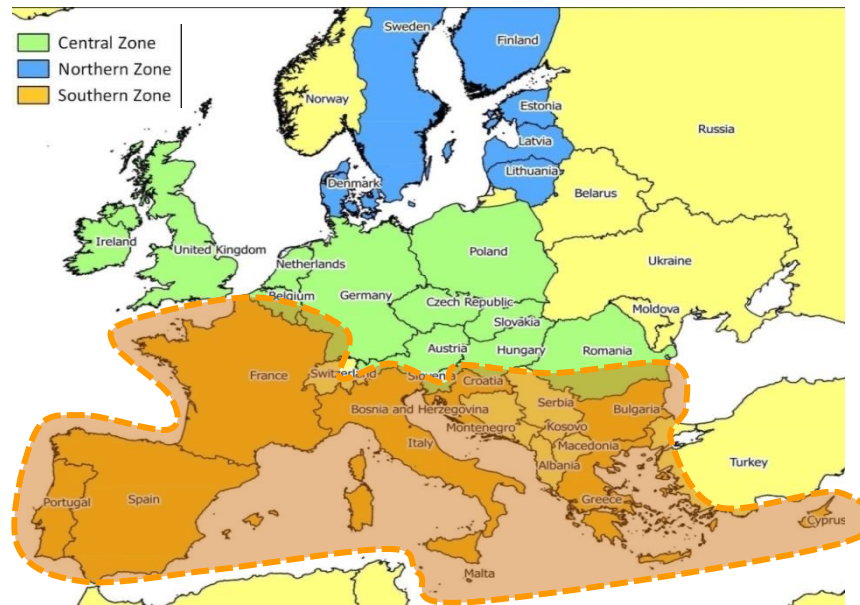


# Compilation Questionnaires “Dose expression”

## Southern zone: France, Spain, Portugal, Greece, Italy and Croatia



Véronique Mironet, Anses (France), Elena Gutierrez, Inia (Spain),  
Santiago Planas (Universidad de Lleida, Spain)

**EPPO Workshop on harmonized dose expression for the zonal evaluation of plant protection products in high growing crops. Vienna, 2016-10-18/20**

# Content

## Importance of high-growing crops in the southern zone

## Results of the SZ questionnaires « Dose expression »

- Current situation
  - Registration units and evaluation units
  - How crop growth stage is currently included in the efficacy evaluation,
- LWA values.
- Isolated trees

## Efficacy evaluators views on “dose expression”

- Does the MS intend to change the “dose expression” for efficacy evaluation?
  - Greece
  - Croatia
  - Portugal
  - Italy
  - France
  - Spain

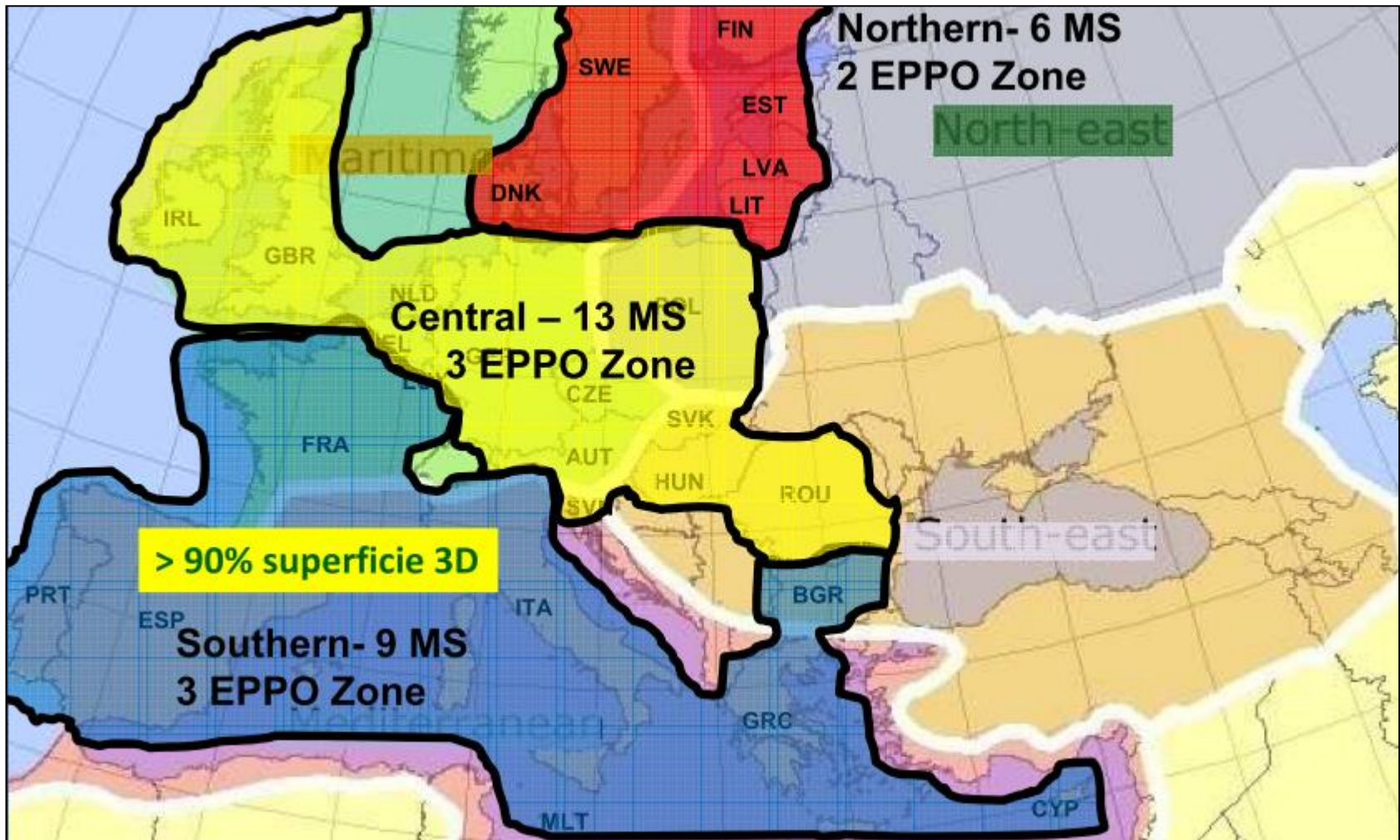
(No questionnaire received from Malta, Cyprus and Bulgaria)

## The question of « dose expression » arises at different levels: dose expression = unit

- At the level the evaluation : european / zonal level
  - Efficacy assessment : Biological dossier, definition of the minimum effective dose...
  - Risk assessments : toxicology, ecotoxicology, residues, e-fate: usually a worst-case scenario, with the assessment of a max dose /ha.
- At the level of the national registration and label: national,

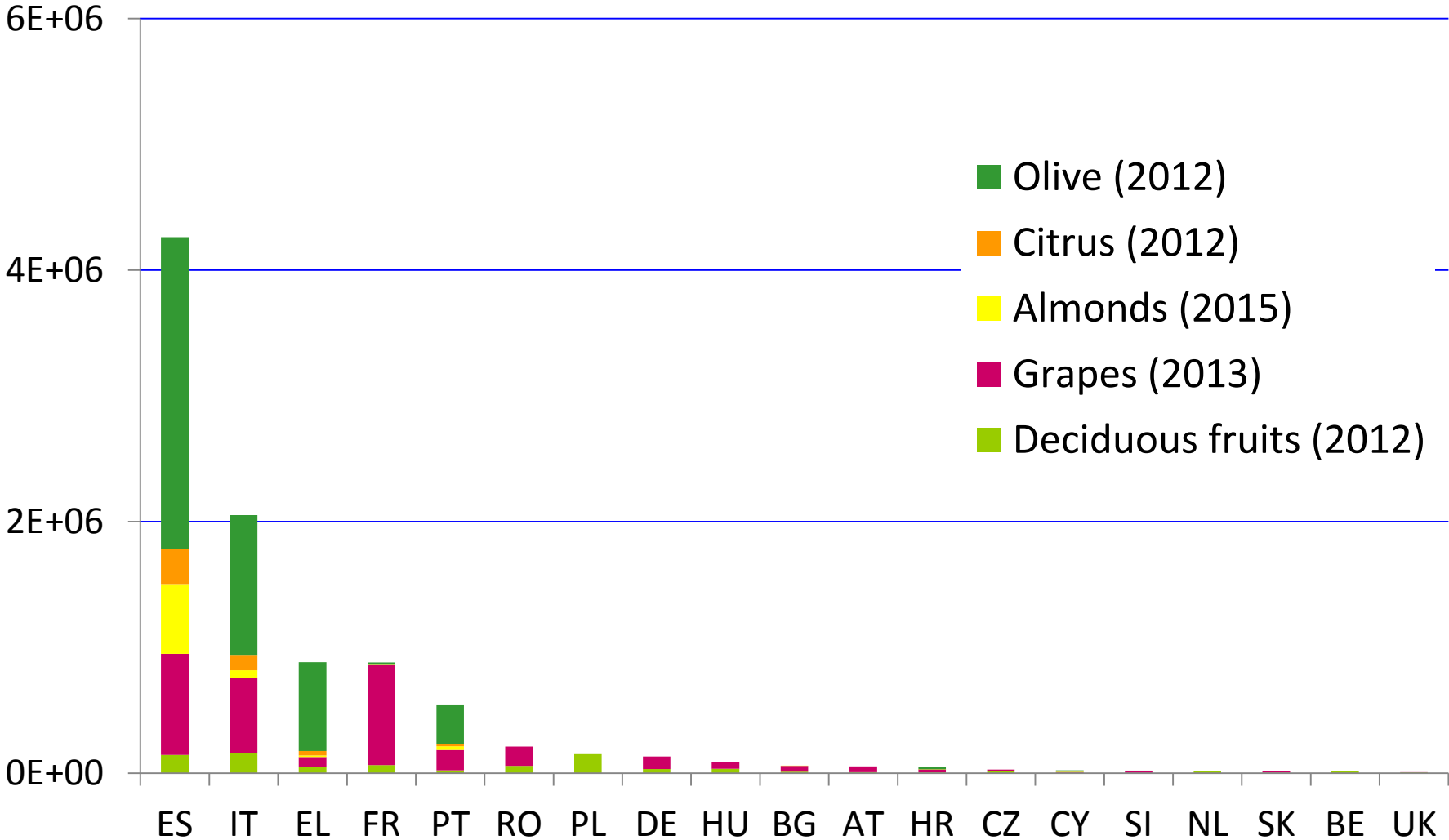
Then, further « dose adjustment » is required at the level of the final user = field level. National, regional, or even plot level

