ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

Urban agriculture and the water cycle: opportunities and challenges

Prof.Gabriele Baroni

Departments of agricultural and food sciences (DISTAL)

About me

Associate professor

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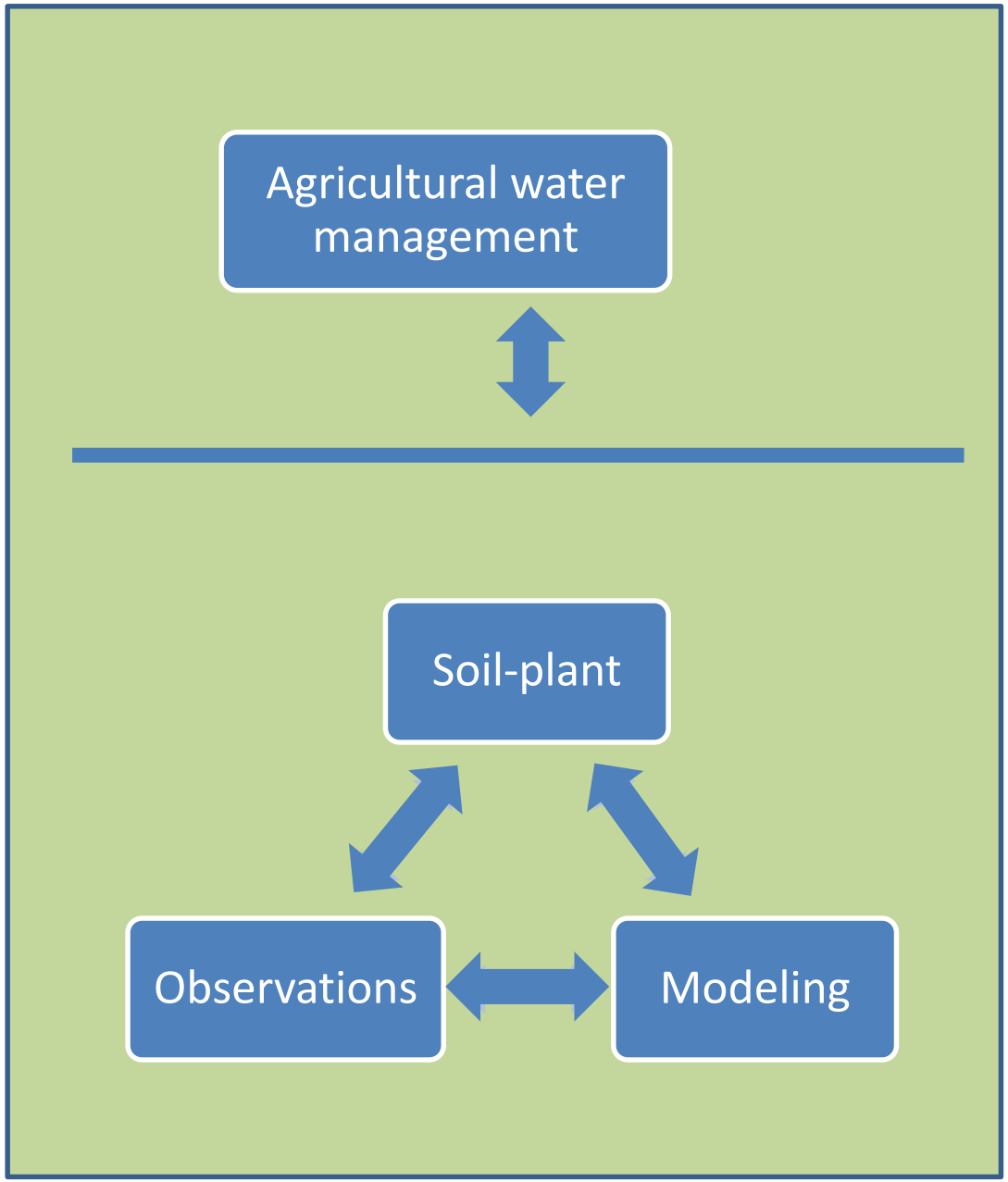
Division Agricultural Engineering – water

