipment care". And this lack of culture of calibration was related with the crop surface: The farmers with larger vineyards were the once who calibrate at each treatment (43.98 Ha in front of 29.84 average of the sample).

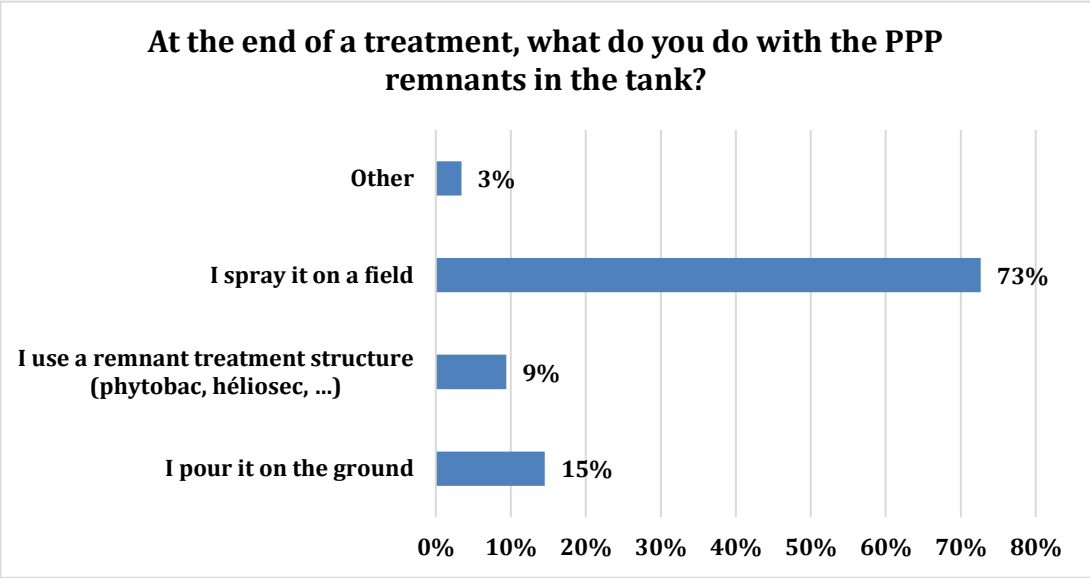
2.4.31 What type of tractor cabine are you using for foliar treatments?



Source: Prepared by the authors

Descriptive analysis: Yet, open tractor cabine or without cabine represented a 34% from total. The main factor with influence was the crop surface: The farmers with smaller vineyards. Open cabine was selected more by smallest farmers (11.59 Ha in front of 29.84 Ha).

2.4.32 At the end of a treatment, what do you do with the PPP remnants in the tank?



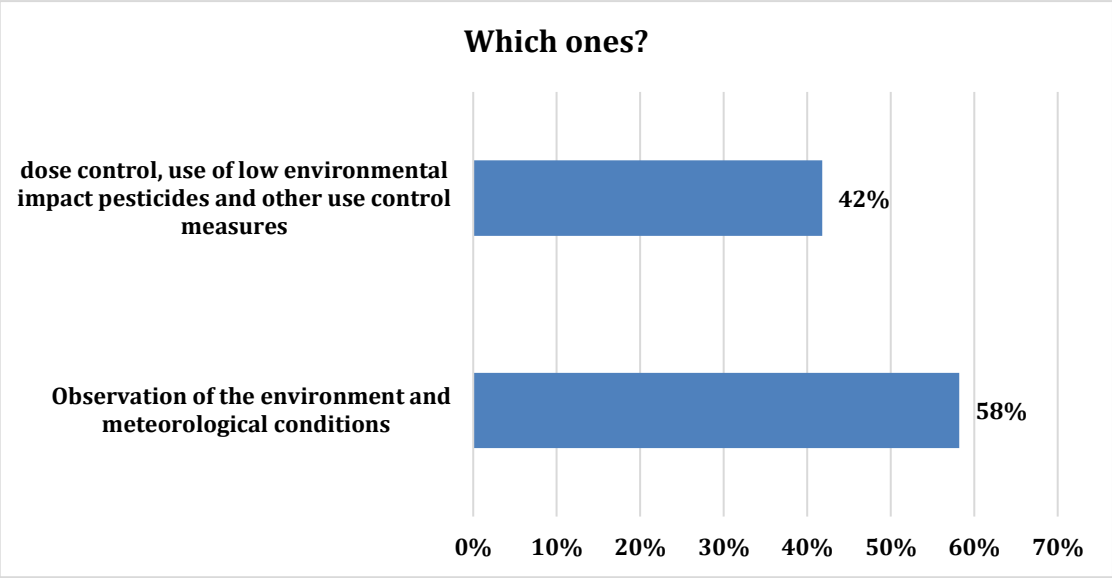
Source: Prepared by the authors

Descriptive analysis: The winegrowers did not know alternatives for PPP remnants. Ground and field represent the 88% and both were selected more by smallest farmers, 20.33 Ha.

2.4.33 Are you using any kind of measure to reduce the environmental impact of phytosanitary treatments?

Descriptive analysis: The 44% was not using any measure to reduce. In France 75% of the farmers declare that they were using some measures to reduce impact.

2.4.34 Which ones?



Source: Prepared by the authors

Descriptive analysis: This question had multiple and open choices, i.e. the winegrowers could answer different things without restriction. We have defined 2 typologies of answers to simplify. The observation was the commonest measure with a 58%.

2.5 Citrus farmers: Data obtained, and analysis made.

CACV was the responsible to obtain data from citrus farmers. During December 2018 CACV planned to cover at least 120 questionnaires implemented. In this sense a calendar to visit a total of 24 Citrus cooperatives/companies was defined. The cooperatives/companies selected in all the Valencian territory were:

- Catadau
- Castelduc
- Vinaroz
- Moncofar
- L´Alcudia (Canso)
- Bugarra (Cobatur)
- Copobla
- Benaguacil
- Burriana
- Agrícola Montedeta
- Coop. Nules
- Marcelo Zapater (Cheste)
- Copuzol
- Coop. Vall D´Uixo
- Coop. Betera
- Coop. Lliria
- Tous (Exagro)
- Copal Algemesi
- Coop. La Viña (La Font)
- Francisco Girona (Pego)
- José Server Falgas (Pego)
- Server Ortola C.B (Pego)
- Elvira Pastor Ballester (Pego)
- Bio Server Ortola (Pego)

Each one of them was visited by staff of CACV to explain the PERFECT project and the present questionnaire.

After the visits, it was necessary to follow and monitoring the answers in several cases due to misunderstandings and no data included. At the end, 129 questionnaires were entirely completed.