# Importance of high growing crops in the Southern Zone

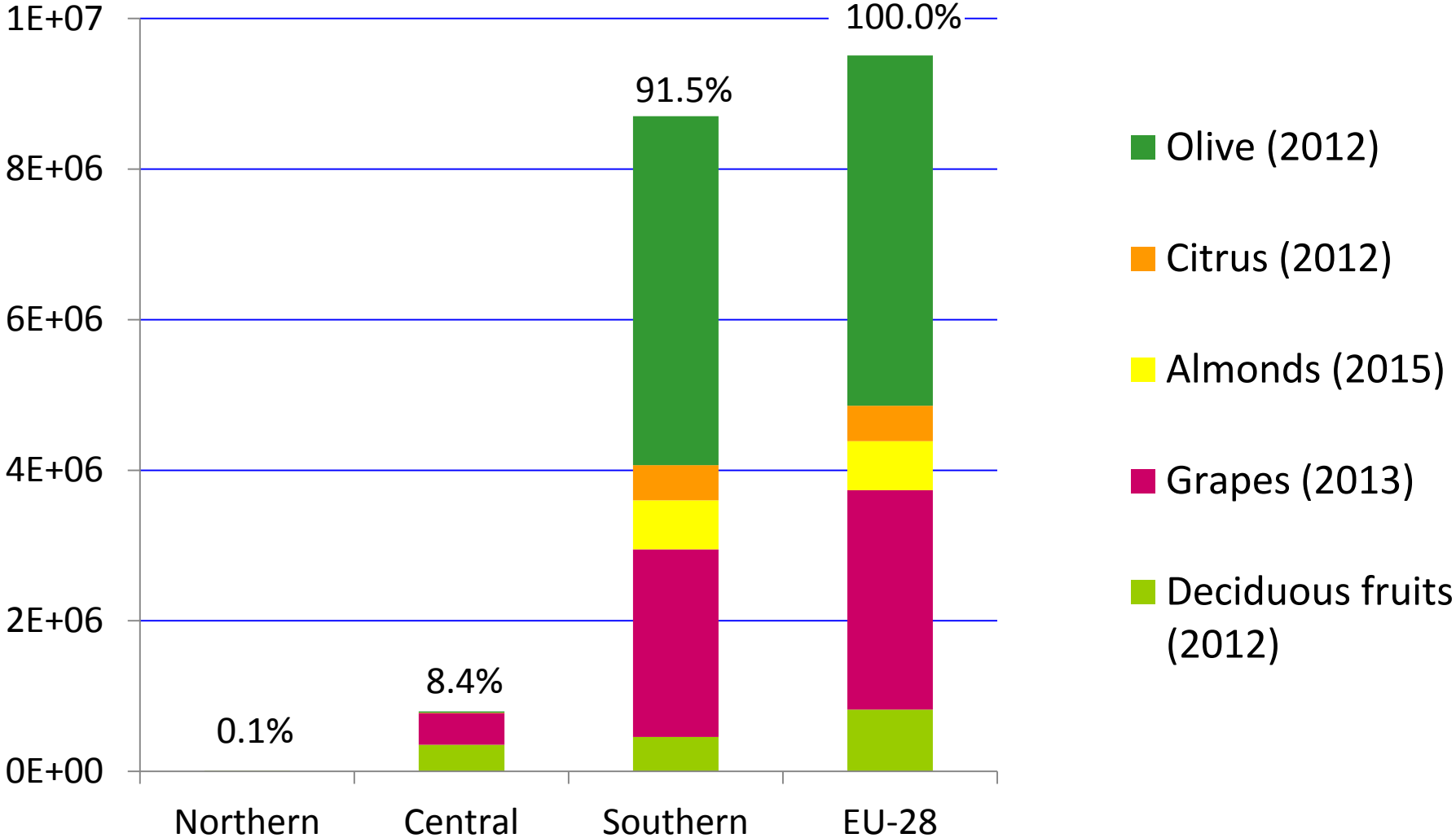


source: EUROSTAT

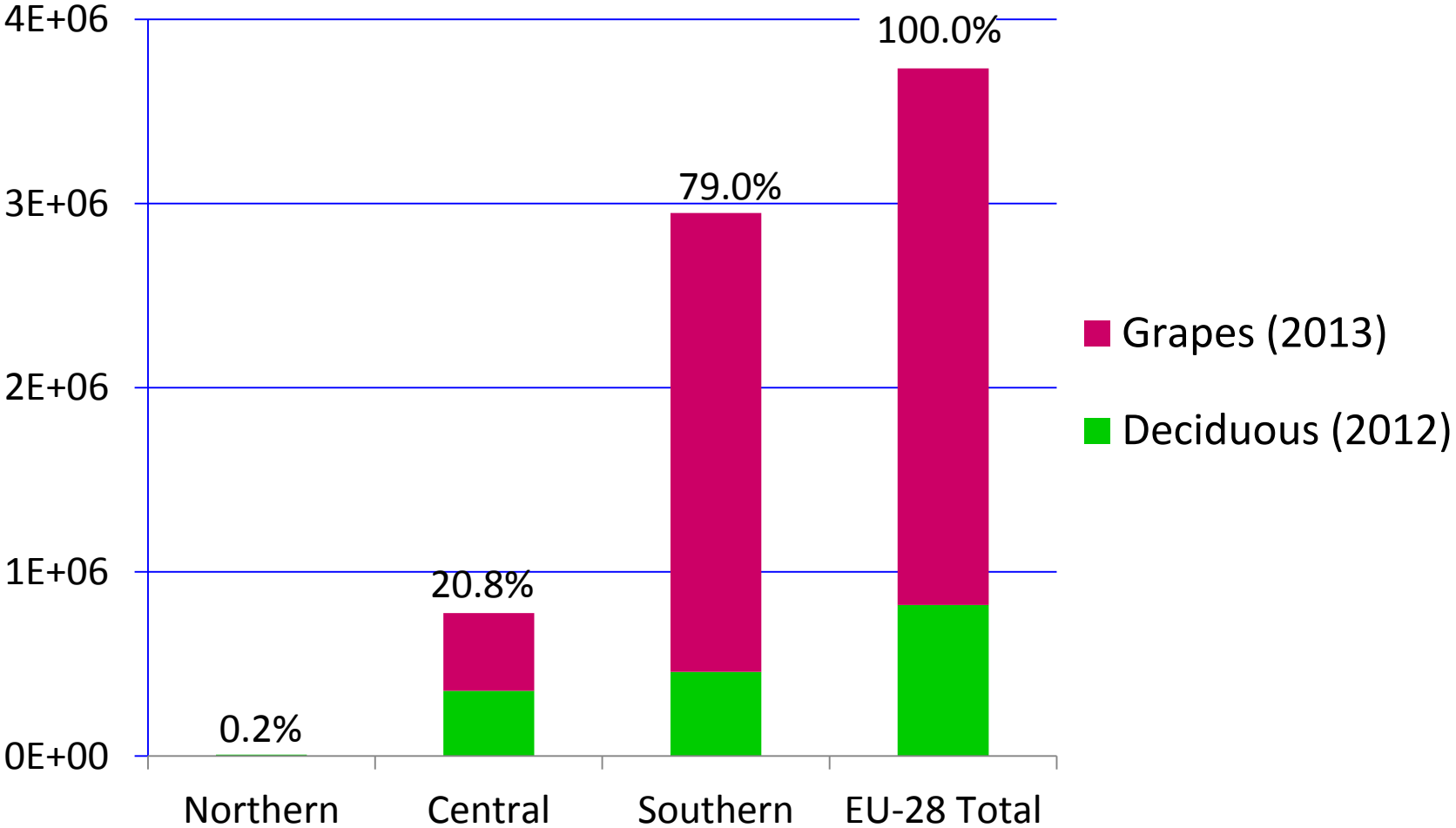
# Production area for EU Member States (ha)



# Production area for EU Zones (ha)



# Production area for EU Zones (ha)














**Results of the SZ questionnaires**  
**« Dose expression »**



1. Which dose expression is currently used in your country for high growing crops (vertical spraying)

## Current national registration units

| (I) National registration  |  |  |   |                  |               |                |  |
|--|--|--|---|------------------|---------------|----------------|--|
| Crop   | France (FR)<br>Decision(currently)   | France (FR) Label  | Spain (ES)  | Portugal<br>(PT) | Italy<br>(IT) | Greece<br>(EL) | Croatia (HR)   |
| Pome fruit        | <p><u>Currently:</u><br/>- Max rate /ha</p> <p><u>In the past:</u> /hL</p> | <p><u>Currently:</u><br/>- Max rate /ha;<br/>- Max rate/ha + /hL;</p> <p><u>In the past:</u> /hL</p> | - % (/hl); - % (/hl) + Max rate /ha; - % (/hl) + Water (L/ha); - % (/hl) + Water (L/ha) + Max rate /ha        | /hL              | /ha and /hL   | /ha and /hL    | /ha in volume of water (e.g: 1000 L of water)                          |
| Stone fruit       |  |  | - % (/hl); - % (/hl) + Water (L/ha); - % (/hl) + Max rate /ha; - /ha  |                  |               |                |  |
| Citrus            |  |  | - % (/hl) + Water (L/ha); - % (/hl) + Water (L/ha) + Max rate /ha; - /ha                                      |                  |               |                |  |
| Olive             |  |  | - % (/hl)   |                  |               |                |  |
| Almond            |  |  | - % (/hl); - % (/hl) + Max rate /ha   |                  |               |                |  |
| Walnut            |  |  | - % (/hl); - % (/hl) + Max rate /ha; - % (/hl) + Water (L/ha); - % (/hl) + Water (L/ha) + Max rate /ha; - /ha |                  |               |                |  |
| Grapevine         | Max rate /ha   | Max rate /ha   | - % (/hl); - % (/hl) + Max rate /ha; - % (/hl) + Water (L/ha); - % (/hl) + Water (L/ha) + Max rate /ha; - /ha | /hL              | /ha and /hL   | /ha and /hL    | /ha in volume of water (e.g: 1000 L of water)                          |
| Hop               | Max rate /ha   | <p><u>Currently:</u> - Max rate /ha; - Max rate/ha + /hL;</p> <p><u>In the past:</u> /hL</p>         | - /ha;<br>- % (/hl)   | /hL              | /ha and /hL   | /ha and /hL    | /ha in volume of water (e.g: 1000 L of water)                          |
| Tomato in GH      | Max rate /ha   | - Max rate /ha;<br>- Max rate/ha + /hL   | - % (/hl); - % (/hl) + Max rate /ha; - % (/hl) + Water (L/ha); - % (/hl) + Water (L/ha) + Max rate /ha; - /ha | /hL              | /ha and /hL   | /ha and /hL    | /ha (/100 m <sup>2</sup> ); concentration in % (/hL)                   |
| Cucumber in GH  |  |  | - % (/hl); - % (/hl) + Max rate /ha; - % (/hl) + Water (L/ha) + Max rate /ha; - /ha                           |                  |               |                |  |
| Pepper in GH    |  |  | - % (/hl); - % (/hl) + Max rate /ha; - % (/hl) + Water (L/ha) + Max rate /ha; - /ha                           |                  |               |                |  |
| Others   | Max rate /ha   |  |   |                  |               |                | Always /ha and/or /100 m <sup>2</sup> (water volume depending on crop) |