Research topic

soil hydrology



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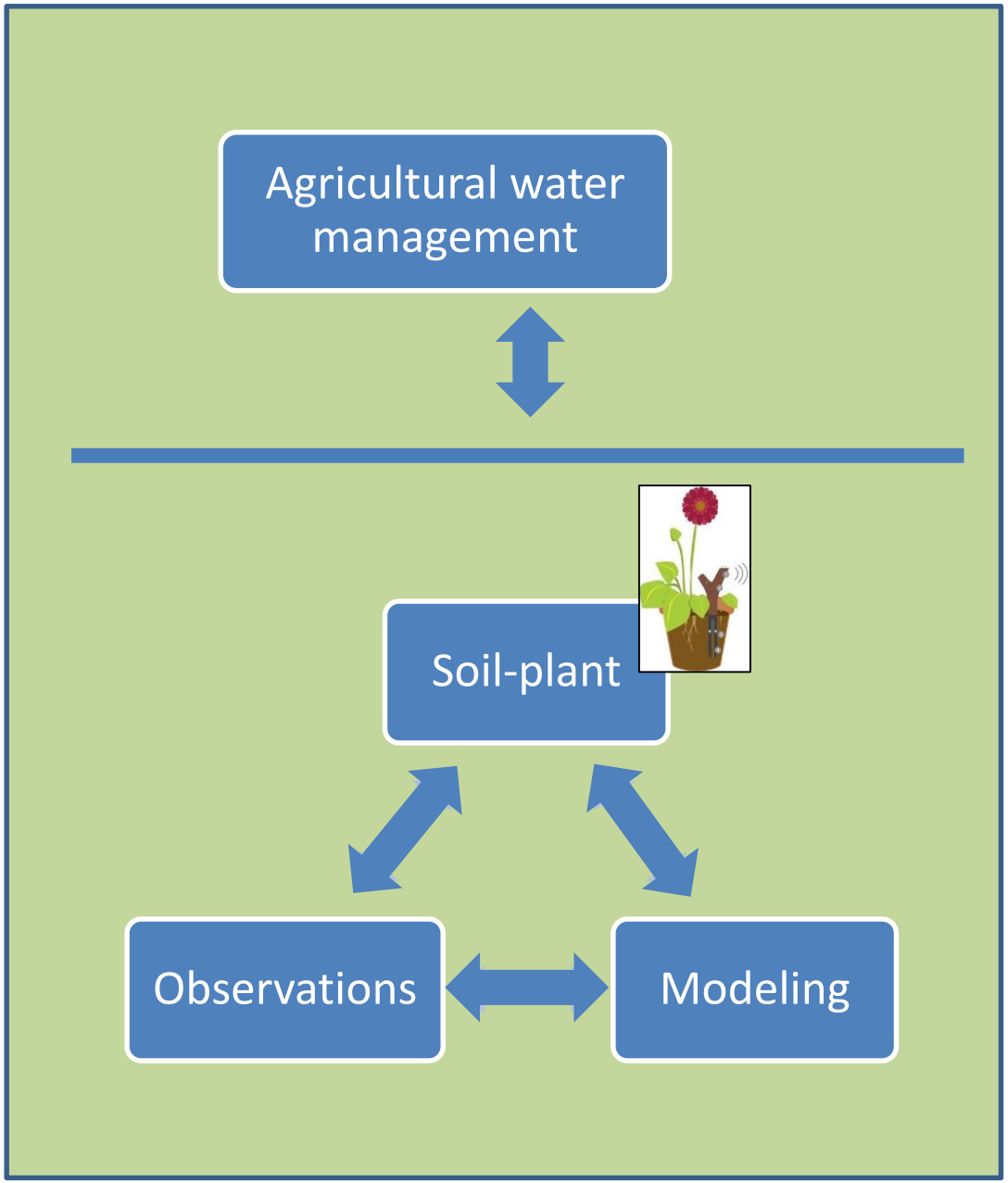