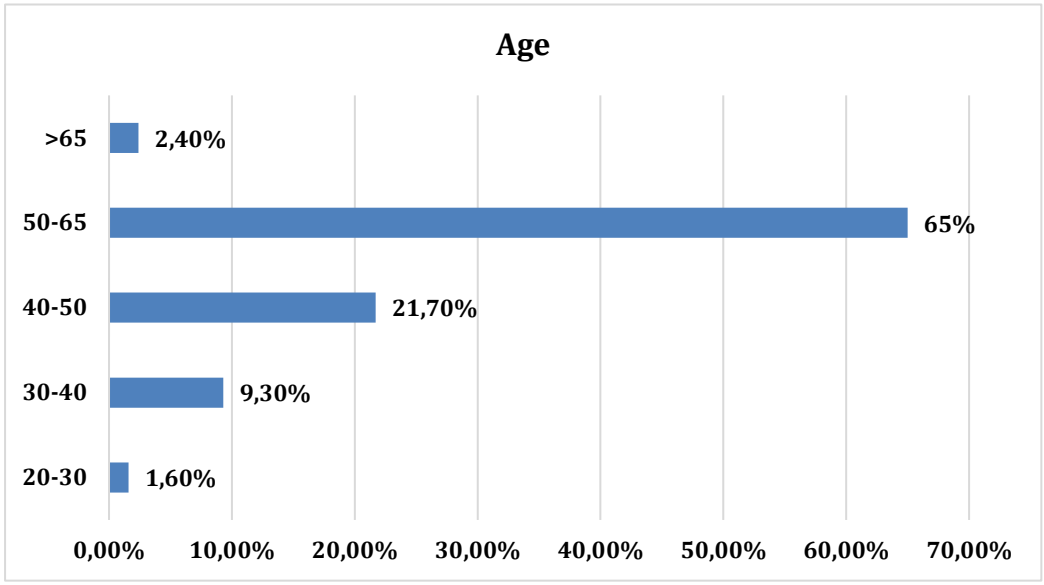
Figure 1.- Cooperative of Vinaroz. CACV Staff explaining how to implement the questionnaire.

Figure 2.- Cooperative of Nules. Citrus farmer implementing a questionnaire.

2.5.1 Gender.

Descriptive data: More than 96% of the farmers were male.

2.5.2 Age



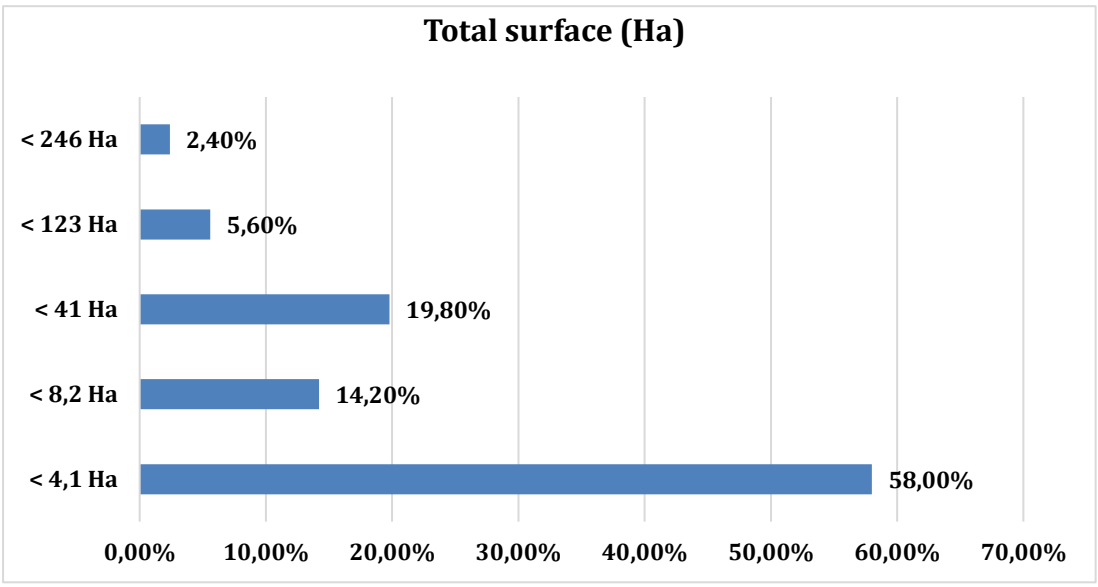
Source: Prepared by the authors

Descriptive data: The average was 52.82 years old. 15% higher than the average for vineyard farmers.

2.5.3 Agricultural dedication

Descriptive analysis: 33% Partial dedication. Typical situation in the Valencian agriculture. A lot of farmers could not live with just the incomes of the agriculture.

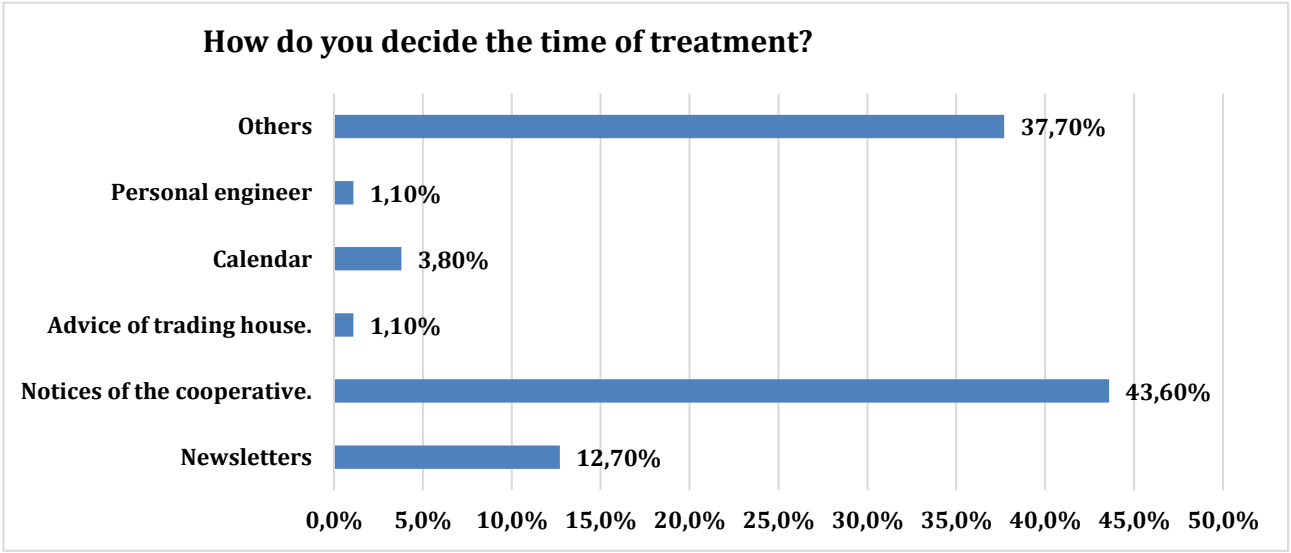
2.5.4 Crop Surface



Source: Prepared by the authors

Descriptive analysis: The average was 16.06 Ha. We remark that a 58% of the citrus farmers had a crop surface lower than 4.1 Ha.