1. Which dose expression is currently used in your country for high growing crops (vertical spraying)

**Current registration units and evaluation units**

|                                 |                             | Pome fruits,<br>stone fruits | Olive, Citrus,<br>Treenuts | Grapes                    | High-growing<br>vegetables |
|---------------------------------|-----------------------------|------------------------------|----------------------------|---------------------------|----------------------------|
| <b><u>Registration unit</u></b> | <b>France</b>               | /ha<br>(/ha and /hL)         | /ha<br>(/ha and /hL)       | /ha                       | /ha<br>(/ha and /hL)       |
|                                 | <b>Spain</b>                | /hL                          | /hL                        | /hL                       | /hL                        |
|                                 | <b>Portugal</b>             | /hL + max water<br>volume    | /hL + max<br>water volume  | /hL + max<br>water volume | /hL + max water<br>volume  |
|                                 | <b>Greece</b>               |                              |                            |                           |                            |
|                                 | <b>Italy</b>                | /hL + max<br>rate/ha         | /hL + max<br>rate/ha       | /hL + max<br>rate/ha      | /hL + max rate/ha          |
|                                 | <b>Croatia</b>              |                              |                            |                           |                            |
| <b><u>Evaluation unit</u></b>   | <b><u>Southern zone</u></b> | /hL and/or /ha               | /hL and/or /ha             | /hL and/or /ha            | /hL and/or /ha             |

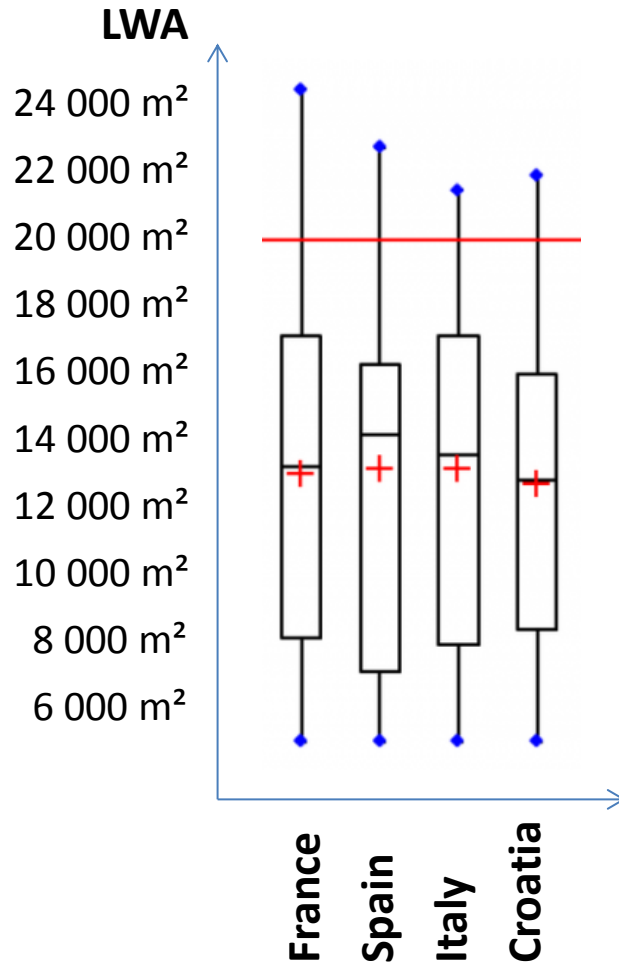
How crop growth stage is currently included in the efficacy evaluation ?

**With dose /hL, the water volume is adjusted according to the crop stage.**

## 5. CROP STRUCTURE

| Crop        |    | 5a LWA   | Min LWA                     |            | Max LWA           |            | Mode*LWA                   |                 |
|-------------|----|--|-----------------------------|------------|-------------------|------------|----------------------------|-----------------|
| Pome fruit  | FR | Apple - Young orchard (≤ 5 years)                              | 1 <sup>st</sup> application | 5 000      | full growth stage | 15 000     | Range at full growth stage | 13 000 – 15 000 |
|             |    | Apple - Standard Orchard (> 5 years)                           |                             | 10 000     |                   | 20 000     |                            | 16 000 – 20 000 |
|             |    | Cider Apple  |                             | 12 000     |                   | 19 000     |                            | 13 000 – 19 000 |
|             | ES |  | 14 000                      |            | 24 000            |            | 18 000                     |                 |
|             | IT | Apple  |                             | 14 300     |                   | 17 000     |                            | 14 700          |
|             |    | Pear   |                             | 16 700     |                   | 17 800     |                            | 17 100          |
|             | HR |  |                             | 10 000     |                   | 25 000     |                            | 13 000          |
| Stone fruit | FR | Peach - Young orchard (≤ 5 years)                              | 1 <sup>st</sup> appl.       | 5 000      | full growth stage | 12 000     | Range                      | 10 000 – 12 000 |
|             |    | Peach - Standard orchard (> 5 years)                           |                             | 7 000      |                   | 16 000     |                            | 10 000 – 16 000 |
|             | ES |  |                             | 8 000      |                   | 20 000     |                            | 16 000          |
|             | IT | Peach/apricot  |                             | 8 800      |                   | 22 200     |                            | 17 800          |
|             |    | Plum   |                             |            |                   | 20 000 (?) |                            | 20 000 (?)      |
|             |    | Cherry   |                             | 12 500     |                   | 20 000     |                            | 15 000          |
|             | HR |  |                             | 8 000      |                   | 20 000     |                            | 10 000          |
| Citrus      | ES |  |                             | 5000       |                   | 30 000     |                            | 7 000           |
|             | HR |  |                             | 15 000     |                   | 25 000     |                            | 15 000          |
| Grapevine   | FR | Burgundy (taille arcure)                                       | 1 <sup>st</sup> appl.       | 10 000     | full growth stage | 20 000     | Range at full growth stage | 15 000 – 20 000 |
|             |    | Burgundy (taille cordon)                                       |                             | 3 000      |                   | 20 000     |                            | 15 000 – 20 000 |
|             |    | Champagne (taille cordon ou guyot)                             |                             | 4 000      |                   | 22 000     |                            | 16 000 – 20 000 |
|             |    | Charentes Cognac (guyot double ou cordon haut ou arcure haute) |                             | 1 300      |                   | 12 000     |                            | 8 000 – 12 000  |
|             |    | Rhone Valley (cordon)  |                             | 1 600      |                   | 11 000     |                            | 8 000 – 11 000  |
|             | ES |  |                             | 1 700      |                   | 16 000     |                            | 6 000           |
|             | IT |  |                             | 5 600      |                   | 7 000      |                            | 6 700           |
|             | HR |  |                             | 10 000     |                   | 15 000     |                            | 12 000          |
| Olive       | ES |  |                             | 8 600      |                   | 21 300     |                            | 18 400          |
|             | IT |  |                             | 10 900 (?) |                   | 11 700 (?) |                            | 11 700 (?)      |
|             | HR |  |                             | 15 000     |                   | 25 000     |                            | 15 000          |
| Hop         | ES |  |                             | 15 000     |                   | 30 000     |                            | 30 000          |
| Almond      | ES |  |                             | 8 000      |                   | 20 000     |                            | 16 000          |
|             | HR |  |                             | 8000       |                   | 20 000     |                            | 12 000          |
| Walnut      | FR |  | 1 <sup>st</sup> appl.       | 12 000     | Full              | 27 000     | Range                      | 14 000 – 27 000 |
|             | ES |  |                             | 7 000      |                   | 14 000     |                            | 12 000          |
|             | IT |  |                             | -          |                   | 20 000 (?) |                            | 20 000 (?)      |
|             | HR |  |                             | 15 000     |                   | 25 000     |                            | 15 000          |
| Tomato GH   | ES |  |                             | 4 000      |                   | 25 000     |                            | 14 000          |
|             | IT |  |                             | 5 000      |                   | 24 000     |                            |                 |
|             | HR |  |                             | 5 000      |                   | 50 000     |                            | 20 000          |
| Cucumber GH | IT |  |                             | 3 300      |                   | 26 700     |                            |                 |
|             | HR |  |                             | 5 600      |                   | 50 000     |                            | 20 000          |
| Kiwi fruit  | IT |  |                             |            |                   | 12 500     |                            | 10 000          |

## Max LWA for high growing crops (southern zone)



### Caution: LWA values

Methodology for measures are likely to differ.

The max LWA can correspond to the 100 percentile (extreme crops) or to the 80-90 percentile in the country.

**Figure: Just for illustration, not realistic values**

# Max LWA for high growing crops (southern zone)

## Pome fruits



| Crop       | MS      | Min LWA | Max LWA       | Mode*LWA        |                               |
|------------|---------|---------|---------------|-----------------|-------------------------------|
| Pome fruit | FRANCE  | 5 000   | <b>15 000</b> | 13 000 – 15 000 | Young apple ( $\leq 5$ years) |
|            |         | 10 000  | <b>20 000</b> | 16 000 – 20 000 | Standard apple ( $> 5$ years) |
|            |         | 12 000  | <b>19 000</b> | 13 000 – 19 000 | Cider Apple                   |
|            | SPAIN   | 14 000  | <b>24 000</b> | 18 000          |                               |
|            | ITALY   | 14 300  | <b>17 000</b> | 14 700          | Apple                         |
|            |         | 16 700  | <b>17 800</b> | 17 100          | Pear                          |
|            | CROATIA | 10 000  | <b>25 000</b> | 13 000          |                               |

### Mode LWA

13 000 m<sup>2</sup> Croatia  
 15 000 – 17 000 m<sup>2</sup> Italy  
 13 000 - 20 000 m<sup>2</sup> France

### Max LWA

18 000 m<sup>2</sup> Italy  
 20 000 m<sup>2</sup> France  
 24 000 - 25 000 m<sup>2</sup> Spain, Croatia

## Stone fruits



| Crop        | MS     | Min LWA       | Max LWA       | Mode*LWA        |                               |
|-------------|--------|---------------|---------------|-----------------|-------------------------------|
| Stone fruit | FRANCE | 5 000         | <b>12 000</b> | 10 000 – 12 000 | Young peach ( $\leq 5$ years) |
|             |        | 7 000         | <b>16 000</b> | 10 000 – 16 000 | Standard peach ( $> 5$ years) |
|             | SPAIN  | 8 000         | <b>20 000</b> | 16 000          |                               |
|             | ITALY  | 8 800         | <b>22 200</b> | 17 800          | Peach / apricot               |
|             |        |               | <b>20 000</b> |                 | Plum                          |
|             |        | 12 500        | <b>20 000</b> | 15 000          | Cherry                        |
| CROATIA     | 8 000  | <b>20 000</b> | 10 000        |                 |                               |

### Mode LWA

10 000 m<sup>2</sup> Croatia  
 10 000 – 16 000 m<sup>2</sup> France  
 16 000 m<sup>2</sup> Spain  
 15 000 – 18 000 m<sup>2</sup> Italy

### Max LWA

16 000 m<sup>2</sup> France (peach),  
 20 000 m<sup>2</sup> Spain, Croatia,  
 20 000 - 22 000 m<sup>2</sup> Italy (peach / apricot).