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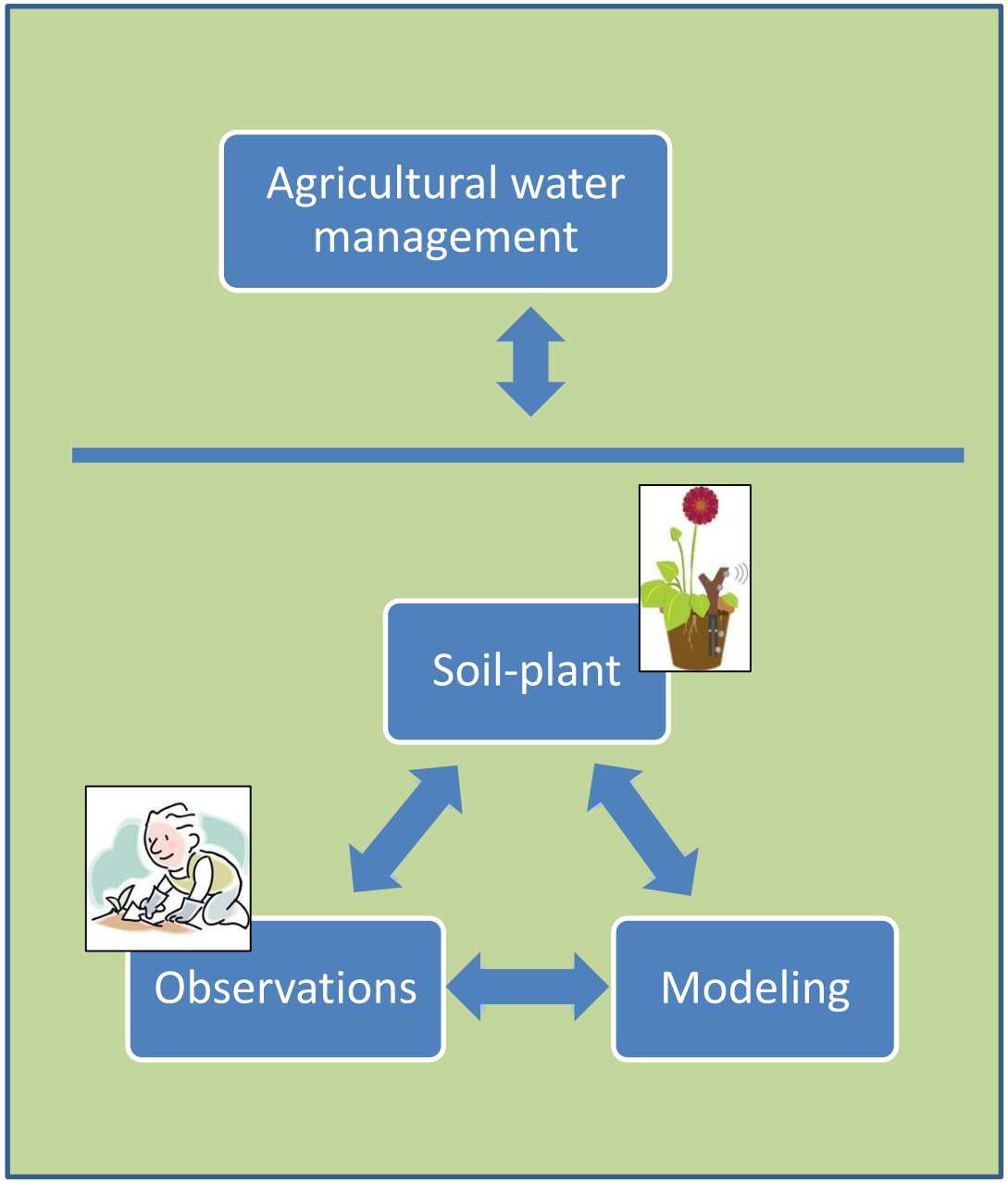

