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## Introduction

Different groups of the population can be exposed before, during and after the application of plant protection products (PPPs). A distinction can be made between:

1. **Operators** : persons involved in activities relating to the application of a PPP (mixing/loading, application, repair and maintenance)
2. **Workers**: persons who, as part of their employment, enter an area or handle a crop that has been treated with a PPP
3. **Bystanders**: persons who are located in/next to an area where PPP application is taking place
4. **Residents**: persons who live or work adjacent to an area that has been treated with a PPP

Before a PPP can be used in the EU, it has to pass the registration process. During this process, exposure models can be a useful tool to assess the exposure of these four exposed groups.

## Objectives

BROWSE is a European project of the Seventh Framework Programme. The project consortium consists of different European members with a certain interest and knowledge within the field of plant protection products. Ghent University is responsible for work package 2 (worker exposure).

The **main objectives** of BROWSE are as follows:

1. Review, improve and extend the **models** currently used in the risk assessment of PPPs to evaluate the exposure of operators (work package 1), workers (work package 2), residents and bystanders (work package 3).
2. Involve all relevant **stakeholders** and end-users and take full account of relevant **gender issues** in the development of new and improved assessment methods and policy tools addressing exposure of operators, workers, residents and bystanders to PPPs (work package 4).
3. Use new and improved exposure models developed in work packages 1-3 to contribute to the implementation of the **PPP authorisation Regulation 1107/2009**, replacing Directive 91/414/EC (work Package 5).
4. Use new and improved exposure models developed in work packages 1-3 to contribute to the implementation of the Thematic Strategy on the **Sustainable Use of Pesticides** (work Package 6).
5. Coordinate the technical, management, financial and dissemination activities of the project, including ethical, gender and intellectual property issues (work Package 7).

## Worker exposure: state of the art

### Dermal exposure

The dermal exposure of re-entry workers can be estimated using an exposure model. The model is based on a simple algorithm. The algorithm takes into account three factors: the amount of residue on the crop that may be transferred during re-entry activities (DFR), the intensity of the contact between worker and crop (TC) and the duration of the task (T).

$$PDE = DFR \times TC \times T$$

Where:

PDE = Predicted Dermal Exposure ( $\mu\text{g}/\text{d}$ )

DFR = Dislodgeable Foliar Residue ( $\mu\text{g}/\text{cm}^2$ )

TC = Transfer Coefficient ( $\text{cm}^2/\text{h}$ )

T = Time of task (h/d)



Figure 1: picking tomatoes (harvest)

### Inhalation exposure and dermal exposure to soil residues

Algorithms for estimating inhalation exposure and dermal exposure to soil residues have also been developed. Inhalation exposure is estimated by multiplying the pesticide application rate (AR) with task-specific factors (TSF). Dermal exposure to residues of pesticides in soil can be calculated by using the following factors: concentration in the soil, dermal adherence of the soil, area of exposed skin and the transfer factor<sub>soil→skin</sub>.

## Worker exposure: progress beyond the state of the art

The current approaches for assessing worker exposure are based on limited data for a limited range of crop/task-combinations. A small number of default parameter values are available: TCs for the manual harvest of four crop groups (vegetables, tree fruit, berries and ornamentals) and a single worst-case default DFR value. The use of the algorithms for inhalation exposure and dermal exposure to soil residues is even more limited.

BROWSE will look to progress beyond the state of the art by:

1. Expanding the range of crops and tasks
2. Taking into account other important exposure factors (e.g. degradation of the residue)  
→ by conducting a literature review to integrate all available relevant data
3. Gathering information on realistic task durations  
→ by conducting a worker survey
4. Refining the approach for inhalation exposure  
→ especially for greenhouses



Figure 2: scouting for diseases (pre-harvest)



Figure 3: sorting of grapes (post harvest)

## Discussion

Although a basic worker exposure model is already available, a lot of work can be done to extend the possibilities of this model. However, more relevant data need to be collected in order to develop a more useful model.