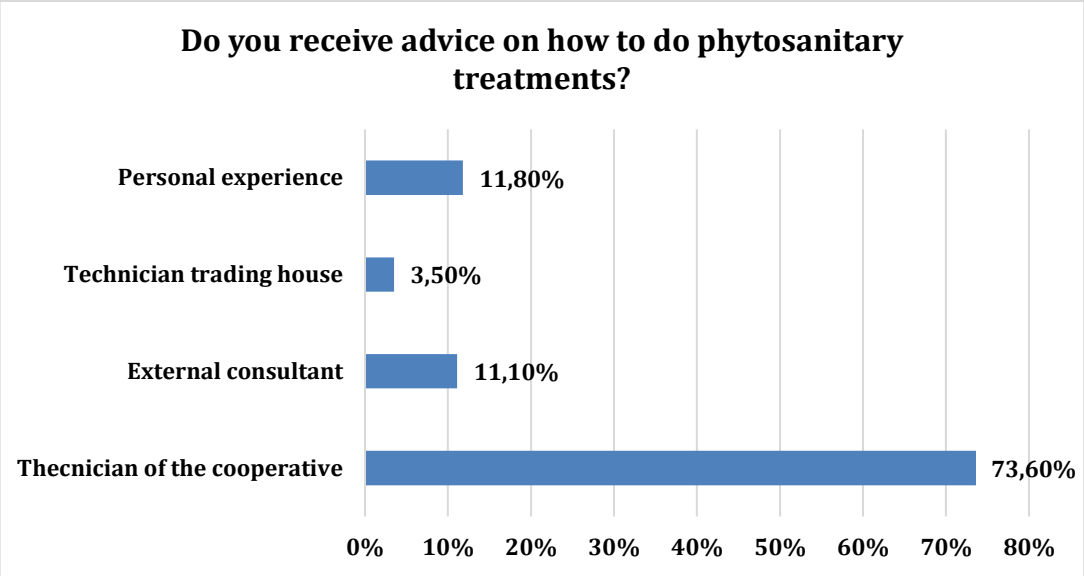
2.5.5 How do you decide the time of treatment?



Source: Prepared by the authors

Descriptive analysis: It was a question with multiple choices. 43% of them decided the time of treatment by recommendations of the technicians from the cooperatives.

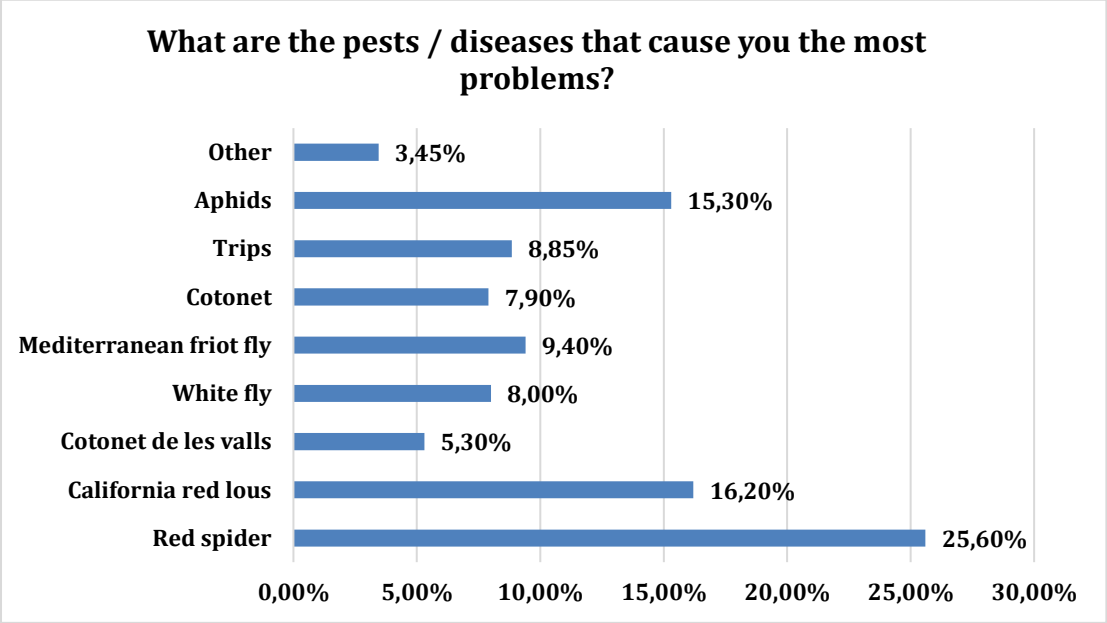
2.5.6 Do you receive advice on how to do phytosanitary treatments?



Source: Prepared by the authors

Descriptive analysis: As in the previous question, the technicians of the cooperatives were who give advice to the citrus farmers, but in this case the percentage was 73.6%, value much higher that previous question. Besides, technician of the cooperative was selected by the farmers with less surface, an average of 13.6 Ha in front of an average of 16.06 Ha of total crop surface.

2.5.7 What are the pests / diseases that cause you the most problems?



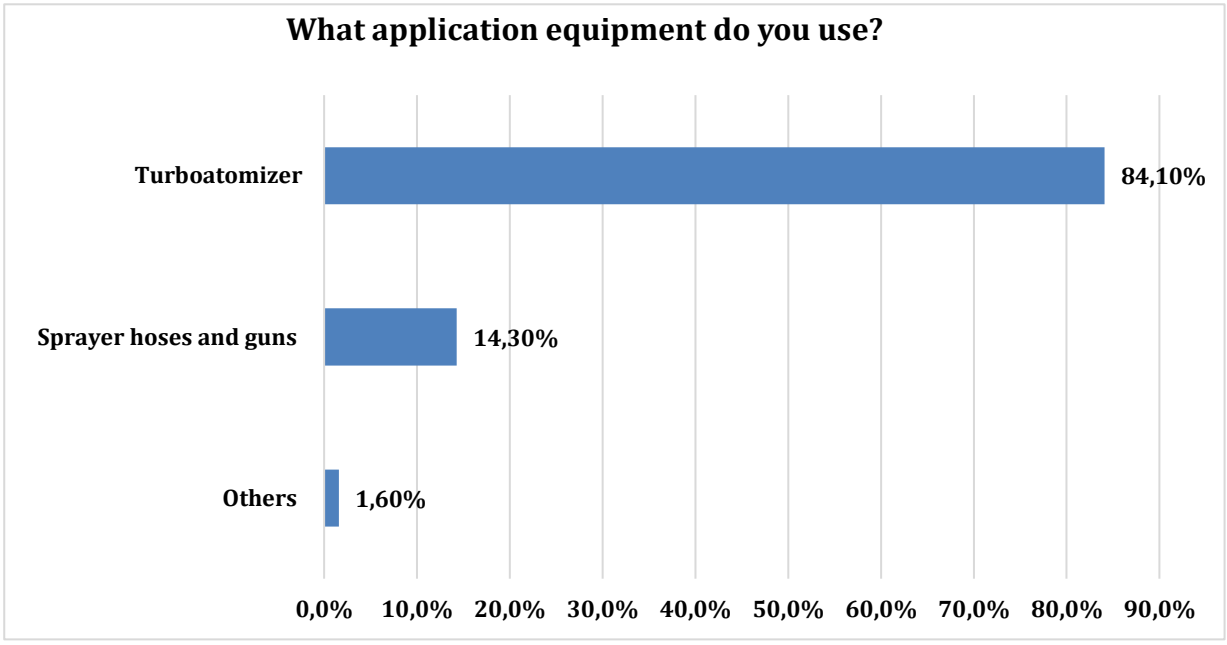
Source: Prepared by the authors

Descriptive data: It was a multiple-choice question. Red spider was the most common pest, 25%.