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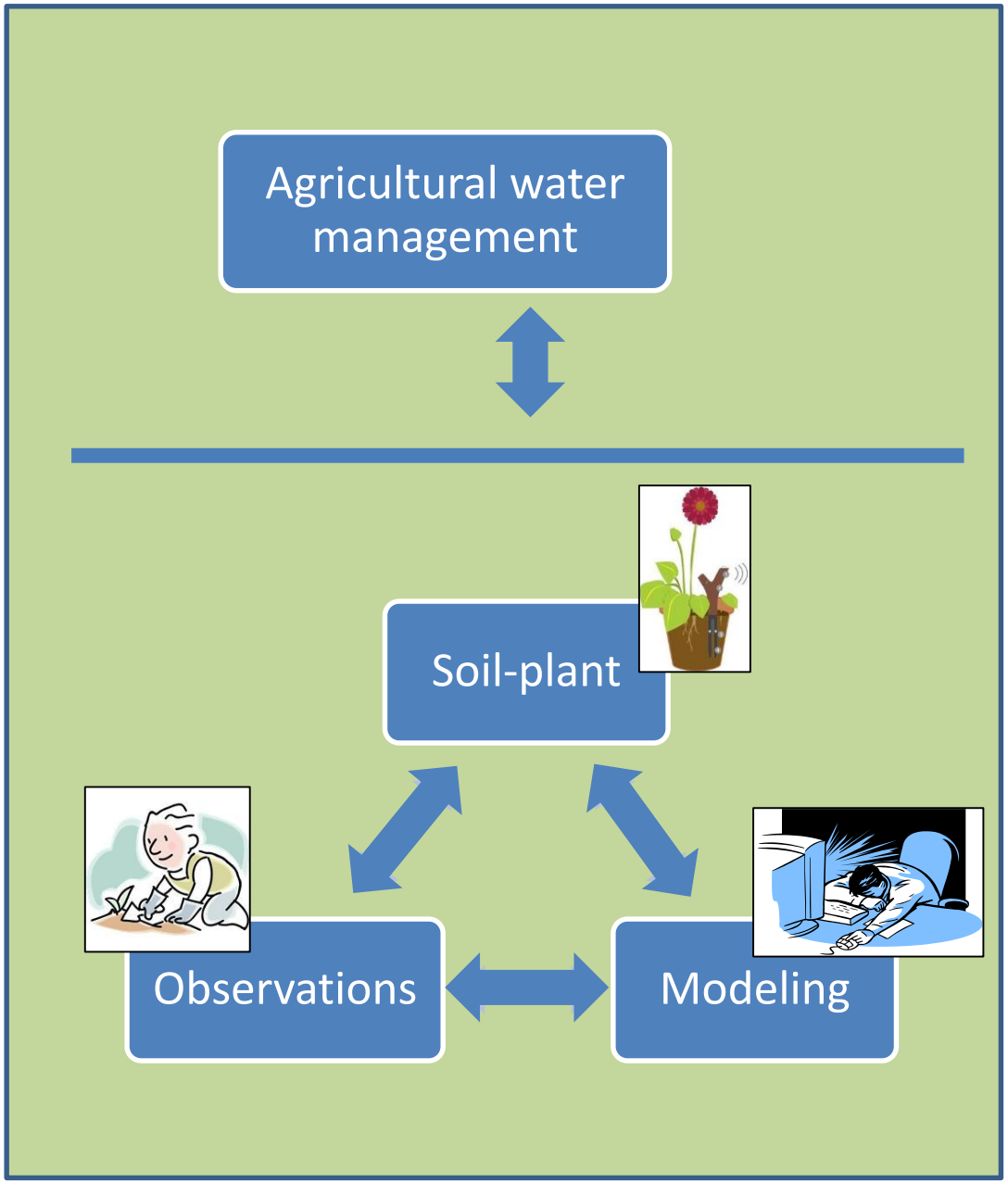