# Max LWA for high growing crops (southern zone)

## • Citrus

Max LWA :

25 000 m<sup>2</sup> Croatia

30 000 m<sup>2</sup> Spain



|        |         | Max LWA | Mode LWA |
|--------|---------|---------|----------|
| Citrus | Spain   | 30 000  | 7 000    |
|        | Croatia | 25 000  | 15 000   |

## • Olive

Max LWA :

12 000 m<sup>2</sup> Italy

21 000 m<sup>2</sup> Spain

25 000 m<sup>2</sup> Croatia



|       |    |            |            |            |
|-------|----|------------|------------|------------|
| Olive | ES | 8 600      | 21 300     | 18 400     |
|       | IT | 10 900 (?) | 11 700 (?) | 11 700 (?) |
|       | HR | 15 000     | 25 000     | 15 000     |

## • Tree nuts

Max LWA :

20 000 m<sup>2</sup> Spain, Italy

25 000 m<sup>2</sup> Croatia

27 000 m<sup>2</sup> France



|        |    |                                |               |                         |
|--------|----|--------------------------------|---------------|-------------------------|
| Almond | ES | 8 000                          | 20 000        | 16 000                  |
|        | HR | 8000                           | 20 000        | 12 000                  |
| Walnut | FR | 1 <sup>st</sup> appl.   12 000 | Full   27 000 | Range   14 000 – 27 000 |
|        | ES | 7 000                          | 14 000        | 12 000                  |
|        | IT | -                              | 20 000 (?)    | 20 000 (?)              |
|        | HR | 15 000                         | 25 000        | 15 000                  |

# Max LWA for high growing crops (southern zone)

- Grape



|               |         |  | Max LWA | Mode LWA        |
|---------------|---------|--|---------|-----------------|
| Grape<br>vine | France  | Burgundy (taille arcure)                                       | 20 000  | 15 000 – 20 000 |
|               |         | Burgundy (taille cordon)                                       | 20 000  | 15 000 – 20 000 |
|               |         | Champagne (taille cordon ou guyot)                             | 22 000  | 16 000 – 20 000 |
|               |         | Charentes Cognac (guyot double ou cordon haut ou arcure haute) | 12 000  | 8 000 – 12 000  |
|               |         | Rhone Valley (cordon)  | 11 000  | 8 000 – 11 000  |
|               | Spain   |  | 16 000  | 6 000           |
|               | Italy   |  | 7 000   | 6 700           |
|               | Croatia |  | 15 000  | 12 000          |









## Max LWA

7 000 m<sup>2</sup> Italy

15 000 – 16 000 m<sup>2</sup> Croatia, Spain

From 11 000 m<sup>2</sup> France (Rhone Valley Cordon) to 22 000 m<sup>2</sup> (France - Champagne).

## CROP STRUCTURE

| Crop  |    | % orchard's land with isolated trees in relation to the total land surface   | tendency                  |  |
|---|----|--|---------------------------|--|
|   |    |  | maintaining               | decreasing   |
| Pome fruit   | FR | 0% Apple<br>60% Cider apple  |                           | X  |
|   | ES | 10%  |                           | X  |
|   | EL | 50%  |                           | X  |
|   | HR |  |                           | X  |
| Stone fruit                                        | ES | 10%  |                           | X  |
|   | EL | 50-60%   | X                         |  |
| Citrus   | ES | <u>East of Spain:</u><br>35% isolated trees, 65% citrus trees hedge.<br><u>South of Spain (Andalusia):</u><br>100% citrus trees hedge* |                           | X<br>The tendency is to reduce the distance between trees and to increase the distance between rows that means to pass from isolated trees to trees hedge. |
|   | EL | 100%   | X                         |  |
|   | HR |  |                           | X  |
| Grapevine    | FR | Isolated vine-unknown  |                           | disappearing   |
|   | ES | 50%  |                           | X  |
|   | EL | 30%  | X (traditional varieties) |  |
|   | HR |  |                           | X  |
| Olive    | ES | 98%  |                           | X  |
|   | EL | 100%   | X                         |  |
|   | HR |  |                           | X  |
| Walnut   | FR |  |                           | X  |
|   | ES | 100%   | X                         |  |
|   | EL | 100%   | X                         |  |
|   | HR |  |                           | X  |
| Almond    | ES | 90%  |                           | X  |
|   | EL | 100%   | X                         |  |
|   | HR |  |                           | X  |
| Others :Pistachios<br>pomegranat<br>kaki, kiwis  | EL | Pistachios, Kaki: almost 100%<br>Pomegranate: 80%<br>Kiwi: 0%  | X                         |  |

ES (Research group): Citrus: \* Intensive orchards shape can be considered as near trellis when trees achieve the maximum dimension (final development). In this situation, the crowns of the trees are practically overlapped in the row performing a near trellis shape.

Olive: official data from AEMO (Spanish Association for Olive Municipalities).



**MS views on “dose expression”**  
**for efficacy evaluation**

# Greece

Does your country intend to change “dose expression”? “No”

Is it feasible to do all evaluations with a harmonized dose expression (e.g. LWA)?

“No, due to cultivation systems.”

“**Any problem with the current dose expressions (in /ha and /hL).** A change in dose expression for efficacy evaluation (whatever the model LWA, TRV, LAI...) won't facilitate or improve evaluation”.

“**Foliar area is already considered in current evaluation based on /hL dose,** with water volume increasing with the seasonal development”

“The use of LWA, TRV or LAI is **not applicable in traditional crop systems** of several crops in Greece such as **olive, citrus, apples** etc. “

“**Converting** LWA, TRV or LAI to the **National dose expression (/hL for 3D crops)** will be necessary for label use. As a consequence, a single dose expressed in LWA may be converted to a range of doses expressed /hl (considering the possible range of LWA in the same crop).”

# Croatia

- **Does your country intend to change “dose expression”?**
- “No, /ha and /hL is working well for efficacy assessment and will remain on labels. »
- « On the label, change of the dose expression will not be an improvement for Croatian agricultural practices. Concentration (%) is used widely by Croatian farmers in practice”
- « Dose harmonization needed for zonal assessment: % model is probably the most suitable dose expression for vertically grown crops”
- “However, conversion between /hL and /ha might be relatively complicated when different water volumes are considered (e.g. from low water volumes to more than 1000 L/ha).”

# Portugal

- **Currently** : “For high growing crops, the dose expression is usually in % or per /hL and sometimes a range of % concentrations (the highest one to be used in highest pest pressure). A max dose rate /ha is also expressed on label, to be used at full vegetative growth.”
- **Does your country intend to change “dose expression”? Yes**
- “In PT, LWA is not yet a common dose expression. Nevertheless **we pretend to harmonize dose expression with other MS and adopt the dose expression that best fits the high-growing crops system.** »
- « In order to have authorizations expressed in LWA, **first trial reports must also be harmonized and expressed in LWA**, which is not yet happening. After, we will need a **transitional adjustment period** in which 2 dose expressions (LWA and a converted dose expression) must be on label in order to be understandable for all users. »

# Italy

- **Does your country intend to change “dose expression”?**
- **“Yes, still debating but it would be advisable.”**
  
- **Is it feasible to do all evaluations (of high growing crops) in the EU with a harmonized dose expression (e.g. LWA)?**
- **“Yes, except for grapevine and kiwifruit”**
  
- **Do you consider LWA as the only method to be adopted regardless of the variability in crop structures in the EU?**
- **“No, not the only method”**
- **“Using Leaf Area Index would be with no doubt more precise but more difficult to apply in practice.”**

# France

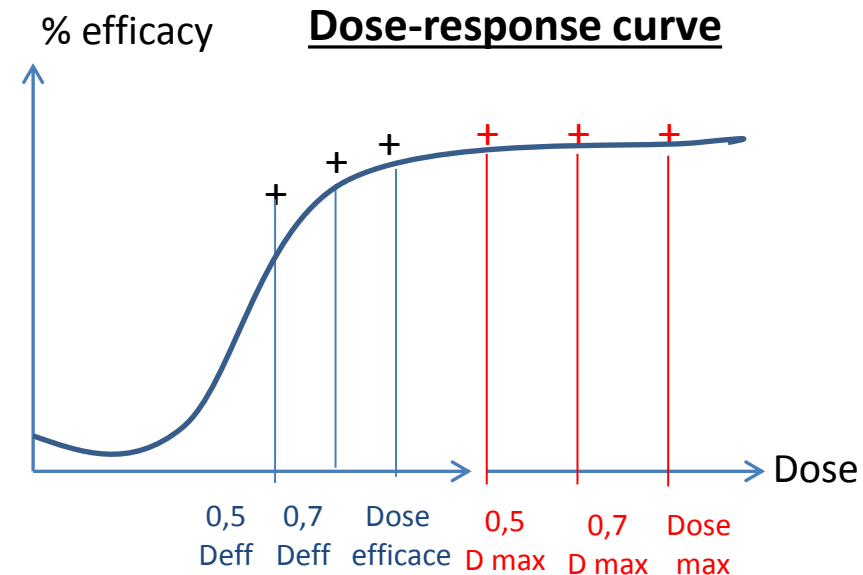
## Efficacy section

**Minimum Effective Dose = MED trials** : determine the appropriate dose  
0,6N, 0,8N, 1N, 1,2N

If  $N = \text{max dose /ha}$  (= corresponding to a high size crops). If field trials are carried out on a « medium size » crop: **overdosage**, so no dose response seen. In that case, the dose /ha not accurate.

If  $N = /hL$  : more suitable, but depends on spraying equipment and water volumes => not satisfactory.

If  $N = \text{dose related to foliar area}$   
A better dose-response is expected.



# France

## LWA

Better than  $/ha$  and  $/hL$ .

Advantage: Simple indicator. Sufficient for efficacy evaluation.

Inconvenient: Maybe too simple (no linearity between LWA and deposits on leaves), especially at field level. Measure of « treated foliage high »: not easy.

We believe this is a good rough model for crops grown as « walls » (trellis...). Not sufficient, need to be adapted for other crop structures.

## TRV

Advantage : Better correlation with deposit on leaves, compared to LWA.

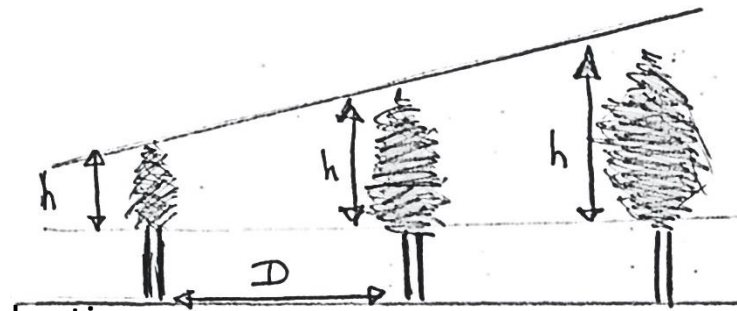
Inconvenient : more complex. For a given crop, it gives very large ranges.

Difficult measures : mid-width of the crown (+ treated foliage high).

## For both LWA and TRV (or other models):

Final user should be accompanied. Not in the attributions of Anses, but we support the proposal of tables of coefficients for easy dose conversion at field level.

First steps : Need to agree on 1 (or 2) model, at european or zonal level. Then, define max values for conversion into a max dose/ha (support of risk assessment).



# France

- **Anses – Conclusions of evaluation**

Now: only max dose/ha. In practice: the max dose/ha can be understood at a “fixed dose”, and therefore not adapted to the growth stage.