2.5.8 Approximately, how many treatments do you apply per year?

Descriptive data: An open question/answer. The average was 5 treatments/year.

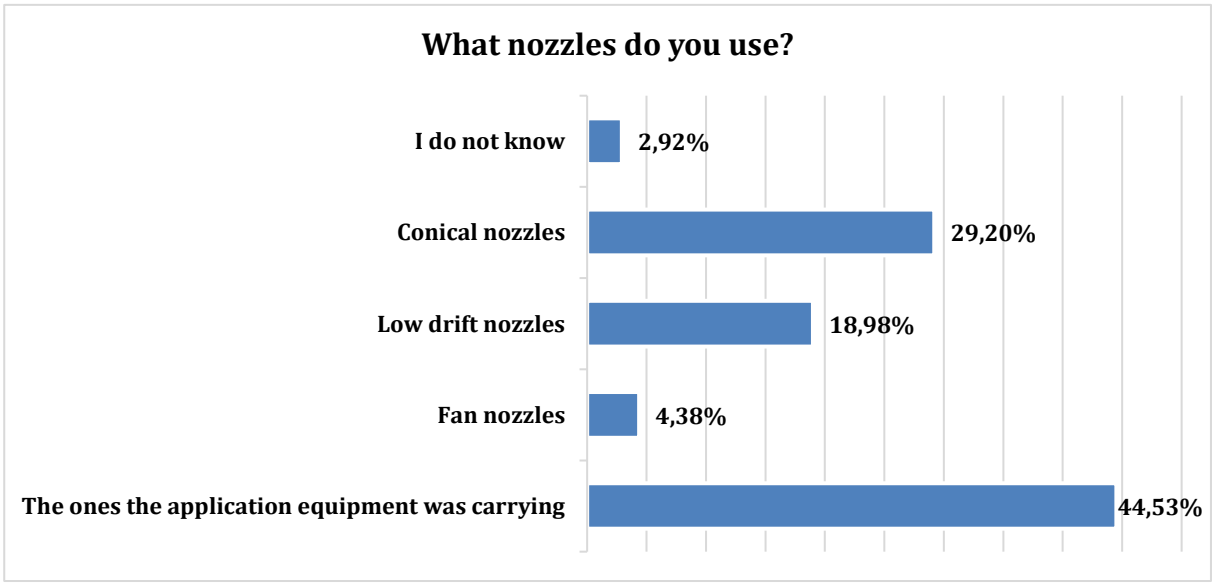
2.5.9 What application equipment do you use?



Source: Prepared by the authors

Descriptive data: Turboatomizer was selected by the majority of citrus farmers, an 84.1 %.

2.5.10 What nozzles do you use?



Source: Prepared by the authors

Descriptive analysis: "The ones the application equipment was carrying" was selected by a 44.5%. This answer shows a lack of advice about other possibilities, especially Low drift nozzles. Besides, low drift nozzles was selected by farmers with smaller orchards, with an crop surface average of 12.4 Ha.

2.5.11 Do you change the nozzles according to the treatment?

Descriptive analysis: Another way to express lack of advice. 53% did not change nozzles. They were the farmers with larger orchards who change the nozzles according the treatment, a crop surface average of 19.53 Ha.

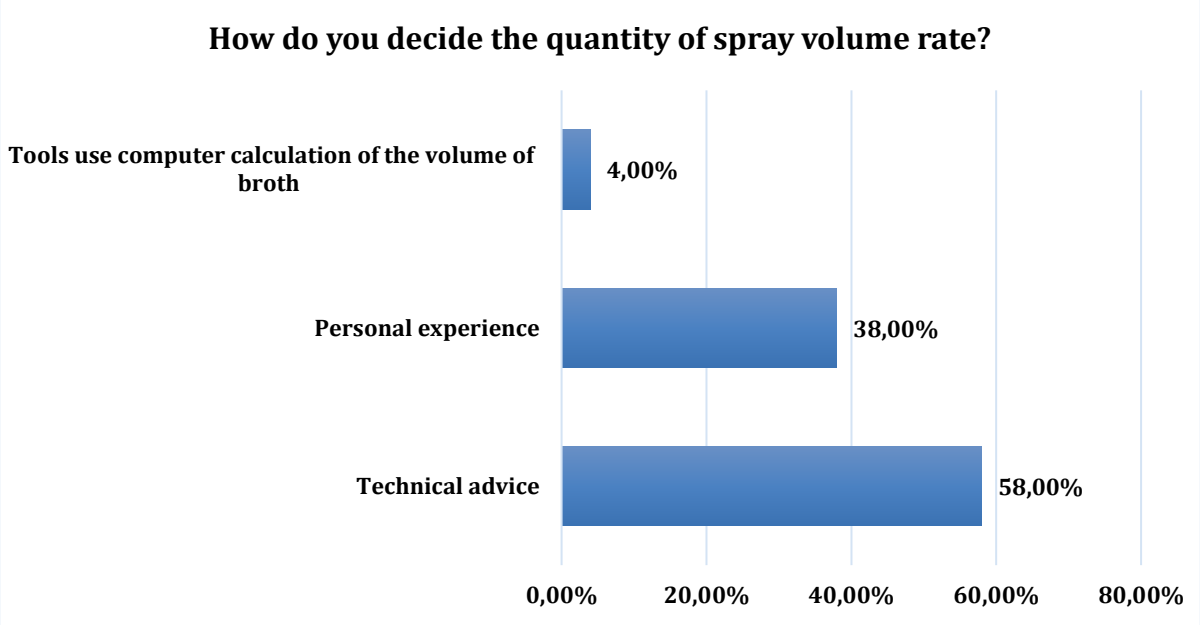
2.5.12 Do you know the low drift nozzles?

Descriptive analysis: Only a 52% knew the low drift nozzles. Futhermore, who did not know low drift nozzles were the farmers with smaller orchards, with a crop surface average of 13.14 Ha.

2.5.13 Orient / close nozzles depending on the shape and size of the trees?

Descriptive data: Only a 16% did not orient/close the nozzles depending shape/size.

2.5.14 How do you decide the quantity of spray volume rate?



Source: Prepared by the authors

Descriptive analysis: The majority (58%) selected technical advice; however, the personal experience was a determinant factor too. The influence of the crop surface was very relevant: Personal experience was selected by the largest citrus farmers (18.46 Ha of crop surface average) while Technical advice was selected by smallest farmers: crop surface average 11.2 Ha.