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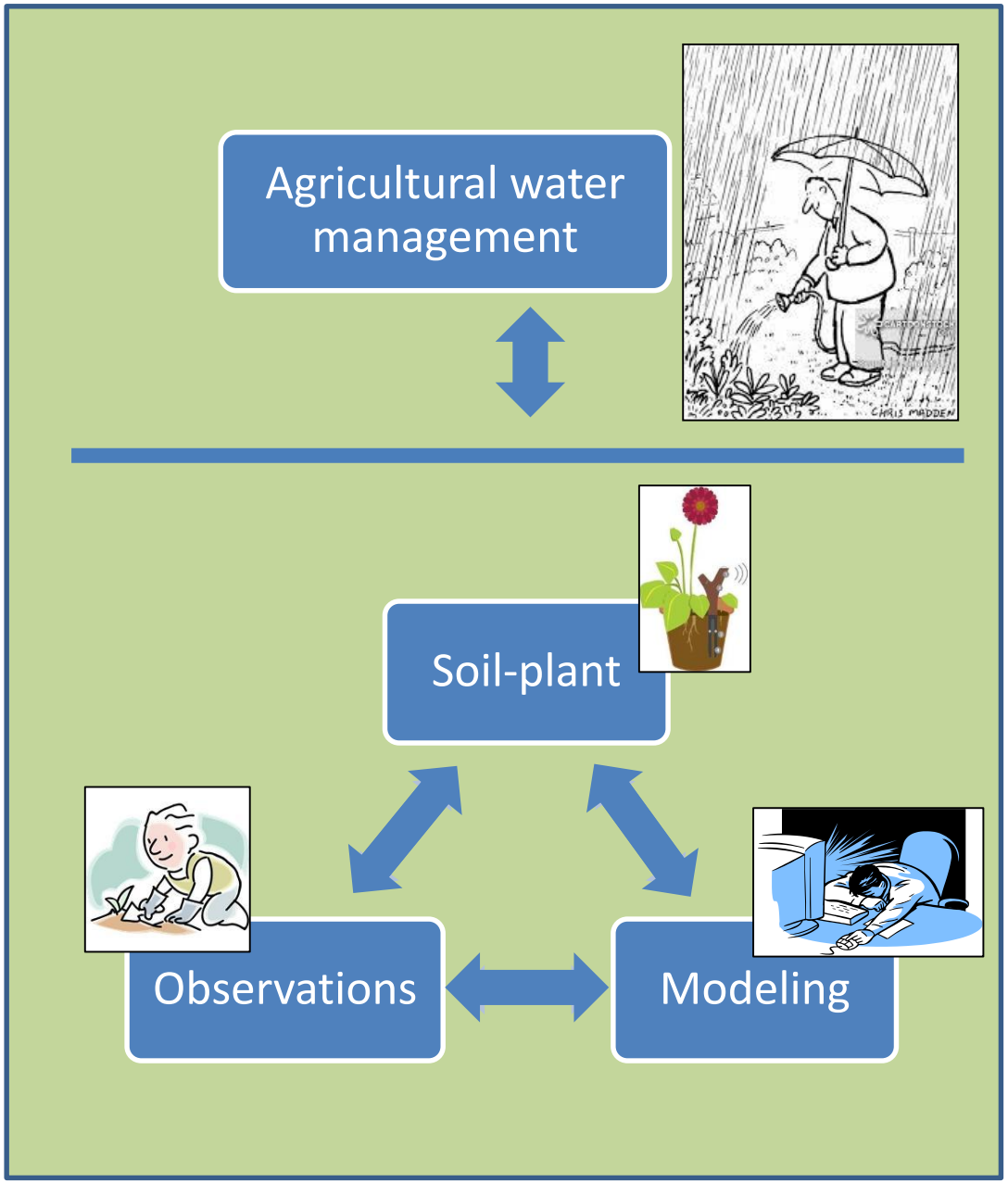
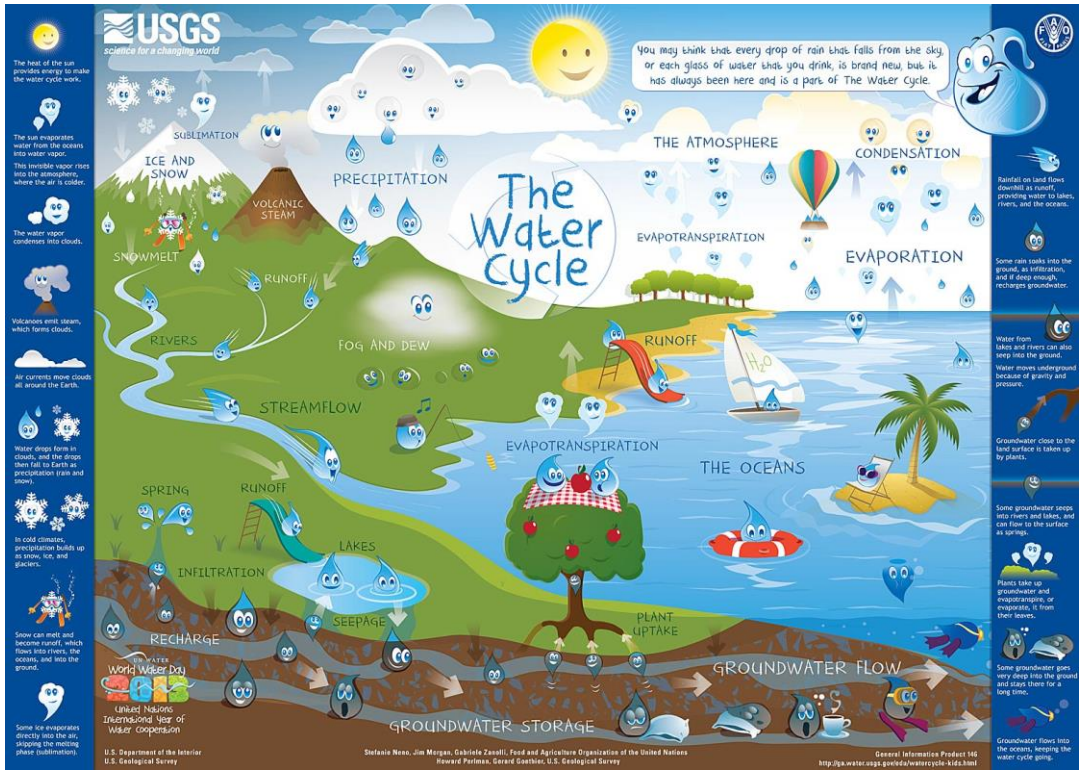