Future: conclusions with a max dose/ha + dose assessed in efficacy assessment.

- Max dose/ha + dose /hL
- Max dose/ha + dose /LWA (or other).

Conditions :

Risk assessment will continue to assess a dose envelope = max dose/ha.

For LWA (or other), the conversion factor **should not be determined at national level** (it multiplies the risk assessments) but should be determined at zonal level (or european level).

- **Ministry / technical institutes**

EC/2009/128 “Directive on Sustainable use of pesticides”

Willingness to consider foliar area and crop structure, to rationalize the use of PPP.

Model / indicator not chosen yet. One proposal is a grid taking into account all the relevant parameters and that offers the possibility of non-linearity between the dose and the value of the variables.



# Spain

## Dose Expression for Applications of PPP in High Growing Crops

Spain (industry, national registration, evaluators, research groups on dose adjustment)

*Still in progress, to be confirmed after workshop*

1

Request form official registration of PPP  
(MAGRAMA. Ministry of Agriculture)



Good Agriculture Practice table with the following dose expression:

- **kg or L product/ha; g or kg as/ha; L/ha water volume** should be included
- **Dose expression** to be indicated **on the label** should be also specified on **remarks** column of GAP table. Consistent relation between dose expression requested and assessed.

| GAP         |    |   |                               |  |                  |   |   |   |  |   |               |  |
|-------------|----|---|-------------------------------|--|------------------|---|---|---|--|---|---------------|--|
| 1           | 2  | 3   | 4                             | 5  | 6                | 7   | 8   | 9   | 10   | 11  | 12            | 13   |
| Use-<br>No. | MS | Crop and/<br>or<br>situation<br><br>(crop<br>destination<br>/ purpose<br>of crop) | F<br>G<br><br>o<br>r<br><br>l | Pests or Group<br>of pests<br>controlled<br><br>(additionally:<br>developmental<br>stages of the<br>pest or pest<br>group) | Application      |   |   | Application rate  |  |   | PHI<br>(days) | Remarks:<br><br><b>Add other dose<br/>expression to be<br/>showed on the<br/>label</b> |
|             |    |   |                               |  | Method /<br>Kind | Timing /<br>Growth stage<br>of crop &<br>season | Max. number<br>(min. interval<br>between<br>applications)<br>a) per use<br>b) per crop/<br>season | <b>kg, L<br/>product /<br/>ha</b><br><br>a) max. rate<br>per appl.<br><br>b) max.<br>total rate<br>per<br>crop/season | <b>g, kg as/ha</b><br><br>a) max. rate<br>per appl.<br><br>b) max.<br>total rate<br>per<br>crop/season | <b>Water<br/>L/ha</b><br><br>min /<br>max |               |  |

# Spain

2

## Efficacy evaluation

If dose expression presented in **BAD** (Biological Assessment Dossier) and **efficacy dRR** (draft registration reports) are:

- / **LWA**
- / **volume of vegetation**
- / **volume of vegetation + leaf density**

—————→  
**CONVERSIONS**

**A conversion factor** between these doses and  
 - **% product (/hL) + (maximum water volume L/ha or max.product /ha )**  
 would be required to relate to other **risk assessment areas (g as/hl; L/ha; gas/hl)**

3

and to be included in the **Registration of Official Authorizations and label Dose expression:**

- **% (/hL) + (maximum water volume L/ha or max. product/ha )**

4

## **Still in discussion:**

For the **Southern Zone**, it would be needed to determine an **equivalence factor** (to be determined) or to use other dose expressions such as **vegetation volume per ha along with leaf density or BBCH**.

The use of other dose expressions as **LWA** should be confirmed by means of **experimentations** in the **specific conditions of high growing crops for the Southern Zone**.

# Spain

**5** Minimum parameters are required to convert to different dose expressions:  
Mid- height of the canopy  
Mid-width of the crown  
Distances between rows  
Distance between plants, within row (importance in olives and isolated trees)  
leaf density (or porosity) (to be developed)

**6** A new EPPO standard or modification of EPPO PP1/239(2) “Dose expression for plant protection products” is needed to include the cited **parameters**, as well as **procedures** (examples, formulas, models) to facilitate the **conversions**. Modification: “it is recognized that this expression (dose per hL or %) is no longer sufficient”. It would be sufficient, if the water volume is added.

**7** The need to develop an officially recognized tool for calculating the optimum volume of application in different crops. Tools developed by the research groups may take into account for this work.

Consequently, participants showed interest in establishing a task force to develop a project on **implementing tool** to help farmer to **calculate and adjust the optimum volume for the application of PPP** in high growing crops.

# Conclusion – Southern zone (1)

- The position toward dose expression is still under discussion. SZ have little experience of use of these new models for efficacy assessment. Further debate / discussions are necessary.
- On 1 side: Greece and Croatia? think the /hL dose expression is already correlated to foliage volume through water volumes. No need to change the dose expression. Conversion between LWA and /hL will be too complicated. Change of labels is not planned.
- On the other side: France, Spain, Portugal, Italy: Change to an harmonized dose expression related to foliar area and crop structure is sought as an improvement.
- LWA considered as a good rough model for efficacy assessment, for some crops grown as hedges (intensive orchards grown in continue formation, very narrow canopies), but not for other crops = the model should be changed or adapted.
- Then, at field level, need to consider more precisely crop width / foliar density.
- For example, Spain wish to keep the concentration (%) + volume rate (L/ha) together to the new harmonized system.

# Conclusion – Southern zone (2)

## SZ MS expectations for the workshop

- Have the feedback of other MS which are using other dose expression (LWA, BBCH, canopy height...)
- Increase our knowledge of the previous discussions on the subject.
- Further discussions are necessary in each MS (different actors) and between us.
- Challenge: In Southern Europe where we observe **a wide range of training systems** compared to other parts of Europe, what could be the best options to express the dose rate in order to:
  - Make the efficacy evaluation more accurate,
  - And at field level, rationalize the use of PPP.

## Still lot of questions

- Understand the improvement with the new dose expression, compared to concentration (% or /hL),
- Understand why the TRV / LAI model was refused, whereas it has a better correlation with the foliage area, compared to LWA?
- Define a common way to make dose expression conversions, especially to relate efficacy dose expression to the max /ha dose for risk assessment,
- How to manage the transitionnal period, the re-registrations...

# Thank you for your attention



**Chestnut, « normal » density:**

Not possible to make automatic measures (LIDAR captor) between the rows.














**Chestnut, low density:**

Possible to make automatic measures (LIDAR captor), but measure not possible manually (very high trees).

1. Which dose expression is currently used in your country for the following examples of high growing crops (vertical spraying)

## Current evaluation units

| Crop  | (II) National efficacy assessment |                         |     |     |             |  | (III) Zonal efficacy assessment |                          |    |                              |                              |     |
|---|-----------------------------------|-------------------------|-----|-----|-------------|--|---------------------------------|--------------------------|----|------------------------------|------------------------------|-----|
|   | FR                                | ES                      | PT  | IT  | EL          | HR                                     | FR                              | ES                       | PT | IT                           | EL                           | HR  |
| Pome fruit               | /hL                               | /hL + water (L/ha); /ha | /hL | /ha | /ha and /hL | /ha                                    | /hL                             | /hl + water (L/ha) ; /ha | -  | dependent on MS requirements | dependent on MS requirements | /ha |
| Stone fruit              |                                   |                         |     |     |             |  |                                 |                          |    |                              |                              |     |
| Citrus                   |                                   |                         |     |     |             |  |                                 |                          |    |                              |                              |     |
| Olive                    |                                   |                         |     |     |             |  |                                 |                          |    |                              |                              |     |
| Almond                   |                                   |                         |     |     |             |  |                                 |                          |    |                              |                              |     |
| Walnut                   | -                                 | -                       | -   | -   | -           | -                                      | -                               | -                        | -  | -                            | -                            | -   |
| Grapevine                | /ha (max rate)                    | /hL + water (L/ha); /ha | /hL | /ha | /ha and /hL | /ha                                    | /hL and-or /ha                  | /hl + water (L/ha) ; /ha | -  | dependent on MS requirements | dependent on MS requirements | /ha |
| Hop                      | /hL                               | -                       | /hL | /ha | /ha and /hL | /ha                                    | /hL                             | -                        | -  | dependent on MS requirements | dependent on MS requirements | /ha |
| Tomato in glasshouses    | /hL                               | /hL + water (L/ha); /ha | /hL | /ha | /ha and /hL | /ha; concentration in % (/hL of water) | /hL and-or /ha                  | /hl + water (L/ha) ; /ha | -  | dependent on MS requirements | dependent on MS requirements | /ha |
| Cucumber glasshouses     |                                   |                         |     |     |             |  |                                 |                          |    |                              |                              |     |
| Pepper in glasshouses  |                                   |                         |     |     |             |  |                                 |                          |    |                              |                              |     |
| Others  | /hL and-or /ha                    |                         |     |     |             | Always L or kg/ha                      | /hL and-or /ha                  |                          | -  |                              |                              | /ha |

France : Other dose expression (LWA, TRV, per meter tree height...) are accepted. Only a few dossiers were submitted in these units.

ES (II, III): National (II) and Zonal (III) efficacy assessment are the same

2. Are different crop structures e.g. cropping system, distance between rows and between plants in the row, treated foliage height (canopy height), mid-width of the crown, canopy volume, BBCH growth stage at application or related parameters such as canopy density (leafiness), etc. considered:

## How crop growth stage is currently included

| a)  | FR  | ES (Yes)   | PT (Y)            | IT (Y and N)   | EL   | HR  |
|---|---|--|-------------------|--|--|-----|
| (I) National registration (label, official notice)    | <p><u>No</u><br/> <b>Decision:</b> a max dose /ha (that can be lowered in function of foliage area).<br/> <b>Label:</b> a max dose /ha + dose /hL.<br/> <b>In practice:</b> most of the time the max dose/ha is not lowered, and is understood at a “fixed dose”.</p> | <p><u>Yes</u>, mainly BBCH growth stage at application. Also, in some crops, the treated foliage height.</p>   |                   | <p>Variable.<br/>           When dose is expressed in /ha, no other parameter is considered.</p>               | <p>/hL in association with a proposed range of spray volume, or in /ha.<br/>           The end user should adjust the water volume considering the crop stage / structure.<br/>           Ranges of spray volume per crop are based on empirical data / practice and seasonal development.</p> | Yes |
| (II) National efficacy assessment (Part B - national) | <p><u>Yes</u><br/>           Currently, only through water volumes by dose /hL.</p>   | <p>In general, parameters such as <i>plant density, cropping system, distance between rows and between plants in the row and BBCH growth stages at application</i> are indicated. However others parameters as <i>treated foliage height (canopy height), mid-width of the crown, canopy volume or canopy density (leafiness)</i> are not pointed out.</p> | BBCH growth stage | <p>In case the dose is expressed in /hL, the water volume applied is based considering canopy development.</p> | <p>Rate expressions commonly used are /hL and /ha.<br/>           1. When Expression is /hl or /ha: No parameter characterizing crop structure is considered individually<br/>           2. When dose expression is m ch: canopy height (rare cases)</p>                                       | No  |
| (III) Zonal efficacy assessment (Part B - zonal)      |   |  |                   |  | <p>1. When Expression is /hl or /ha: No parameter characterizing crop structure is considered individually<br/>           2. When expression is m ch (rare cases): Canopy height<br/>           3. When expression is LWA (just one case): Canopy height, distance between rows</p>            | No  |



# Max LWA for high growing crops (southern zone)

- High-growing vegetables

|             |         |       |        |        |
|-------------|---------|-------|--------|--------|
| Tomato GH   | Spain   | 4 000 | 25 000 | 14 000 |
|             | Italy   | 5 000 | 24 000 |        |
|             | Croatia | 5 000 | 50 000 | 20 000 |
| Cucumber GH | Italy   | 3 300 | 26 700 |        |
|             | Croatia | 5 000 | 50 000 | 20 000 |
| Kiwi fruit  | Italy   |       | 12 500 | 10 000 |

## Max LWA











24 000 – 26 000 m<sup>2</sup> Spain, Italy











50 000 m<sup>2</sup> Croatia (Mode LWA: 20 000 m<sup>2</sup>)



b) If your answer is “yes”, please, indicate which parameters are considered.

