

## Services and dis-services of collective gardens in urban areas: a soil perspective

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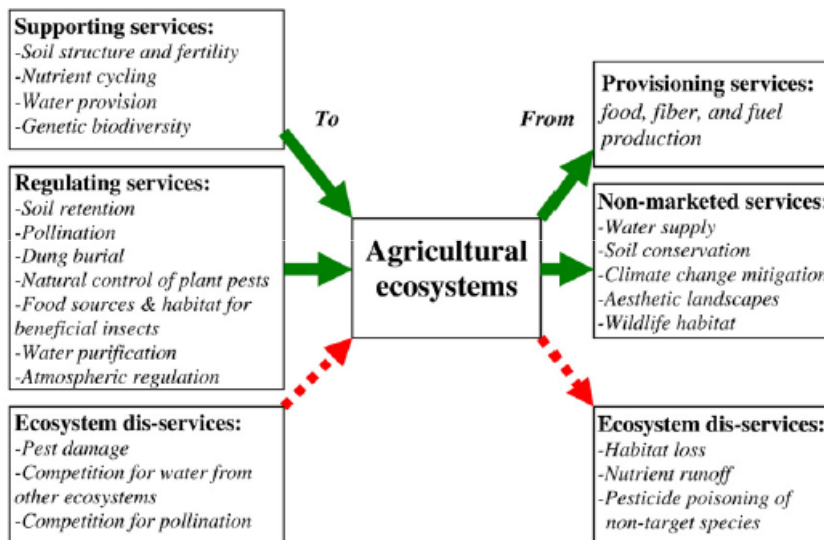
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2. RIVM, The Netherlands

3. CNRS, France

### 1. Introduction

#### What are services and dis-services?



Zhang et al. (2007)

Feedback effect of dis-services from agriculture to agricultural input (e.g., removal of natural enemy habitat can encourage pest outbreaks)

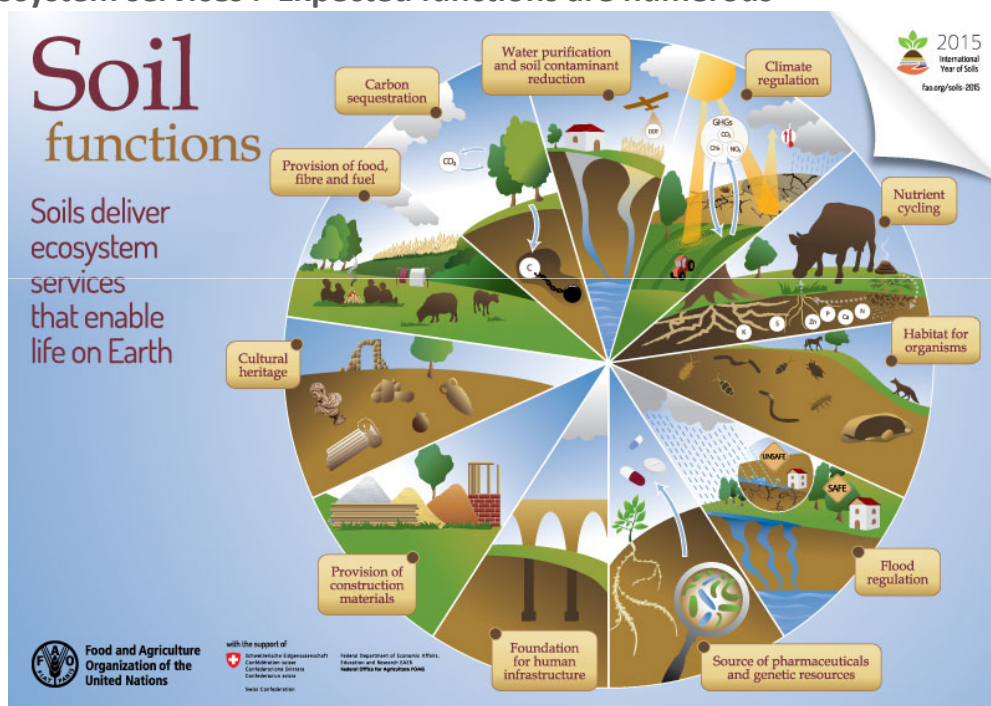
What are dis-services?