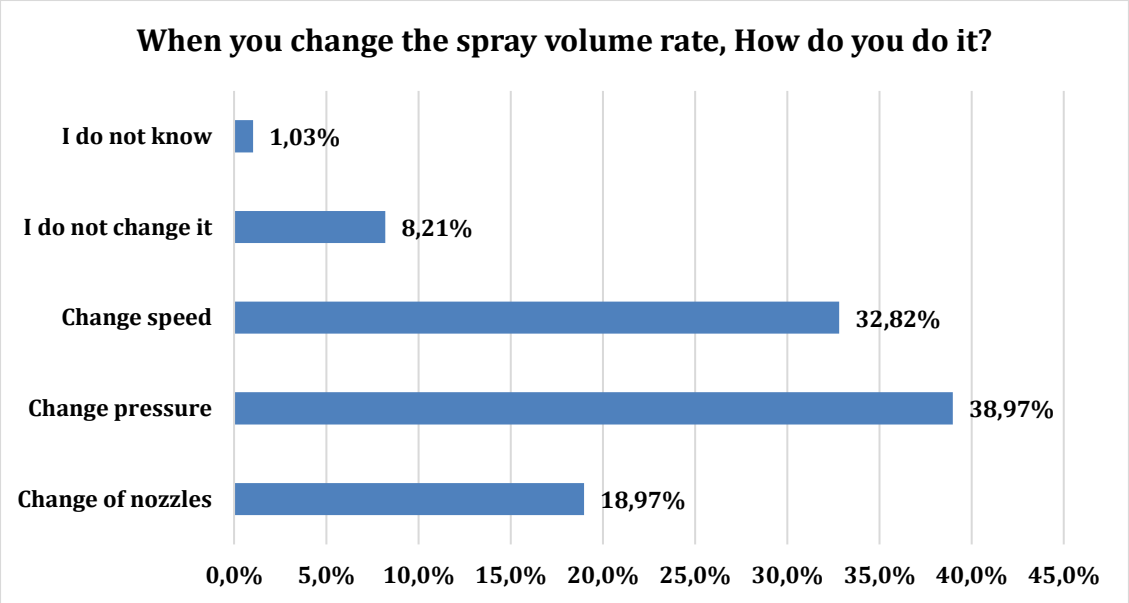
2.5.15 Do you know any computer tools for calculating the spray volume rate?

Descriptive analysis: The majority (84%) did not know computer tools for calculating the spray volume. But the surface was a determinant factor, the largest farmers (crop surface average 34.12 Ha) knew these computer tools for calculating spray volume rate.

2.5.16 What range of spray volume rates do you usually use?

Descriptive data: A minimun of 219 and a maximun of 340 litres/ha.

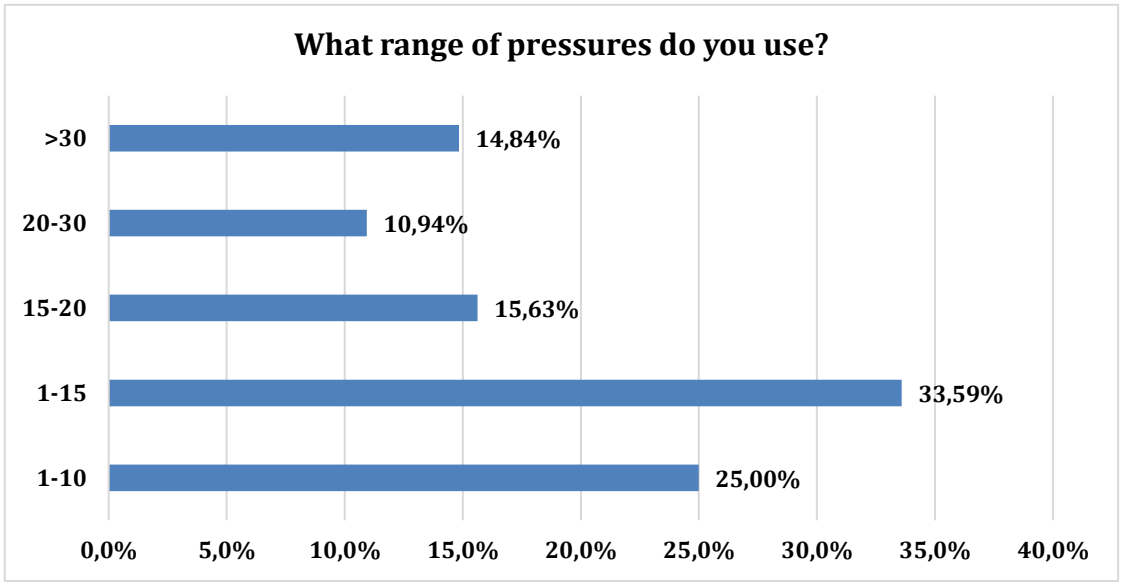
2.5.17 When you change the spray volume rate. How do you do it?



Source: Prepared by the authors

Descriptive analysis: A question with multiple selection. "Change pressure" was selected almost by a 39% but, “Change speed” with a 33% was also often selected. This question was a multiple selection question, that means that more than a 70% of the farmers were combining changes in speed/pressure to change volume rate.

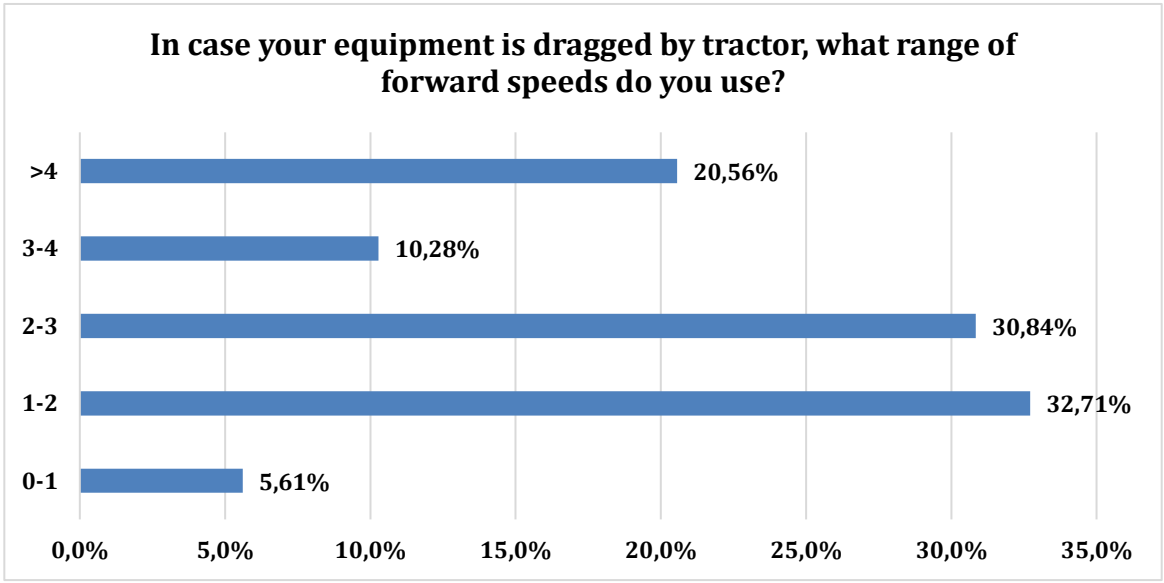
2.5.18 What range of pressures do you use?



Source: Prepared by the authors

Descriptive analysis: Between 1 to 15 bars representing 59%.