## How crop growth stage is currently included

| Crop   | (I) National registration |   |                   |                   |    |  |   |
|--|---------------------------|---|-------------------|-------------------|----|--|---|
|  | FR                        | ES  | PT                | IT                | EL | HR   |   |
| Pome fruit      |                           | BBCH growth stage at application          | BBCH growth stage | BBCH growth stage |    | BBCH growth stage at application, age of the orchard |   |
| Stone fruit     |                           |   |                   |                   |    | BBCH growth stage, age of the vineyard               |   |
| Grapevine       |                           |   |                   |                   |    | Cropping system                                      |   |
| Olive           |                           |   |                   |                   |    | BBCH at application                                  |   |
| Almond          |                           |   |                   |                   |    | BBCH growth stage at application, age of the orchard |   |
| Walnut          |                           |   |                   |                   |    |  |   |
| Citrus          |                           | BBCH growth stage; Treated foliage height | -                 |                   |    |  | - |
| Hop             |                           | -   | -                 |                   |    |  |   |
| Tomato in GH    |                           | BBCH growth stage                         | BBCH growth stage |                   |    |  |   |
| Cucumber in GH  |                           |   |                   |                   |    |  |   |

| Crop   | (II) National efficacy assessment   |                   |    |                   |    |    | (III) Zonal efficacy assessment             |                   |    |                   |    |    |
|--|---|-------------------|----|-------------------|----|----|---|-------------------|----|-------------------|----|----|
|  | FR  | ES                | PT | IT                | EL | HR | FR  | ES                | PT | IT                | EL | HR |
| Pome fruit        | /hL dose, volume adapted to the foliar area   | BBCH growth stage |    |                   |    |    | /hL dose, volume adapted to the foliar area | BBCH growth stage |    |                   |    |    |
| Stone fruit       |   | -                 |    |                   |    |    |   | -                 |    |                   |    |    |
| Citrus            |   |                   |    |                   |    |    |   |                   |    |                   |    |    |
| Olive             |   |                   |    |                   |    |    |   |                   |    |                   |    |    |
| Almond            |   |                   |    |                   |    |    |   |                   |    |                   |    |    |
| Walnut            |   |                   |    |                   |    |    |   |                   |    |                   |    |    |
| Grapevine       | For French trials /ha, no consideration of foliar area / crop structure. Other trials: /hL dose, with volumes adapted to the foliar area. | BBCH growth stage | -  | BBCH growth stage | -  | -  | /hL dose, volume adapted to the foliar area | BBCH growth stage | -  | BBCH growth stage | -  | -  |
| Hop             |   | -                 |    |                   |    |    |   | -                 |    |                   |    |    |
| Tomato in GH    |   | BBCH growth stage |    |                   |    |    |   | BBCH growth stage |    |                   |    |    |
| Cucumber in GH  |   |                   |    |                   |    |    |   |                   |    |                   |    |    |

3. Are changes of crop structure due to increasing crop (canopy) height, mid-width of the crown, canopy volume, etc. during the growing period (seasonal development) considered?

## How crop growth stage is currently included

|                                   | FR  | ES   | PT   | IT   | EL   | HR        |
|-----------------------------------|---|--|--|--|--|-----------|
| (I) National registration         | <p><u>Decision</u>: a max dose /ha (that can be lowered in function of pest pressure or foliage area).</p> <p><u>Label</u>: a max dose /ha + dose /hL.</p> <p><u>In practice</u>: most of the time the max dose/ha is not lowered, and is understood at a “fixed dose”.</p> | <p>YES</p> <p>In all crops. (indirectly)</p>                         | <p>Grapevine, pome fruit and stone fruit</p> |  | <p>YES</p> <p>1. Greenhouse tomato/cucumber: change in water volume (dose per ha) according to seasonal development</p> <p>2. Trees: change in water volume (dose per ha) according to tree density, cropping system, canopy height</p>  | <p>NO</p> |
| (II) National efficacy assessment | <p>YES</p> <p>All high growing crops (except grapevine) through the /hL dose, with a volume adapted to the foliar area.</p>   | <p>YES</p> <p>Only BBCH in all crops listed in question 1 and 2.</p> | <p>Grapevine, pome fruit and stone fruit</p> | <p>NO</p> <p>It is empirically considered when applying the product in different BBCH stage.</p> | <p>YES</p> <p>National efficacy assessment is based on the spray volumes that have been tested in the efficacy trials. We expect that parameters such as seasonal development (greenhouse crops), tree density are taken into consideration to determine the spraying volumes in the trials.</p> | <p>NO</p> |
| (III) Zonal efficacy assessment   |   |  |  |  | <p>YES</p> <p>Zonal efficacy assessment is based on the spray volumes that have been tested in the efficacy trials. We expect that parameters such as seasonal development (greenhouse crops), tree density are taken into consideration to determine the spraying volumes in the trials.</p>    | <p>NO</p> |

- FR: /hL dose, volume adapted to the foliar area.

- ES: **ES (I):** The main change of the crop structure considered is the **canopy volume based on BBCH but without a direct relation between canopy and volume, to work out the volume of water to add in the tank of application.** In some cases the volume of water range is indicated in the label. The lower range value is used at the first stage of the crops, when the volume of canopy is small, and the higher range value is used at advanced stage of the crops. **ES (II, III): Only BBCH tested in trials (growth stage in accordance with GAP table) is considered in the assessment.** Changes on other parameters - increasing crop (canopy) height, mid-width of the crown or canopy volume - are not considered.

- PT: In PT for high growing crops usually is authorized a concentration (kg or L/hL) and sometimes a range of concentrations, normally the highest one to be used in highest pest pressure. **The dose rate per ground area increases with canopy development, thus a maximum dose rate per hectare is also expressed on label, to be used at full vegetative growth.**

- IT : / - EL : **Change in water volume based on the growing period (seasonal development).** - HR : /

4. Does your country intend to change the procedures addressed in the questions 1 to 3?

|    | YES | NO | Comments  |
|----|-----|----|---|
| FR |     |    | <p><u>France: still under discussion</u></p> <p><u>Evaluation level</u>: Change still under discussion. Currently efficacy evaluation in /hL (orchards and high growing vegetables) and /ha (grape, field crops). Risk assessment based on a max dose /ha. Conclusions (efficacy + risk assessment): max dose /ha.</p> <p><u>Decision level</u>: max rate /ha.</p> <p><u>Label and field level</u> (national): Avoid the over-dosage related to the application of the max registered dose. E.g. a grid taking into account growth thickness, distance between rows and vegetation height and that offers the possibility of non-linearity between the dose and the value of the variables. Willingness to consider foliar area and crop structure. Model / indicator not chosen yet.</p> |
| ES | X   |    | <b>There is an intention to uniform the expression of dose and to use the expression of dose more suitable for each crop.</b>   |
| PT | X   |    | <p>In PT, LWA is not yet a common dose expression. Nevertheless we pretend to harmonize dose expression with other MS and adopt the dose expression that best fits the high-growing crops system.</p> <p>In order to have authorizations expressed in LWA, first trial reports must also be harmonized and expressed in LWA, which is not yet happening.</p> <p>After, we will need a transitional adjustment period in which two dose expressions (LWA and a converted dose expression) must be on label in order to be understandable for all users.</p>  |
| IT | YES |    | Still debating but it would be advisable  |
| EL |     | x  |   |
| HR |     | NO | <b>Dose expression per treated area (ha) will remain the main dose expression in all types of efficacy assessments and will remain to be specified on the label.</b>  |

| 6. Application technique |   |   |   |  |  |   |
|--------------------------|---|---|---|--|--|---|
| Crop                     | FR  | ES  | PT  | IT                                     | EL   | HR  |
| Pome fruit               | 80% of axial sprayers and 20% divided between axial sprayers with towers, or tangential (cross flow) sprayers or pneumatic sprayers.  | Air assisted sprayers (air blast sprayer)   | hydraulic sprayers and air assisted sprayers (tractor mounted and trailed sprayers) | Air assisted boom sprayer              | air blast sprayer  | Air assisted boom sprayers                  |
| Stone fruit              | 100% of axial sprayers  |   |   |  | 80% air blast sprayer 20 % gun sprayer                     |   |
| Citrus                   | 100% of axial sprayers  | In East citrus area of Spain: Air-blast sprayer with axial fan (65%) and Gun sprayers (35%). In South area of Spain: Air-blast sprayer with axial fan (95%) and Gun sprayers (5%) | gun sprayer   |  |  |   |
| Grapevine                | <i>Narrow vineyard (distance between rows: 1.0-1.4 m):</i> A wide range of sprayers are used in viticulture: Side by side sprayer in pneumatic technology or air assisted technology. Schema of the different material will be send (Sébastien Codis). <i>Large vineyard (distance between rows: 1.8-3 m):</i> Pneumatic arch used every 2, 3 or 4 rows. Axial sprayer used every 2 rows. | Air assisted sprayers (air blast sprayer)   |   | 50% air blast sprayer 50 % gun sprayer |  |   |
| Olive                    | -   | Air blast sprayer with hollow cone nozzles (no calibration done) / Spray guns sprayer   | <i>idem</i> and hand held application   | gun sprayer*                           |  |   |
| Hop                      | -   | Air assisted sprayers (air blast sprayer)   | -   | -                                      |  |   |
| Almond                   | -   |   | hand held application   | gun sprayer                            | Air assisted boom sprayers                                 |   |
| Walnut                   | 100% of axial sprayers  | -   | -   | -                                      |  |   |
| Tomato in GH             | -   | Hand held sprayers  | hand held application   | Air assisted boom sprayer, Fogger      | 60% fixed and semi mobile sprayers, 40 % knapsack sprayers | Knapsack air assisted boom sprayers         |
| Cucumber in GH           | -   |   |   | Air assisted boom sprayer, Fogger      |  |   |
| Others                   | -   | -   | -   | -                                      | -  | Boom sprayers or air assisted boom sprayers |




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EL: \* The application in olives is either full cover or bait application. In the bait application treatments are applied in a part of canopy and trunk inside the trees (300 ml on 10 randomly selected trees for every acre).