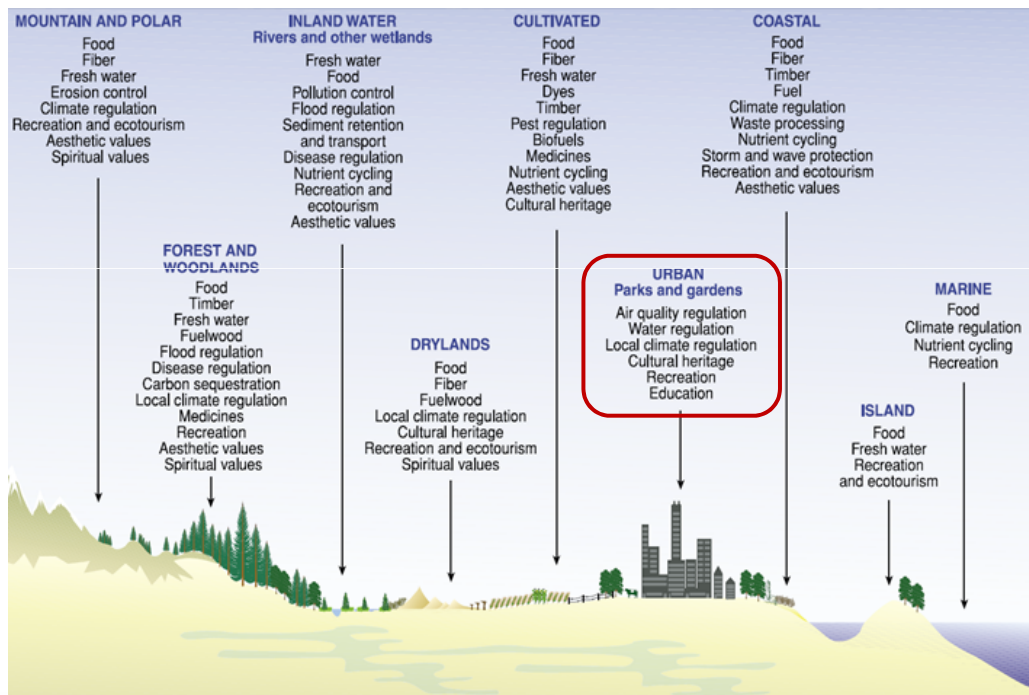
Situation A

Oosterbroek et al (2016)

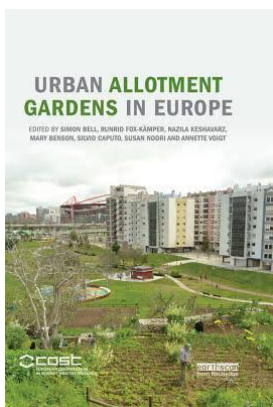
Soil Ecosystem services : Expected functions are numerous



Ecosystem services of Urban areas : specific functions are expected



Collective gardens= numerous forms, often as an answer to crisis



Summer House and Garden Cooperative

Kitchen Garden  
Family Garden Allotment Plots  
**Allotment Garden**  
**Community Garden**

Farm Garden Collective Garden

Intercultural Garden

School Garden Municipal Garden

Therapeutic Garden

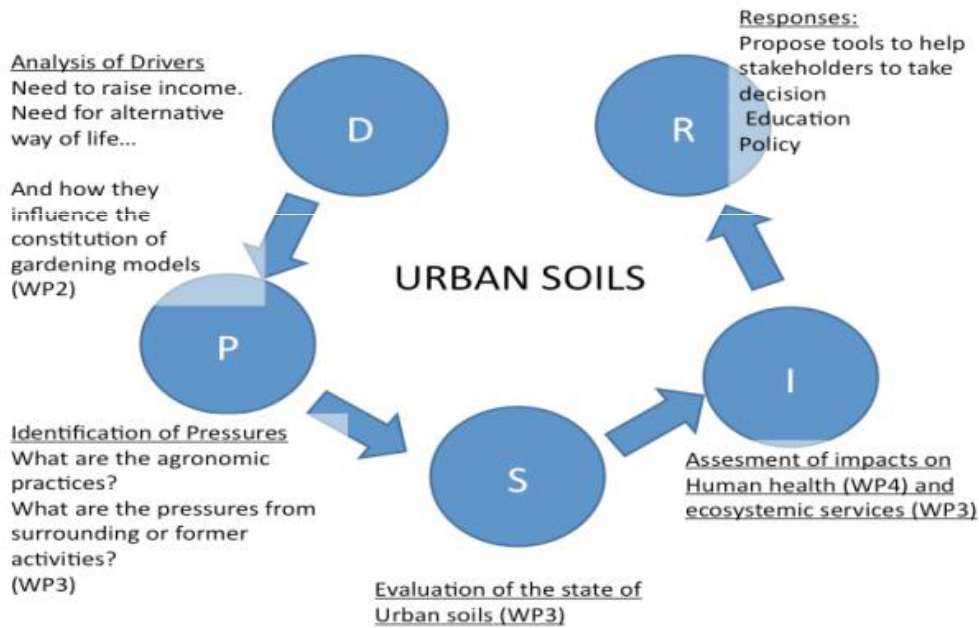
Old practices in western Europe (France, UK...) industrial revolution/ family  
« Institutionnal » in Russia

Recent (80's in Southern Europe (Italy, Spain, Greece...))



## 2. The “Urban Soil” project within Snowman initiative

“Urban Soil” aims at deciphering links between social, economical and environmental considerations of collective gardening in Urban/periurban areas.