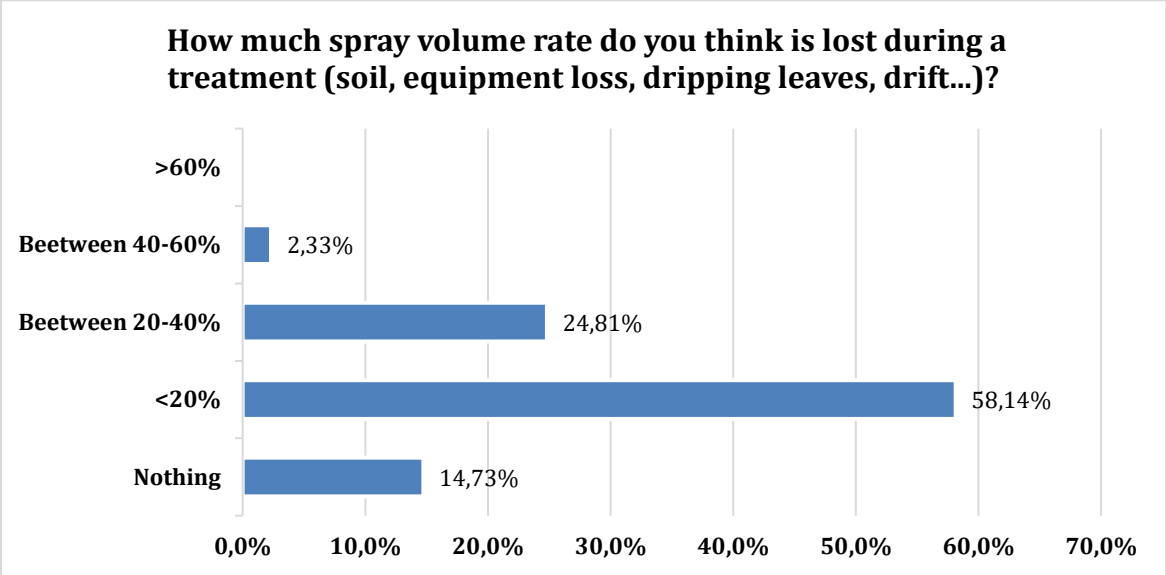
2.5.19 In case your equipment is dragged by tractor, what range of forward speeds do you use?



Source: Prepared by the authors

Descriptive analysis: The range tractor speed was 1 to 3 km/h for a 63,5% of citrus farmers.

2.5.20 How much spray volume rate do you think is lost during a treatment (soil, equipment loss, dripping leaves, drift...)?



Source: Prepared by the authors

Descriptive analysis: Nothing or less of 20% represented a 72.87%. Analyzing the comparation between averages the situation was more clear: "Nothing" was selected by the smallest farmers (crop surface 2.15 Ha). But, also for "< 20%", with a crop surface average of 13.2 Ha. In syntensis: More crop surface so more spray volume lost.

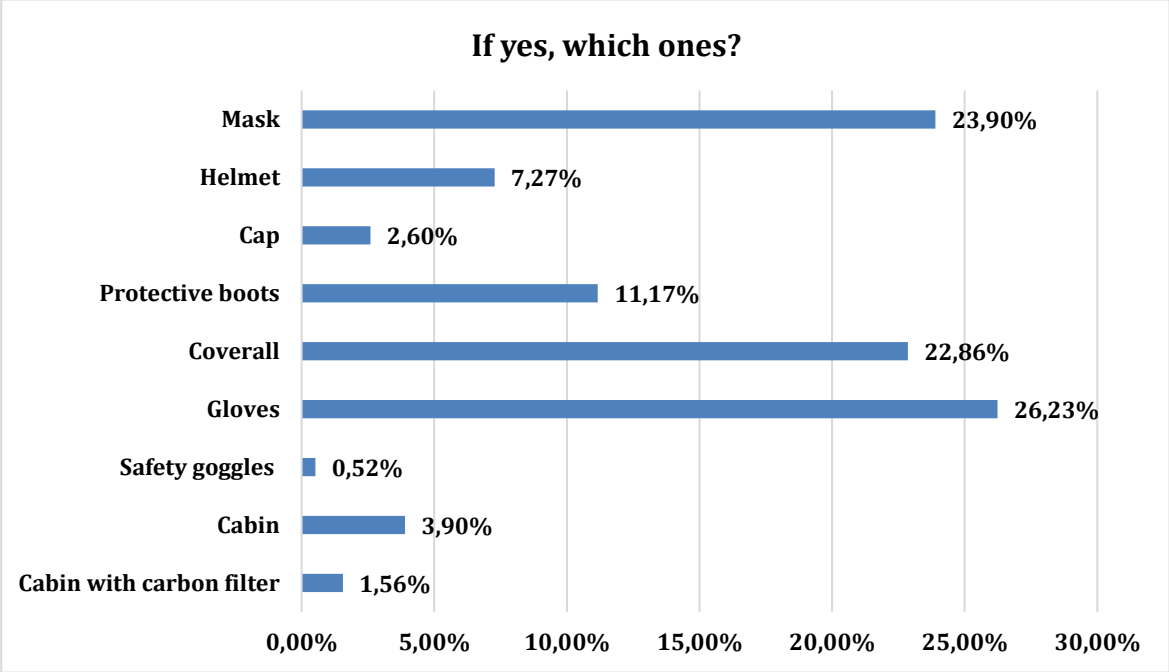
2.5.21 Do you consider the weather conditions to make the treatment?

All them consider the weather conditions.

2.5.22 Do you use any type of personal protection equipment during the application of phytosanitary products (masks, gloves, overalls, boot, application helmet ...)?

Almost all of them, 98%.

If yes, which ones?



Source: Prepared by the authors

Descriptive analysis: The most used were Gloves, Mask and Coverall. As conclusion, citrus farmers were using a combination of these three elements, Gloves, Mask and Coverall (Gloves+Mask, Gloves +Coverall or Coverall+Mask) or all of them at the same time.

2.5.23 Are you using any kind of measure to reduce the environmental impact of phytosanitary treatments?

Descriptive analysis: A 31% were not using measures to reduce the environmental impact. A very high percentage. They were the smallest farmers who were not using measures to reduce environmental impacts. Surface average 4.69 Ha, in front of 16 Ha general crop surface average.

“What type of measures are you using?”

To answer this question, it was proposed several measures. The farmers should indicate what measure they were using more frequently. Nozzle closure was the measure more used (see next table).

Kind of mesure	Order of greatest to least appear
nozzle closure	1
sigfito(company)	2
Anti-drip	3
sexual confusion pheromones	4
adjust the volume of broth	5
adjust the treatment volume	6
calculate the dose	7
natural materials	8
Optimization of the broth dose	9
recycling of packaging	10
deal with when it's exactly necessary	11

3 CONCLUSIONS AND LESSONS LEARNED

This deliverable shows the real situation in terms of citrus and vineyards farmers behaviour in the 4 different studied European areas (Valencia/Spain, Piamonte/Italy, Catalonia/Spain and Midi/France) related with PPP application. Presenting the level of knowledge of farmers about losses and exposure to pesticides and methods of reduction of pesticide impact prior to the project.

In the following tables it can be seen a summary of all the question done to better understand in a general way the outputs for the present document. The symbol "+" means what profile is predominant.