Outline

Urban agriculture and the water cycle: opportunities and challenges

1. Water cycle and land surface interactions
2. What is (for me) urban agriculture
3. What are the opportunities and challenges?

What is hydrology and the water cycle?



http://www.sciencekids.co.nz/sciencefacts/weather/thewatercyclediagram.html

Perception of the processes quite simple

Some key points

- Water mass is constant
- Water cycle strongly related to energy (temperature)
- Prediction still difficult

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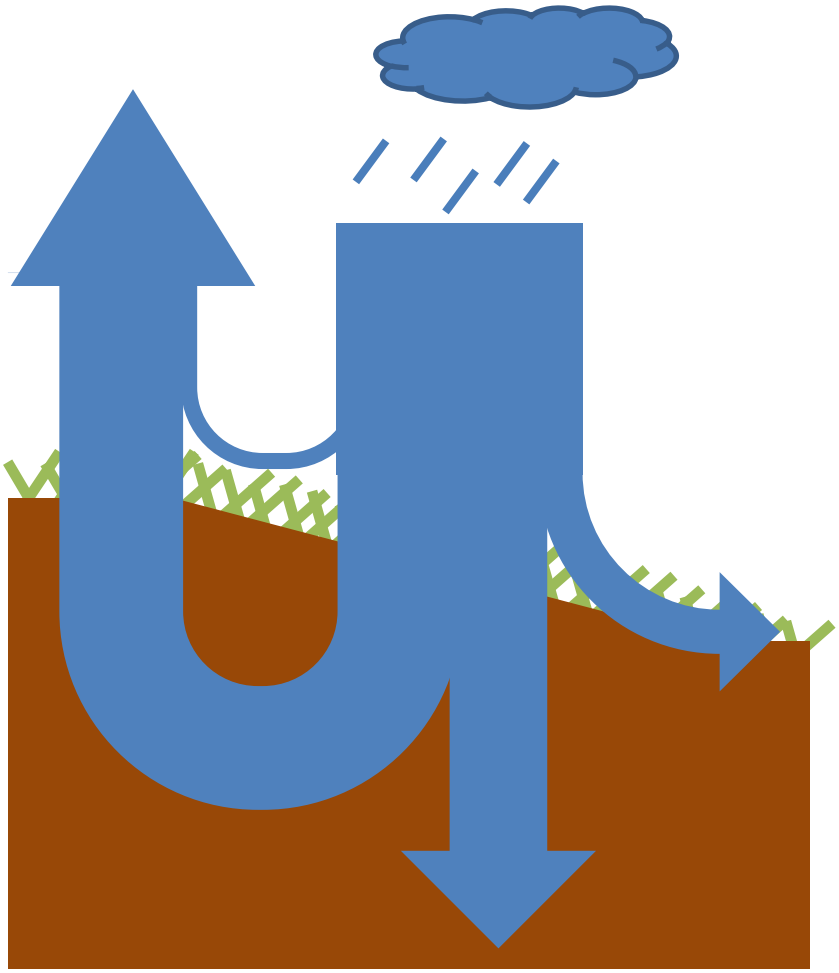
What happens at the land surface?