- Wallonia
- Brussels
- Paris
- Manchester
- Utrecht
- Barcelona

## 2. The “Urban Soil” project within Snowman initiative

14. What importance do you attribute to these functions within the project?  
Mark only one oval per row.

	Main	Second	Auxiliary	Not relevant
Education	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Employment creation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recreation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Health (as therapy)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food sovereignty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Environmental management and conservation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social cohesion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

15. Consistency activities? <sup>1</sup>  
Tick all that apply

Forbidden

Allowed but not frequent

Allowed and frequent

Officially organized

Open doors

Other: \_\_\_\_\_

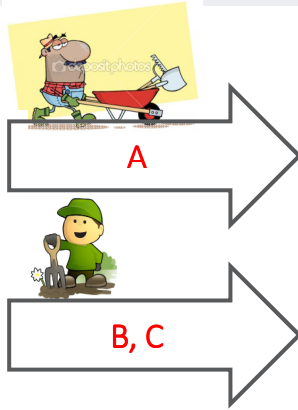
## 2. The “Urban Soil” project within Snowman initiative

14. What importance do you attribute to these functions within the project? \*  
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Social cohesion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

15. Community activities? \*  
Tick all that apply.

- Forbidden
- Allowed but not frequent
- Allowed and frequent
- Officially organized
- Open doors
- Other: \_\_\_\_\_

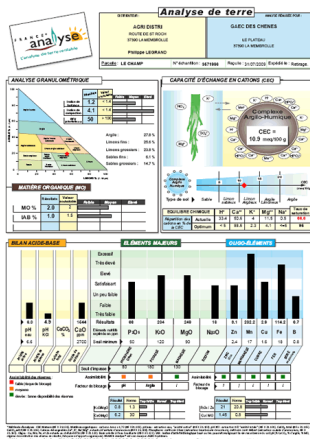


Questionnaire survey:

- What is the collective project?
  - Aims, history and description of the project
  - Description of the garden
- Who are the gardeners?
  - What do they do on the plots?
  - Why do they cultivate and how do they consider environment?

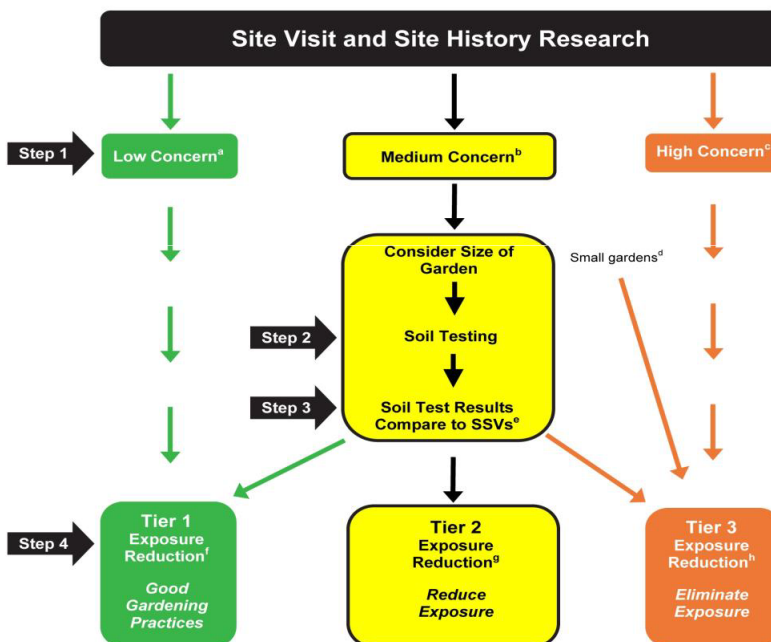
Soil quality assesment :

- Soil fertility
  - pH, TOC, available nutrients (Ca, Mg, K, P)
  - Texture, CEC (in progress)
- Soil contamination
  - As, Cd, Cr, Co, Cu, Hg, Ni, Pb, Zn (Total Aqua Regia)
  - Cd, Cu, Pb, Zn (Available CH<sub>3</sub>COONH<sub>4</sub> + EDTA pH 4.65)