Farmers	Question	Farmer profile/Communication target			
		Age		Crop Surface	
		Younger	Older	Larger	Smaller
Winegrowers	Using low drift nozzles	+		+	
	Using Decision support tools	+			
	Using Personal experience to take decisions			+	
	No spray volume lost	+			+
	> 20% spray volume lost			+	
	Do not use protective equipment				+
	Spraying equipment calibrate at each treatment			+	
	Using Open cabine for treatments				+

Farmers	Question	Profile/Target	
		Crop Surface	
		Larger	Smaller
Citrus farmers	Advice on how to do phytosanitary treatments: Technician of cooperative		+
	Using Low drift nozzles		+
	Changing the nozzles according the treatment	+	
	Do not know low drift nozzles		+
	Decision about the quantity of spray volume rate: Personal experience	+	
	Decision about the quantity of spray volume rate: Technical advice		+
	Knowing computer tools for calculating the spray volume rate	+	
	No spray volume lost or less of 20%		+
	Do not using measures to reduce environmental impact		+

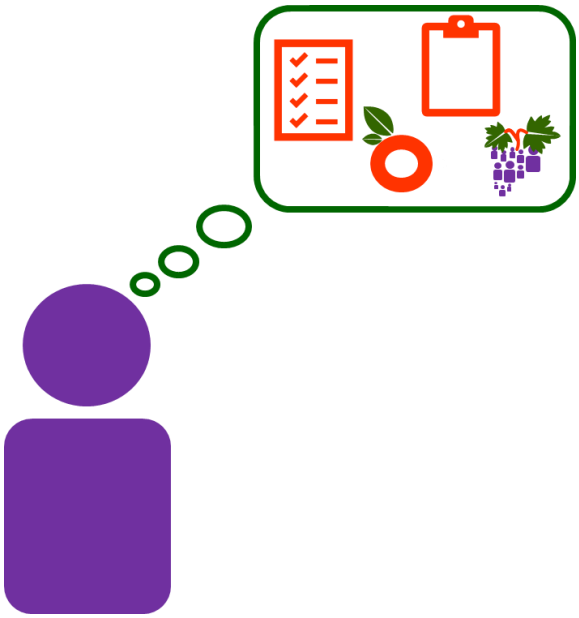
With all this data, it will be possible to compare, at the end of the project, the impact of the project in change of behaviour in both target groups, winegrowers and citrus farmers. Besides, in a quantitative way as well, comparing averages for the different questions made to the same farmers. In this sense this deliverable has been a success.

Beyond meeting the primary objective i.e. to quantify the behaviour of farmers around the application of PPP, we can draw several practical conclusions:

- About citrus farmers: This is a traditional and conservative subsector. To take care of the environment is not a priority action for them. Also, the protection measures are implemented but not in all the cases, and without all the needed equipment. The lack of a complete and accurate advice about these matters must be a priority action. The strategical target group are the technicians of Cooperatives, because they are the reference for the farmers. Besides, crop surface is a very important factor (but not the age).
- About winegrowers. A complex scenario was draw, where several factors influence in the behaviour about PPP application. Both factors, age and crop surface were important, but also country/region determine how this application is made. To improve this application and to promote the use of the project tools and techniques it will be needed. As well as, a specific and different communication effort focusing on the right target's groups will be necessary.

- It will be interesting to maintain a continuous communication with the volunteers who has answered the questionnaire, but also with the responsible and technicians of the Cooperatives and ADV (Agrupaciones de defensa vegetal/ plant protection groups), to create a favourable atmosphere about the project, highlighting advantages of the products developed, etc.
- Besides, we want to highlight some operative conclusions related to the main factors directly influenced the answers, crop surface and age. This influence generates specific communication targets (behaviour profiles), whose increasing efforts in communicative terms may increase the impact of dissemination and training actions.

Annex 1. Questionnaire for winegrowers.



ACTIVITY C3. MONITORING OF BEHAVIORAL CHANGE OF FARMERS

INITIAL SURVEY FOR WINEGROWERS

Personal Information

Name and surname:

Location of origin:

Cooperative/Institution you belong:

Contact telephone:

E-mail:

Note: The personal data provided will not be incorporated into the surveys, which are totally anonymous. These will only be part of the database of the Federation of Cooperatives Agroalimentarias of CV and at no time will be part of the project or any of its partners other than the Federation of Cooperatives

Personal information

- ✓ Age range:
  - ☐ <20
  - ☐ 20-30
  - ☐ 30-40
  - ☐ 40-50
  - ☐ 50-65

- ✓ Sex:
  - ☐ Woman
  - ☐ Man

- ✓ Agricultural dedication:
  - ☐ Full time/Professional:
  - ☐ Part-time: _____%

- ✓ Surface of the farm you handle:
  - Total area (all crops): _____Has
  - Surface only citrus/vineyard : _____Has

Survey

Make all the options you use

1. How do you decide the time of treatment?
   - ☐ Tracking of pests in the plot.
   - ☐ Notices of the cooperative.
   - ☐ Official phytosanitary bulletin.
   - ☐ Advice of PPP companies
   - ☐ Weather forecasts
   - ☐ Decision Support tools (e.g. previsional models)
   - ☐ Calendar.
   - ☐ Others:_____

2. Do you receive advice on phytosanitary treatments?
   - ☐ Technician of the cooperative
   - ☐ External consultant
   - ☐ Technicians of PPP companies
   - ☐ I do not receive advice / Personal experience

3. What are the pests / diseases that cause you the most problems?
   - ☐ Powdery mildew
   - ☐ Downy mildew
   - ☐ Grapevine moth
   - ☐ Black rot
   - ☐ Botrytis
   - ☐ Esca disease
   - ☐ Flavescence doree
   - ☐ Mites
   - ☐ Other:_____

4. Approximately, how many treatments do you do a year?

   _____

5. What application equipment do you use?
   - ☐ Manual backpack
   - ☐ Motor backpack
   - ☐ Air-assisted sprayer
   - ☐ Pneumatic sprayer
   - ☐ Side to side sprayer
   - ☐ Tunnel sprayer
   - ☐ Others:_____

6. What nozzles do you use?
   - ☐ The ones the application equipment was carrying
   - ☐ Cone nozzles
   - ☐ Flat Fan nozzles
   - ☐ Low drift nozzles
   - ☐ I do not know

7. Do you change the nozzles according to the treatment?
   - ☐ Yes
   - ☐ Do not

8. Do you know the low drift nozzles?
   - ☐ Yes
   - ☐ Do not

9. Do you orient nozzles (or spouts) depending on the shape and size of the canopy?
   - ☐ Yes
   - ☐ Do not

10. Do you close some nozzles (or spouts) depending on the shape and size of the canopy?
    - ☐ Yes
    - ☐ Do not

11. Do you adapt the air speed to the shape and size of the canopy?
    - ☐ Yes
    - ☐ Do not

12. How do you decide the quantity of spray volume rate?
    - ☐ Thecnical advice
    - ☐ Personal experience
    - ☐ Tools use computer calculation of the volume of broth (Applications for mobile, web, etc. ...)