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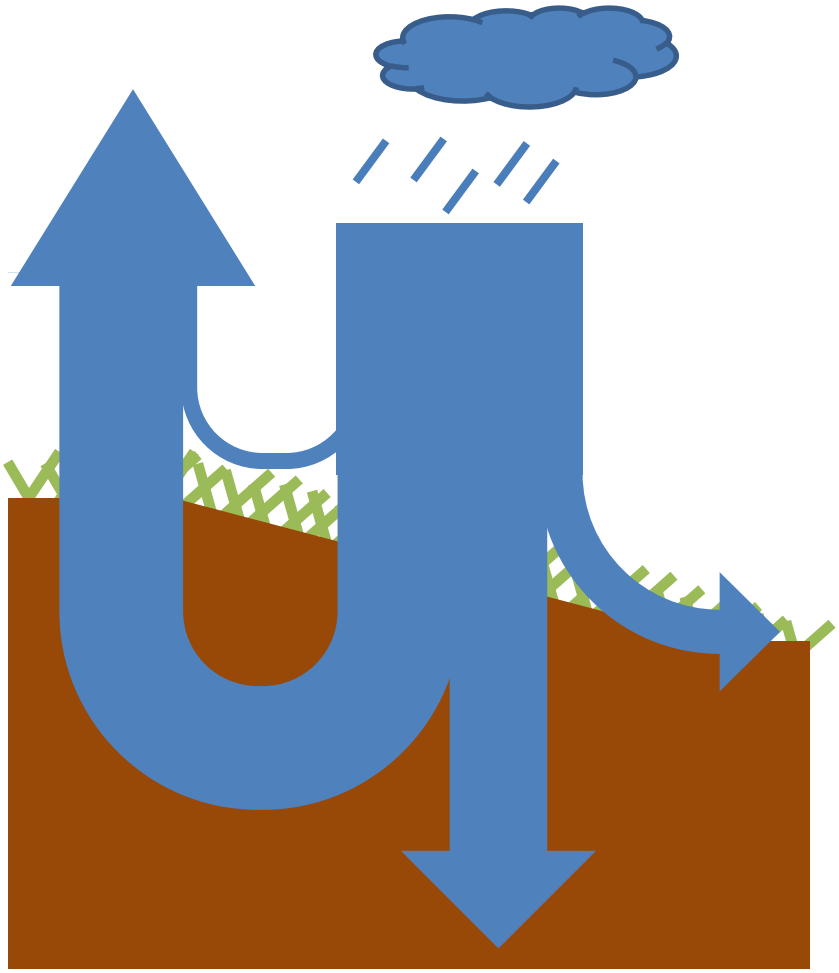