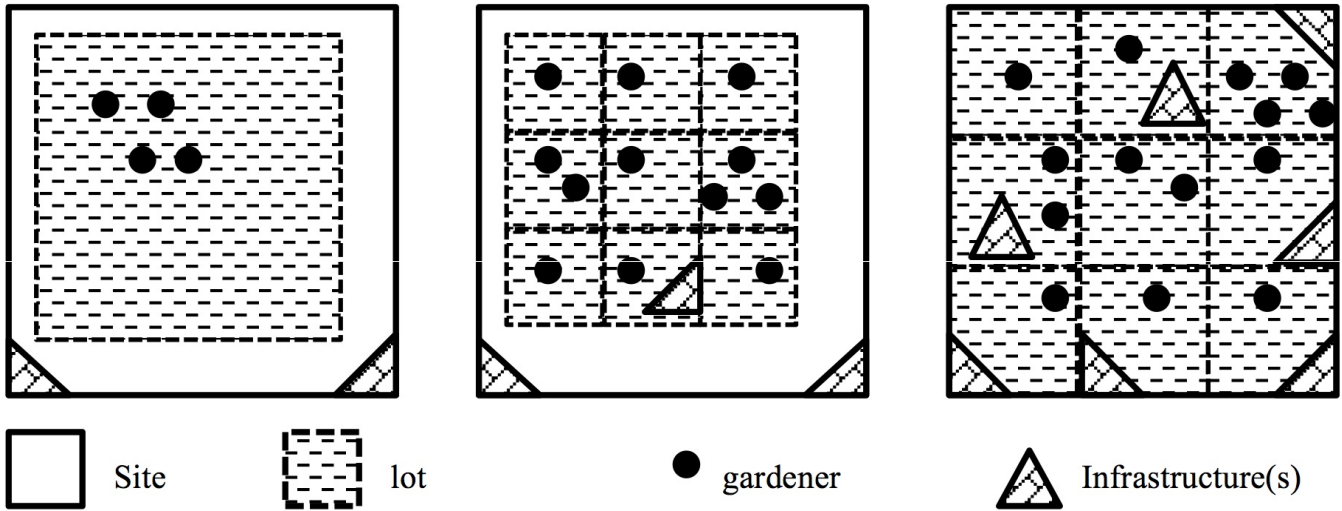


## 2. The “Urban Soil” project within Snowman initiative

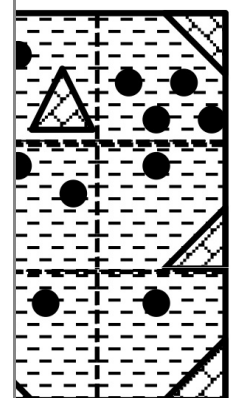
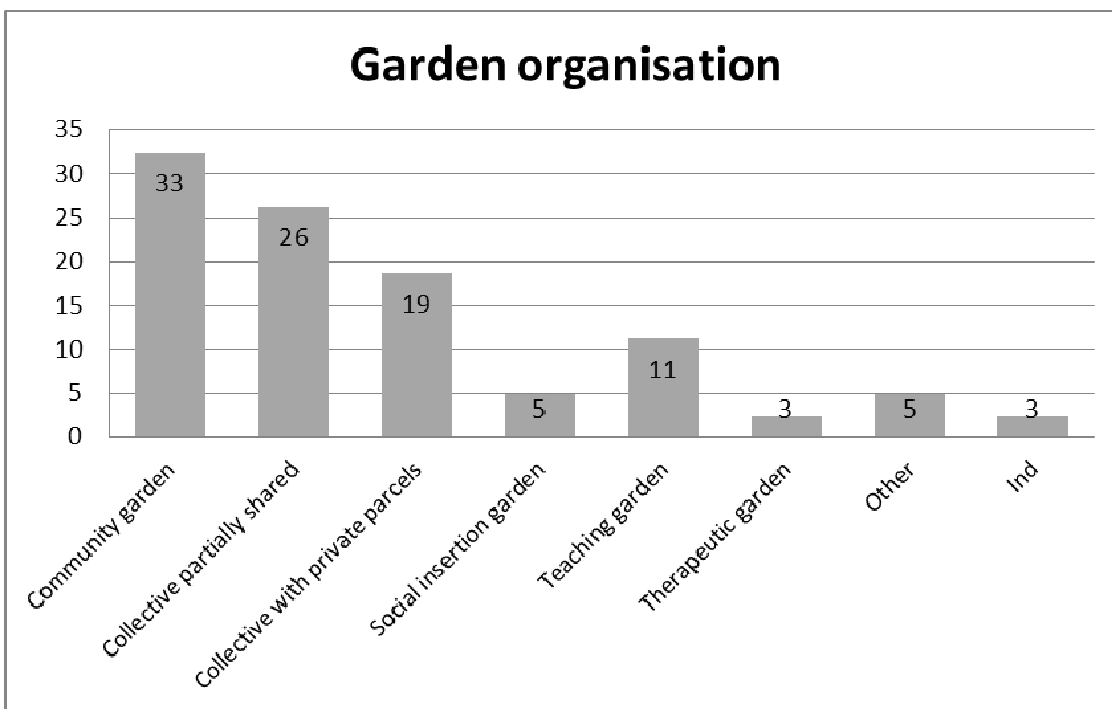
Need for decision tools for stakeholders = The Toronto model