13. Do you know any computer tools for calculating the spray volume rate?
    - ☐ Yes
    - ☐ Do not

If yes, which one?_____

14. What range of spray volume rates do you usually use?
    Minimum_____liters/ha
    Maximum_____liters/ha

15. When you change the spray volume rate, how do you do it?
    - ☐ Change nozzles
    - ☐ Change pressure
    - ☐ Change speed
    - ☐ I do not change it
    - ☐ I do not know

16. What range of pressures do you use?
    ____ bars

17. In case your equipment is dragged by tractor, what range of forward speeds do you use?
    _____km/h

18. How much spray volume rate do you think is lost during a treatment (soil, equipment loss, dripping leaves, drift...)?
    - ☐ Nothing
    - ☐ <20 %
    - ☐ Between 20-40%
    - ☐ Between 40-60%
    - ☐ >60%.

19. Do you consider the weather conditions to make the treatment?
    - ☐ Yes
    - ☐ Do not

    If yes which parameters do you consider?

20. Do you use any type of personal protection equipment during the application of phytosanitary products (masks, gloves, overalls, boot, application helmet ...)?
    - ☐ Yes
    - ☐ Do not

    If yes, which ones?_____

21. Are you using any kind of mitigation measure to reduce the environmental impact of phytosanitary treatments?
    - ☐ Yes
    - ☐ Do not

    If yes, which one? _____

22. How often do you check the calibration of your spraying equipment?
    - ☐ Never
    - ☐ Once a year
    - ☐ 2-3 times a year
    - ☐ At each treatment

23. When you prepare the mixture for spraying, do you use any protective equipment?
    - ☐ Yes
    - ☐ Do not

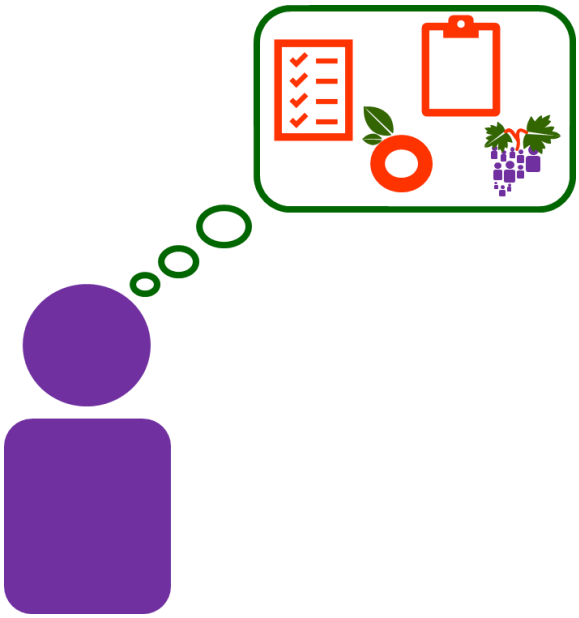
If yes, which one? _____

24. What type of tractor are you using for spray application on vine canopies?

Without cabin / Open cabin	
Close cabin	
Cabin with protection equipment (pressurized cabin / with filters)	

25. At the end of a treatment, what do you do with the PPP remnants in the tank?
    a. I pour it on the ground
    b. I use a remnant treatment structure (phytobac, héliosec, …)
    c. I spray it in the field
    d. Other, please specify: _____

Annex 2. Questionnaire for citrus farmers.



ACTIVITY C3. MONITORING OF BEHAVIORAL CHANGE OF FARMERS

INITIAL SURVEY FOR CITRUS FARMERS.

Personal Information

Name and surname:

Location of origin:

Cooperative/Institution you belong:

Contact telephone:

E-mail:

Note: The personal data provided will not be incorporated into the surveys, which are totally anonymous. These will only be part of the database of the Federation of Cooperatives Agroalimentarias of CV and at no time will be part of the project or any of its partners other than the Federation of Cooperatives

Personal information

- ✓ Age range:
  - ☐ <20
  - ☐ 20-30
  - ☐ 30-40
  - ☐ 40-50
  - ☐ 50-65

- ✓ Sex:
  - ☐ Woman
  - ☐ Man

- ✓ Agricultural dedication:
  - ☐ Full time/Professional:
  - ☐ Par time: _____%

- ✓ Surface of the farm you handle:
  - Total area (all crops): _____Has
  - Surface only citrus: _____Has

Survey

Make all the options you use

1. How do you decide the time of treatment?
   - ☐ Tracking of pests in the plot.
   - ☐ Notices of the cooperative.
   - ☐ Avisos de boletines oficiales.
   - ☐ Advice of trading house.
   - ☐ Calendar.
   - ☐ Others:_____

2. Do you receive advice on how to do phytosanitary treatments?:
   - ☐ Thecnician of the cooperative
   - ☐ External consultant
   - ☐ Technician trading house

     I do not receive advice / Personal experience

3. What are the pests / diseases that cause you the most problems?
   - ☐ Aphids
   - ☐ Red spider
   - ☐ California red lous
   - ☐ Cotonet
   - ☐ Cotonet de les Valls
   - ☐ Trips
   - ☐ White fly
   - ☐ Mediterranean friot fly
   - ☐ Other:_____

4. Approximately, how many treatments do you do a year?

   _____

5. What application equipment do you use?
   - ☐ Manual backpack
   - ☐ Motor backpack
   - ☐ Sprayer hoses and guns
   - ☐ Turboatomizer
   - ☐ Others:_____

6. What nozzles do you use?
   - ☐ The ones the application equipment was carrying
   - ☐ Conical nozzles
   - ☐ Fan nozzles
   - ☐ Low drift nozzles
   - ☐ I do not know

7. Do you change the nozzles according to the treatment?
   - ☐ Yes
   - ☐ Do not

8. Do you know the low drift nozzles?
   - ☐ Yes
   - ☐ Do not

9. Orient / close nozzles depending on the shape and size of the trees?
   - ☐ Yes
   - ☐ Do not

10. How do you decide the quantity of spray volume rate?
    - ☐ Thecnical advice
    - ☐ Personal experience
    - ☐ Tools use computer calculation of the volume of broth (Applications for mobile, web, etc. ..)

11. Do you know any computer tools for calculating the spray volume rate?
    - ☐ Yes
    - ☐ Do not

If yes, which?_____

12. What range of spray volume rates do you usually use?
    Mínimum_____liters
    Maximum_____liters

13. When you change the spray volume rate, How do you do it?
    - ☐ Change nozzles
    - ☐ Change pressure
    - ☐ Change speed

- ☐ I do not change it
- ☐ I do not know

14. What range of pressures do you use?
    _____ bars

15. In case your equipment is dragged by tractor, what range of forward speeds do you use?
    _____km/h

16. How much spray volume rate do you think is lost during a treatment (soil, equipment loss, dripping leaves, drift...)?
    - ☐ Nothing
    - ☐ <20 %
    - ☐ Between 20-40%
    - ☐ Between 40-60%
    - ☐ >60%.

17. Do you consider the weather conditions to make the treatment?
    - ☐ Yes
    - ☐ Do not

18. Do you use any type of personal protection equipment during the application of phytosanitary products (masks, gloves, overalls, boot, application helmet ...)?
    - ☐ Yes
    - ☐ Do not

    If yes, which?_____

19. Are you using any kind of measure to reduce the environmental impact of phytosanitary treatments?
    - ☐ Yes
    - ☐ Do not

    If yes, which?_____