## CROP STRUCTURE

| Crop           | <i>5b. Description of cropping systems</i>   |
|----------------|--|
| Pome fruit     | FR: Axe ES: Trellis IT: Tall Spindle, super spindle, Vertical Axis, slender axis, slender pyramid EL: Palmette and isolated HR: Tall spindle, super spindle, vertical axis, slender axis. PT: /  |
| Stone fruit    | FR: Gobelet and axe ES: Trellis, gobelet IT: Vase, Vertical axis, dwarf (cherry) EL: Palmette and isolated HR: Spanish bush, pyramids, tall spindle, Vogel central leader, vase, solax. PT: /  |
| Citrus         | FR: Gobelet ES: Globular trees with short distance between trees in the row form as a hedge, Globular isolated trees. EL: isolated HR: Vase. PT: / IT: /   |
| Grapevine      | FR: Trellis, gobelet... ES: Trellis, pergola and gobelet PT: Portugal is divided in 14 viticulture regions with several particularities in each region, including different compass and different crop systems. For example: in Douro/Porto, with steep slopes, walled terraces the cordon prevails unilateral and bi-lateral; 'pergola' in Minho and 'gobelet' in Alentejo. IT: Pergola, Guyot, Cordon train, Cane, Gobelet, Sylvos-Casarsa, VSP Trellis, Tendone (parral) EL: Trellis and gobelet HR: Geneva double curtain, Guyot, fan shape, duplex, traditional |
| Olive          | ES: Vertical axis with short branches / Bi-axis system / Open-center training IT: Polyconic vase EL: Isolated HR: Free forms, free vase, polyconical vase, monocone FR: / PT: /  |
| Hop            | ES: Trellis<br>FR: / PT: / IT: / EL: / HR: /   |
| Almond         | ES: Gobelet, trellis EL: Isolated HR: Traditional vase, pyramid<br>FR: / PT: / IT: /   |
| Walnut         | FR: Axe and gobelet ES: Gobelet EL: Isolated HR: Structured central leader, free leader<br>PT: / IT: /   |
| Tomato in GH   | ES: Trellis EL: Vertical (high growing) in rows  |
| Cucumber in GH | FR: / PT: / IT: / HR: /  |
| Kiwi fruit     | IT: Pergoletta and Tendone (Parral) EL: Isolated (pistachios), Isolated and vertical (pome granates), Isolated (kaki), Vertical, pergola (kiwi)  |






## CROP STRUCTURE

| Crop   | <i>5c. orchards with isolated (large) trees</i> |                         | Distance between rows | Distance between trees                                      | Crown volume   | Mid-width of the crown          | Other information   |
|--|---|-------------------------|-----------------------|---|--|---------------------------------|---|
| <b>Pome fruit</b><br>  | FR  | Apple orchards (Axe)    | 4 m (3.0 to 5.0)      | 1 to 2 m  | 11 000<br>(2 000 to 27 000)  | 1.8 m<br>(0.6 to 3.4)           | 2.6 m<br>(1 to 4.1)   |
|  |   | Pear orchards (Axe)     | 3.8 m (2.0 to 4.0)    | 1.5 to 2 m  | 10 000<br>(4 000 to 25 000)  | 1.8 m<br>(1.2 to 2.8 m)         | 2.4 m (1.4 to 3.6 m)  |
|  |   | Cider apple orchards    | 5 m (4.0 to 6 m)      | 1.7 to 2.6 m  | 22 000<br>(6 000 to 41 000)  | 3.2 m<br>(1.4 to 4.8 m)         | 3.6 m (2.2 to 5.3 m)  |
|  | ES  |                         | 5-6 m                 | 5-6 m   | 80-100 m <sup>3</sup>  | 3 m                             |   |
|  | EL  |                         | 3.5-4 m (palmette)    | 0.5-2.5 m (palmette)  |  |                                 | Height approx. 2-2.5 m  |
| HR   |   | 4 – 8 m                 | 4 – 6 m               | 10 000 – 40 000 m <sup>3</sup> /ha                          | 7 – 8 m  |                                 |   |
| <b>Stone Fruit</b><br> | FR  | Peach orchard (gobelet) | 5.5 m<br>(4 to 6 m)   | 1.25 to 4 m   | 11 500<br>(3 000 to 22 000) TRV  | 3.8 m<br>(0.8 to 6 m)           | 2.4 m (1.3 to 3.8 m)  |
|  | ES  |                         | 4-5 m                 | 3-4 m   | 60-80 m <sup>3</sup>   | 2.5 m                           |   |
|  | EL  |                         | 4 m                   | 0.5 (cherries) –<br>1(peaches)-1.5 m                        |  |                                 | For isolated trees 2.5-4.5 m X 5m (for peaches), 5-6 m X 5-6 m (for cherries), height approx. 2-2.5 m |
|  | HR  |                         | 4 – 8 m               | 4 – 6 m   | 10 000 – 40 000 m <sup>3</sup> /ha   | 6 – 8 m                         |   |
| <b>Citrus</b><br>     | ES  | Citrus *                | 4m (min)-7m (max)     | 2m (min)-6m (max)   | **0.6m <sup>3</sup> (min);15 m <sup>3</sup> (mean); 78 m <sup>3</sup> (max); | ***1m (min);3.5 (mean);5m (max) | Crown height: 1m (min);3m(mean);6m (max)  |
|  | EL  |                         | 5-6 m                 | 3 m (tangerine) – 4 m (oranges)- 5 m (grape fruit & lemons) |  |                                 |   |
|  | HR  |                         | 4 – 8 m               | 4 – 6 m   | 10 000 – 40 000 m <sup>3</sup> /ha   | 6 – 8 m                         |   |

FR: Plum- data being acquired. Mean value. Crown volume: TRV; Mid-width of the crown: at full growth stage; Other information: Treated foliage height (at full growth stage).

ES (research group): Citrus: \*There are differences between species of citrus: Lemmon trees are bigger than orange trees and both are bigger than mandarin trees. \*\*Considering the tree as an ellipsoid and taking into account diameter between rows and diameter between trees. \*\*\* Mid-width of the crown between trees is limited for the distance between trees, however Mid-width of the crown between rows are not limited so in adult plantations values this parameter is higher than mid-width of the crown between trees.

## CROP STRUCTURE

| Crop   | <i>5c. (cont.) orchards with isolated (large) trees</i> |                                    | Distance between rows  | Distance between trees                         | Crown volume                       | Mid-width of the crown   | Other information     |              |
|--|---|------------------------------------|--|--|------------------------------------|--------------------------|-----------------------|--------------|
| <b>Grapevine</b><br>                             | FR  | Burgundy (taille arcure)           | From 1.1 to 1.4 m  | 1.0 m  | -                                  | From 20 to 40 cm         | 0.80 to 1.20 m        |              |
|  |   | Champagne (taille cordon ou guyot) | From 1.0 to 1.2 m  | 1.0 to 1.2 m                                   |                                    | From 20 to 40 cm         | 0.80 to 1.20 m        |              |
|  |   | Bordeaux                           | From 1.0 to 3.0 m<br>(Medoc 1.5 m. Cote de Bourg: 2 m) lot of variability according to the training system |  |                                    |                          |                       |              |
|  |   | Charentes Cognac (guyot)           | From 2.5 to 3.2 m  | From 1.1 to 1.3 m                              |                                    |                          | From 50 to 85 cm      | 1.4 to 1.6 m |
|  |   | Rhone Valley (cordon)              | 2 m to 2.5 m   | From 1.0 to 1.2 m                              |                                    |                          | From 30 to 60 cm      | 1.1 to 1.5 m |
|  | ES  |                                    | 2 – 3 m  | 2 – 3 m  | 4-10 m <sup>3</sup>                | 1 m                      |                       |              |
|  | EL  |                                    | 2.30 (wine grapes)<br>2.70 m (table varieties)   | 0.90 (wine grapes)<br>1.40 m (table varieties) |                                    |                          |                       |              |
| HR   |   | 2-4 m                              | 2-3 m  |  |                                    |                          |                       |              |
| <b>Olive</b><br>                                 | ES  |                                    | 7- 12 m  | 6- 12 m  | 25 – 120 m <sup>3</sup>            | 3.5 – 5.0 m              | 1-4 trunks            |              |
|  | EL  |                                    | 6-8 m  | 3-8 m  |                                    |                          |                       |              |
|  | HR  |                                    | 6 – 8 m  | 6 – 8 m  | 10 000 – 40 000 m <sup>3</sup> /ha | 6 – 8 m                  |                       |              |
| <b>Almond</b><br>                                | ES  |                                    | 5-7 m  | 4-5 m  | 80-100 m <sup>3</sup>              | 2-4 m                    |                       |              |
|  | EL  |                                    | 6 m  | 5 m  |                                    |                          |                       |              |
|  | HR  |                                    | 4 – 8 m  | 4 – 6 m  | 10 000 – 40 000 m <sup>3</sup> /ha | 5 – 7 m                  |                       |              |
| <b>Walnut</b><br>                              | FR  |                                    | 8.4 m<br>(8 to 10)   | 7 to 10 m                                      | 56 000 (23 000 to 102 000)         | 8.9 m<br>(6.4 to 13.3 m) | 8.3 m (5.7 to 11.5 m) |              |
|  | ES  |                                    | 6-8 m  | 6-8 m  | 100 m <sup>3</sup>                 | 3                        |                       |              |
|  | EL  |                                    | 6-10 m   | 6-10 m   |                                    |                          |                       |              |
|  | HR  |                                    | 4 – 8 m  | 4 – 8 m  | 10 000 – 40 000 m <sup>3</sup> /ha | 8 – 10 m                 |                       |              |
| <b>Others (pomegranates, kaki, kiwis)</b><br> | EL  | kaki                               | 4.5-6 m  | 4-6 m  |                                    |                          |                       |              |
|  |   | pomegranate                        | 3.5 m  | 3m   |                                    |                          |                       |              |
|  |   | kiwi                               | 4m   | 1.5-3.5 m                                      |                                    |                          |                       |              |









| 7. Are parameters to calculate the LWA sufficiently included in single trial reports and are they clearly described (treated foliage height, plant height, LW height, distance between rows, etc.)? |  |
|---|--|
| FR  | It depends. For dossiers in “LWA” dose expression (only a few dossiers were submitted): YES.<br>For dossiers in “/hL” or “/ha” dose expression: usually NO. Maybe reported in single trial reports, but usually not reported in dRR /BAD. Remark: Should be included in single trial reports, but also in the BAD and dRR. |
| ES  | NO. In general, all parameters are not always indicated in the trial reports.  |
| PT  | NO   |
| IT  | NO. Usually only distance between rows and distance between plants are indicated   |
| EL  | 1. When dose is expressed in LWA: YES<br>2. When other dose expressions is used: NO. Usually the plant height rather than the treated foliage height is available in the Study Reports. The distance between rows is typically available.  |
| HR  | YES  |