The collective project in Southern Belgium



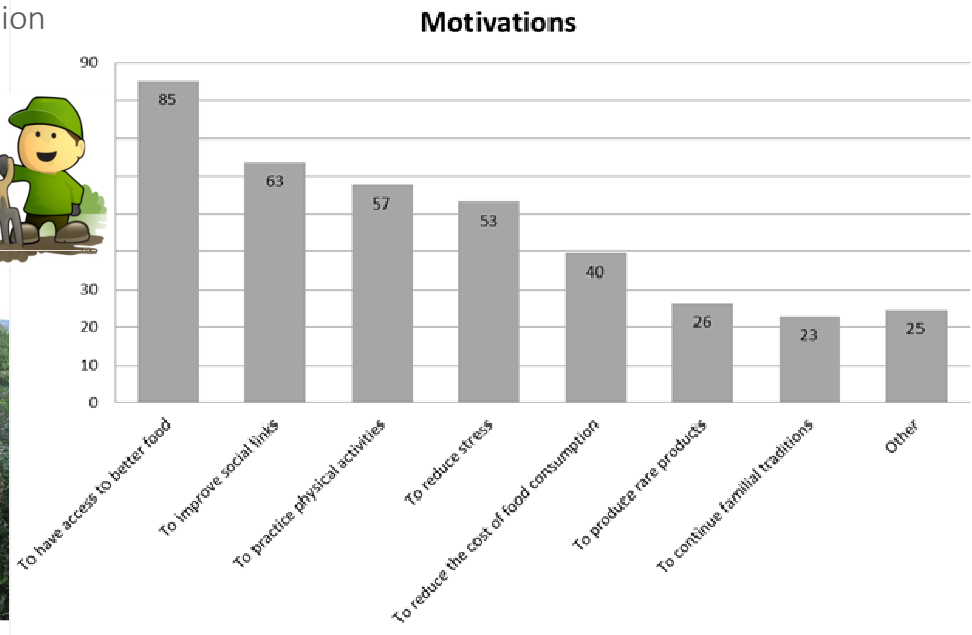
Garden organisation



Infrastructure(s)

## The motivations of gardeners

- Healthy vegetable production
- Social link
- Activity
- ...
- (Nature)

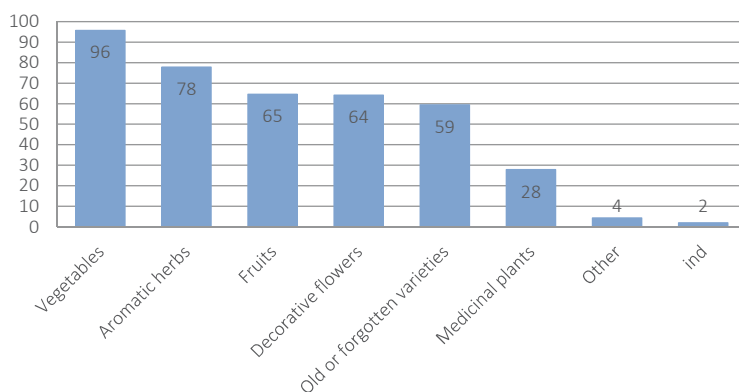


## The agronomic practices of gardeners

- Organic fertilisation
- Out of control and over- fertilisation
- Chemical pesticide avoided
- Recycle rain water
- Self consumption of production or share but **no commercial activity**



## Crop production in collective gardens



## The agronomic practices of gardeners

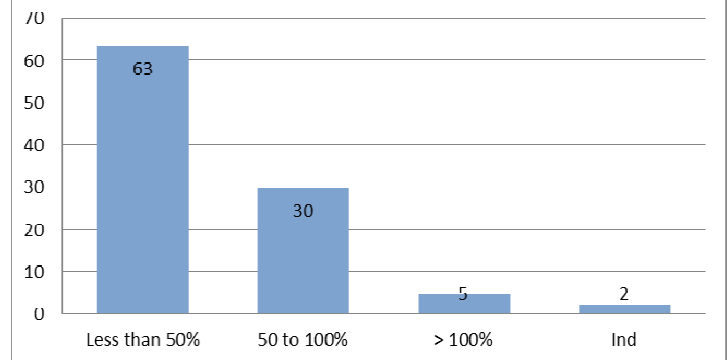


Schwartz (2013)



- Good health (Mass index)
- Social contacts
- Stress ↘
- Nature benefits
- ...

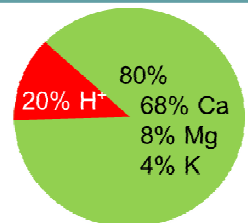
### Autosatisfaction of production



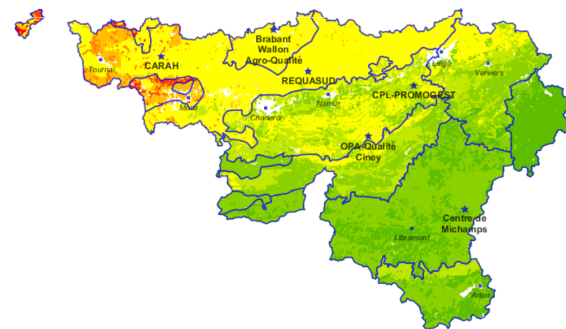
## Interpretation reference system

pH	Qualification	Interpretation
< 4.5	Highly acidic	To be improved
4,5 ≤ < 5.3	Acidic	To be improved
5,3 ≤ < 6,2	Slightly acidic	To monitor
6,2 ≤ < 6,8	Neutral	Good
6,8 ≤ < 7,2	Slightly basic	High
≥ 7,2	basic	High

P (mg/100g)	pH <sub>KCl</sub>	
	< 5,5	≥ 5,5
High	> 6,0	> 7,5
Good	3,0 - 6,0	4,6 - 7,5
Low	< 3,0	< 4,6



Métaux/ métalloïdes :	Catégorie 3 <sup>1</sup>		
	VR	VS	VI
Arsenic	12	49	300
Cadmium	0,2	3	30
Chrome, total	34	125	520
Cuivre	14	110	290
Mercure	0,05	1	6
Nickel	24	150	300
Plomb	25	200	700
Zinc	67	230	710



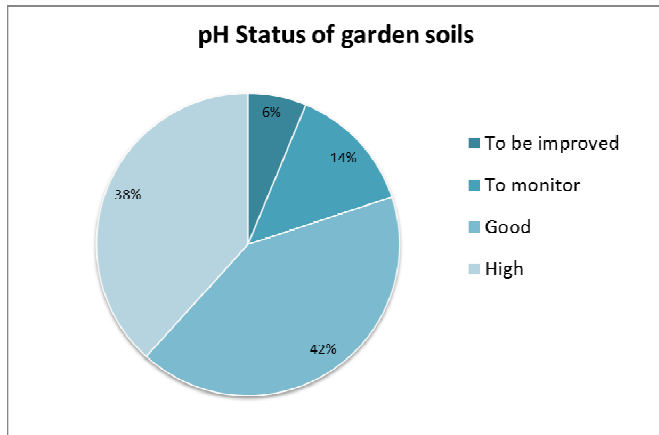
Natural level

Study needed

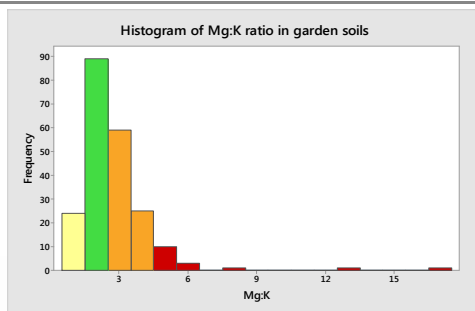
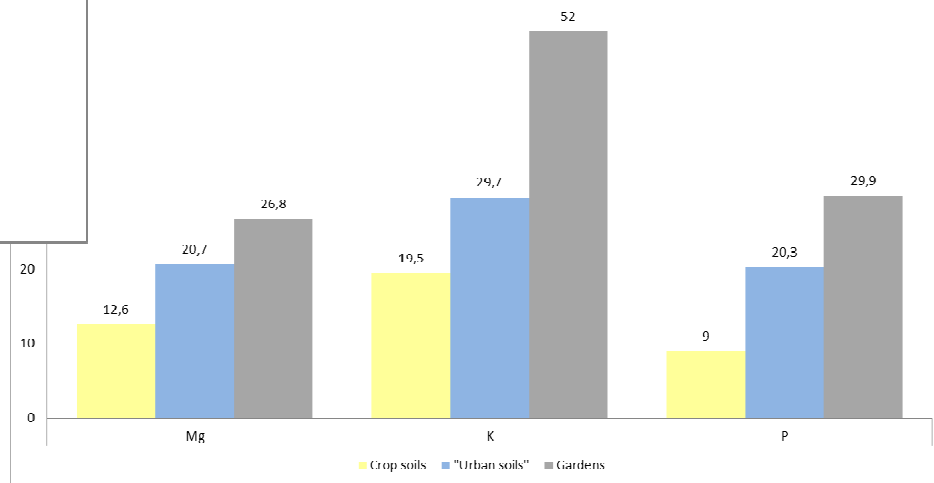
Remediation needed