| 8. Which parameters to calculate the LWA are frequently missing in current zonal dossiers and draft evaluation reports (BAD and dRR)? |   |
|---|---|
| FR  | Pome and stone fruits : For dossiers in “LWA” or “per meter canopy height” dose expression (only a few examples were submitted): YES.<br>For dossiers in “/hL” or “/ha” dose expression: usually NO.<br>Other crops: No experience.   |
| ES  | Generally, parameters to calculate LWA are missing in current zonal dossiers (dRR or BAD); only distance between rows is frequently pointed out in each individual report, although treated canopy height is often missing. (Pome fruit- Other parameters such as <i>leaf density</i> would be also clearly described to calculate other possible dose expressions; Citrus: To estimate the vegetation should be sprayed, we will need: <i>distance between rows, distance between trees, treated foliage height, tree diameter between rows, tree diameter between trees, foliage density tree</i> ) |
| PT  | - distance within the row and distance between rows are sometimes missing;<br>- treated canopy height is frequently missing.  |
| IT  | Plant height or canopy  |
| EL  | Treated canopy height. Neither the distance between rows nor the treated canopy height is usually reported in the dRRs/BADs although the distance between rows is usually available in the study reports.   |
| HR  | All parameters are usually reported in single trial reports.  |

| <b>9. Do efficacy dossiers and draft evaluation reports (BAD and dRR) provided by the applicant always include a discussion of results implementing the LWA approach?</b> |  |
|---|--|
| FR  | NO   |
| ES  | NO. Our experience with LWA is limited to two products (1 assessed PPP and 1 commented PPP). No discussion on LWA was indicated by the notifier in the assessed PPP but an explanation was showed in the commented PPP.                              |
| PT  | NO   |
| IT  | NO   |
| EL  | NO. Pome fruits: LWA was implemented in one efficacy dossier; discussion of results available in the dRR.<br>Tomato / Cucumber : In one dossier the LWA expression was used in the generation of efficacy data; no discussion of the LWA in the dRR. |
| HR  | NO   |
| <b>9a. If not, do you ask for it (I) for the national efficacy assessment, (II) for the zonal efficacy assessment?</b>  |  |
| FR  | NO   |
| ES  | For 1 dossier in LWA, Yes. Applicant submitted an explanation on LWA in pome fruit and an example on conversion of different dose expressions (1 assessed PPP).  |
| PT  | NO   |
| IT  | NO, Even though It would be an important parameter   |
| EL  | NO   |
| HR  | NO   |

| 10. Do you consider the current EPPO standard PP 1/239(2) Dose expression for plant protection products useful or do you recommend (major) modifications? |   |
|---|---|
| FR  | <b>Appendix 1 to be completed with more details on how to implement these dose expression systems + practical examples.</b>   |
| ES  | <p><b>YES</b>, we consider EPPO PP1/239(2) is useful and we also recommended (major) modifications</p> <p>- <i>Extracted from EPPO PP1/239 (2): “One very commonly used expression of dose in three-dimensional crops is concentration of the formulated product in the spray volume (e.g. dose per hL or %)....As such, it is recognised that this expression is no longer sufficient”.</i> It could be added “without a spray volume”, because <b>expression dose per hL + volume is accepted.</b></p> <p>- Major modification is recommended to consider additional crown parameters as mid-width and leaf density (porosity) or BBCH stage. <b>Minimum parameters</b> to describe in trials and required to convert to different expression dose: canopy height; mid-width of the crown; distances between rows, distances between plants and leaf density. As well as <b>procedures (examples, formulas, models) to facilitate the conversions.</b></p> <p>- A harmonized dose for all high growing crops should be included. <b>LWA as a common expression would be only applicable to high growing vegetables and intensive orchards in continue formation (system crops in trellis or hedge).</b> It would be needed to determine an <b>equivalence factor for non-intensive crops, isolated plants or non-uniform plants.</b> Specific instructions for isolated trees must be incorporated.</p> |
| PT  | <b>YES, It is useful</b>  |
| IT  | <b>YES, Grapevine and kiwifruit for example the expression of the dose still maintain a certain level of difficulties</b>   |
| EL  | /   |
| HR  | <b>YES, As with all EPPO standards, PP 1/239(2) is useful, but different countries have different approach to dose expression. This approach is not harmonized.</b>   |

| <b>11. Is it feasible to do all evaluations (of high growing crops) in the EU with a harmonized dose expression (e.g. LWA)?</b> |  |   |   |   |   |
|---|--|---|---|---|---|
| <b>FR</b>   | <p><u>still under discussion.</u></p> <p>1 option can be a harmonized dose for experimentation and evaluation at European level on all high growing crops, AND then more specific adaptation at “field” and national level (e.g. grid of coefficient factors, or other).</p> <p>The new dose expression(s) should reflect the real dose applied (quantity of product deposit on leaves) and on the other side, should be based on parameters easy to measure. Besides the diversity between crops, the diversity within 1 crop is also high, due to different training systems (e.g. Gobelet vs axe, or isolated trees vs high density). Also, the evolution of foliage area during the growing period (from early to full growth stages) should be included in the new dose expression.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;"></td> <td style="padding: 5px;">Chestnut, « normal » density: Not possible to make automatic measures (LIDAR captor) between the rows.</td> <td style="text-align: center;"></td> <td style="padding: 5px;">Chestnut, low density: Possible to make automatic measures (LIDAR captor), but measure not possible manually (very high trees).</td> </tr> </table> |    | Chestnut, « normal » density: Not possible to make automatic measures (LIDAR captor) between the rows.                          |  | Chestnut, low density: Possible to make automatic measures (LIDAR captor), but measure not possible manually (very high trees). |
|    | Chestnut, « normal » density: Not possible to make automatic measures (LIDAR captor) between the rows.   |  | Chestnut, low density: Possible to make automatic measures (LIDAR captor), but measure not possible manually (very high trees). |   |   |
| <b>ES</b>   | <p><b>YES if comment on question 10 is considered.</b></p> <p>In the efficacy assessment we have to take into account expression indicated on GAP table that is also pointed out in the rest of the areas including risk assessment involved in a whole evaluation of dossier. Different dose expressions (Kg as/ha, Kg as/hl, L/ha -water volume-) are required therefore <b>an easy correlation among all of them</b> should be determined.</p> <p><b>LWA could be feasible for some high growing crops planted in row (wall crops, in trellis, intensive orchards) but it would be not proper for non-intensive crops, isolated plants or non-uniform plants so an equivalence factor would be required.</b> It will be important a harmonized dose for all high growing crops in the same way. A research group suggest for example: <i>volume of vegetation/hectare</i></p>   |   |   |   |   |
| <b>PT</b>   | <b>NO, not yet because trials are not performed in LWA and most of the times trial reports have no relevant parameters of crop structure to dose expression conversions. Also the conversion may be not correct.</b>   |   |   |   |   |
| <b>IT</b>   | <b>YES, Except for grapevine and kiwifruit.</b>  |   |   |   |   |
| <b>EL</b>   | <b>NO, due to cultivation systems.</b>   |   |   |   |   |
| <b>HR</b>   | <b>YES</b>   |   |   |   |   |

**12. Do you consider LWA as the only method to be adopted regardless of the variability in crop structures in the EU?**

|    |   |
|----|---|
| FR | still under discussion  |
| ES | <p>NO. LWA is a simplification of dose expression that just takes into account the crop height. It is important to take into account also de width and the foliage density. This method is valid for all high growing crops and is accuracy estimating vegetation.</p> <p>LWA could be adopted as a general basis (rough approach) providing a wide interval for dose recommendation. Additional tool must be provided to refine (adjust) the dose accordingly to the specific orchard conditions/parameters.</p> |
| PT | /   |
| IT | NO, Using Leaf Area index would be with no doubt more precise but more difficult to apply in practice.  |
| EL | NO  |
| HR | YES   |

**13. If you would like to share some positive /negative experiences/doubts regarding the assessment of high growing crops from your daily work please do so in the space below**

|    |  |
|----|--|
| FR | /  |
| ES | <p>ES (II, III): The mainly negative experience is the lack of a <i>clear correlation</i> between the minimum effective dose (or effective dose) established from efficacy trials at a specific dose expression (e.g. Kg as/ha, LWA or Kg as/ha; L/ha) and that one indicated on GAP table and required in the risk assessment (Kg as/ha; L/ha) being different dose expressions.</p> <p>ES (Research group): Specific conditions for the Southern Zone must be taken into account. Tree dimensions are usually greater than Central and Northern Zones. This is consequence of the differences in temperatures and sun radiation through the season. In accordance, canopies are more developed, mainly in width dimension and leaf density. When spraying chemicals, additional amount is required in order to achieve an even covering of the target, including inside and outside zones. Penetration can be a real problem when appropriate and well calibrated equipment is not used. So LWA don't explain the complexity of a large proportion of intensive orchards in SZ. Width and leaf density (as porosity, Leaf area index or BBCH stage) could be incorporated. On the other hand, LWA is no sense when dealing on isolated trees. For this case, the dose can be related to the crown volume and to the leaf density. Other factors as distance between trees in the row and on/off automatic regulation could be considered for adjusted target spraying.</p> |
| PT | /  |
| IT | /  |
| EL | /  |
| HR | <p>Within mutual recognition authorization in Southern zone, dose expression for high growing crops is often presented in kg (L) per 100 l of water. Conversion of such dose expression in fruit crops and grapevine to kg (L) per ha might be relatively complicated when different water volumes are considered (e.g. from low water volumes to more than 1000 L/ha).</p> <p>It is important to have dose expression in kg (L) /ha whereas water volume depends beside the crop on application equipment.</p>  |

**14. What are your expectations for this Workshop?**

|    |   |
|----|---|
| FR | <p>At evaluation level, listen to the experience of other MS on the use of LWA, TRV, conversion... and eventual consequences for the other areas of evaluation: risk assessments.</p> <p>For MS already using LWA or other dose expression (TRV, BBCH crop stages, meter of canopy height), how they handle the evaluation conclusions, and then at national level (the decision, the label)? And how it is managed then at field level?</p> <p>In Southern Europe where we observe a wide range of training system compared to central Europe (at least in viticulture and orchards), what could be the best options to express the dose rate in order to:</p> <ul style="list-style-type: none"> <li>- Make the efficacy evaluation,</li> <li>- And at field level, rationalize the use of pesticides.</li> </ul> |
| ES | <p>ES (I): The expectations are to uniform the expression of dose and to use the expression of dose more suitable for each crop in order to put clearer information in the label, so, growers could make more effective use of the pesticides.</p> <p>ES (II, III): Understanding how transformations between different dose expressions are carried out (in an easy way for both individual and overall trials), as dose expressions used in individual trials and that one showed on the GAP table are often different and a direct correlation is needed.</p> <p>ES (Research group): To agree on a general system for dose expression considering the differences in canopy shapes and densities and orchard structure (wall shaped or isolated trees) that are existing through the EU Zones.</p>              |
| PT | <p>To increase knowledge's in LWA and share experiences with different MS.</p>  |
| IT | <p align="center">/</p>   |
| EL | <p align="center">/</p>   |
| HR | <p>EPPO workshops are always useful.</p>  |