## Soils are rich but imbalanced

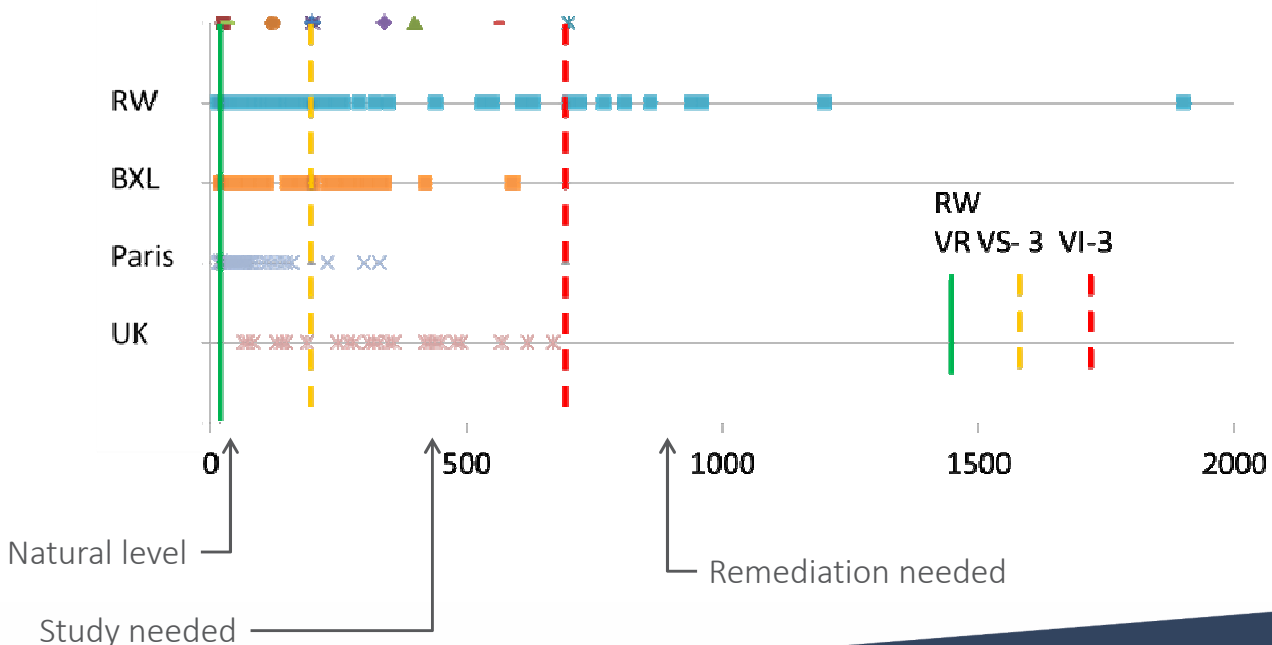


Nutrient content (Mg, K, P in mg/100g) in garden soils compared to crop soils



## Some soils are contaminated

Pb content of Topsoil (mg.kg<sup>-1</sup>) in the 4 study cases of collective gardens according to RW limits for gardening











The “Bressoux” Case study in Wallonia

Multicultural and diverse social profiles / owned by the Public administration, ruled by social organism



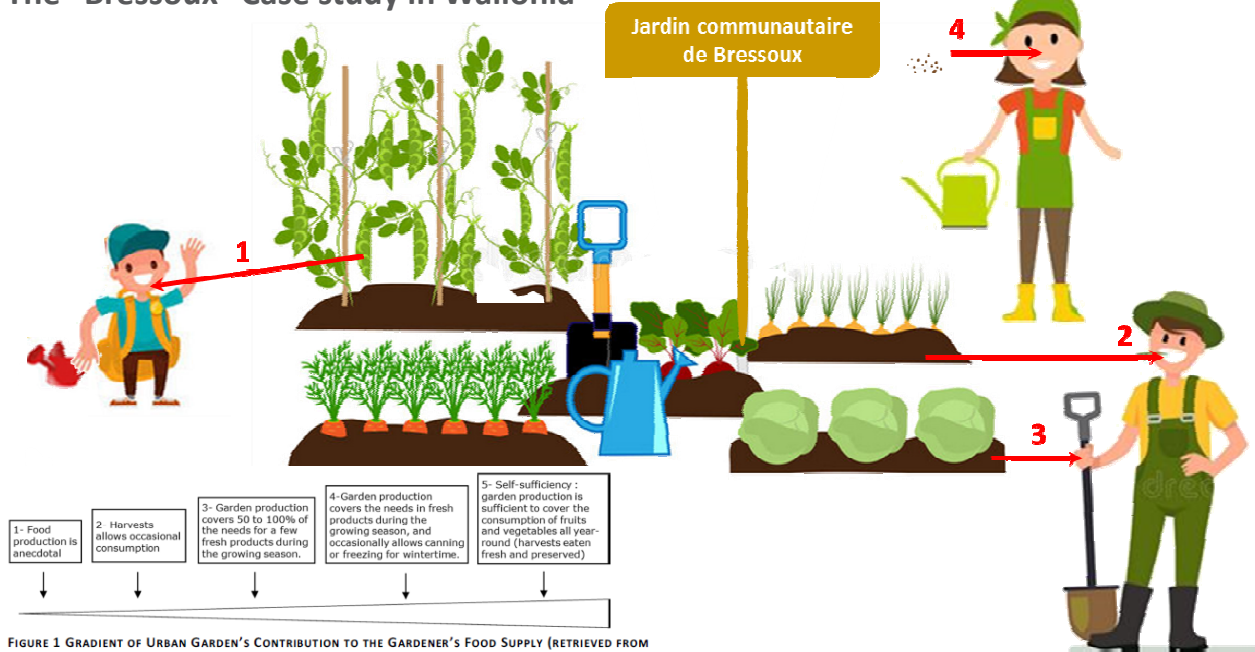
59 plots / 160 soil and vegetable samples

The “Bressoux” Case study in Wallonia

<p><math>n &gt; 10</math></p>   <p><math>5 \leq n \leq 10</math></p>  <p><math>n &lt; 5</math></p> 	<p><math>n &gt; 10</math></p>   <p><math>5 \leq n \leq 10</math></p>  <p><math>n &lt; 5</math></p> 
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According to EC regulations on Cd and Pb in vegetables

The “Bressoux” Case study in Wallonia



Making a risk analysis based on realistic scenarios

The “Bressoux” Case study in Wallonia



Defining targets

## The "Bressoux" Case study in Wallonia

		Voies d'exposition			
Cibles					

Defining exposure path



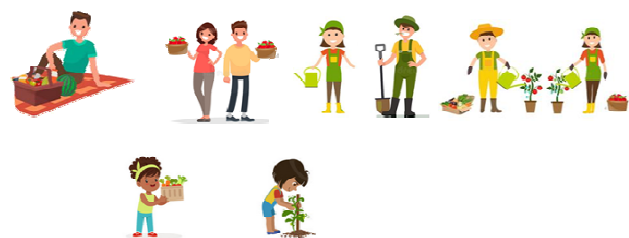
## The "Bressoux" Case study in Wallonia Cd - Cr - Cu - Hg - Ni - Zn - Mo - Mn

- : inhalation of dust
- : contact with skin



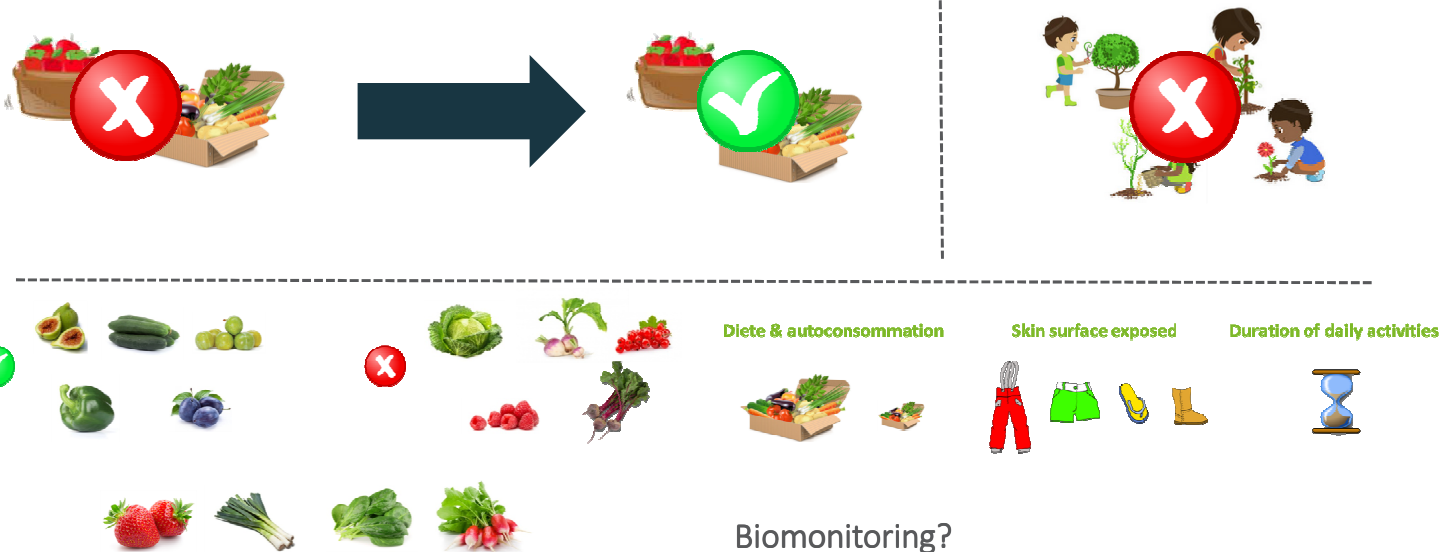
## As - Pb

- : ingestion of soil and dust
- : ingestion of vegetables and fruits



Making a risk analysis based on realistic scenarios

## The “Bressoux” Case study in Wallonia



Making recommendations and more studies are needed

# Conclusions

- This study aimed at studying services and dis-services provided by collective gardens in urban areas
- Results show that soils are often chemically unsuitable for safe production of food. However, the gardening provides services and benefits for human health that are difficult to estimate quantitatively.
- Aspecially, the health issue must be considered in the long term and are complex by nature (multifactorial).
- Based on our results, decision tools should be developed not only on criteria defined upon soil measurement and transfer predictions but should integer risk analysis based on sound scenarios and moreover the gardeners should be informed about the limits of our knowledge.



Thank you!



Gilles Colinet

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22-25 November 2017, Sousse, Tunisia