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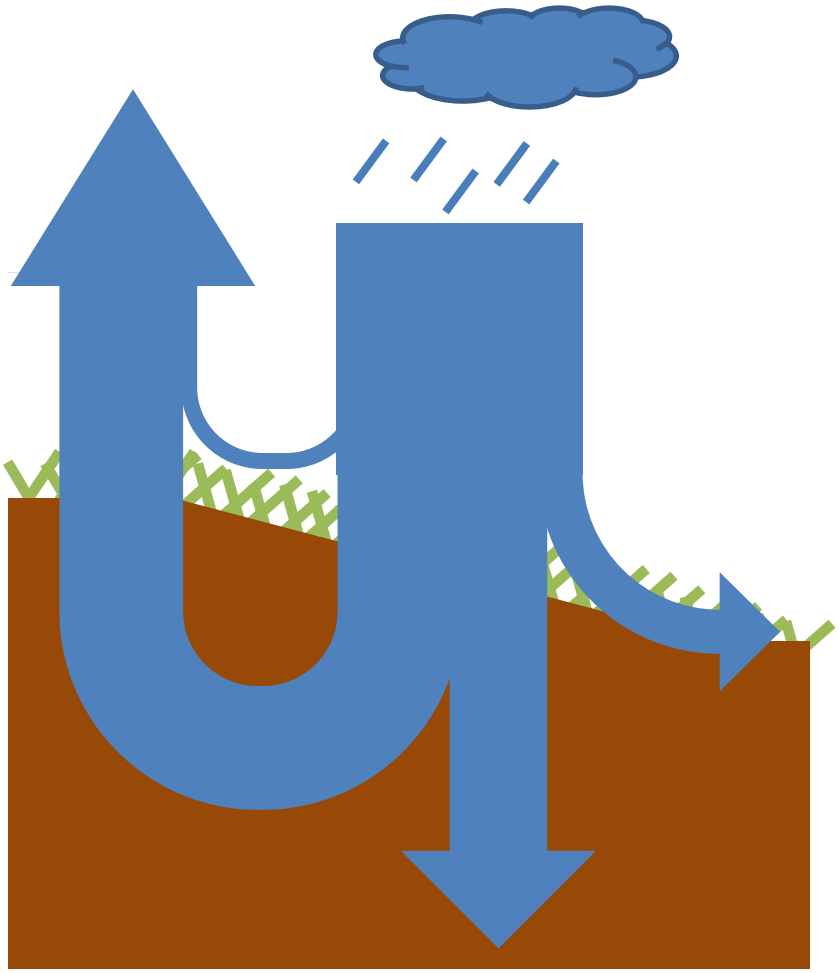

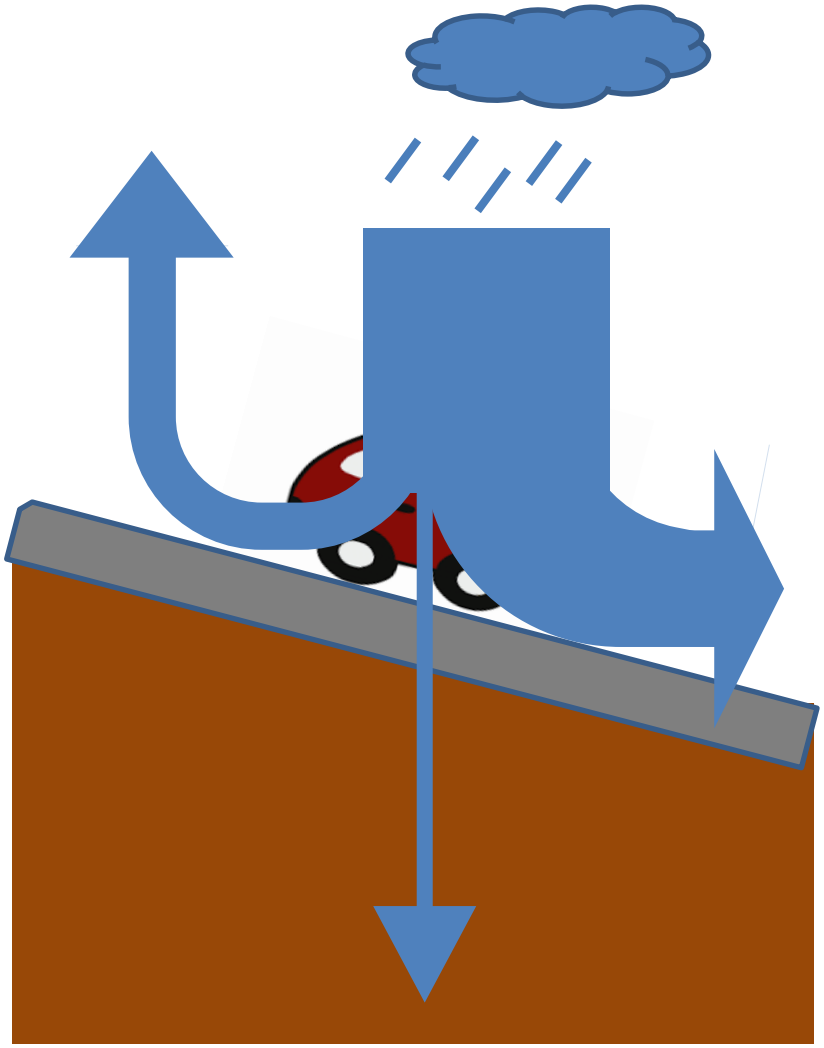

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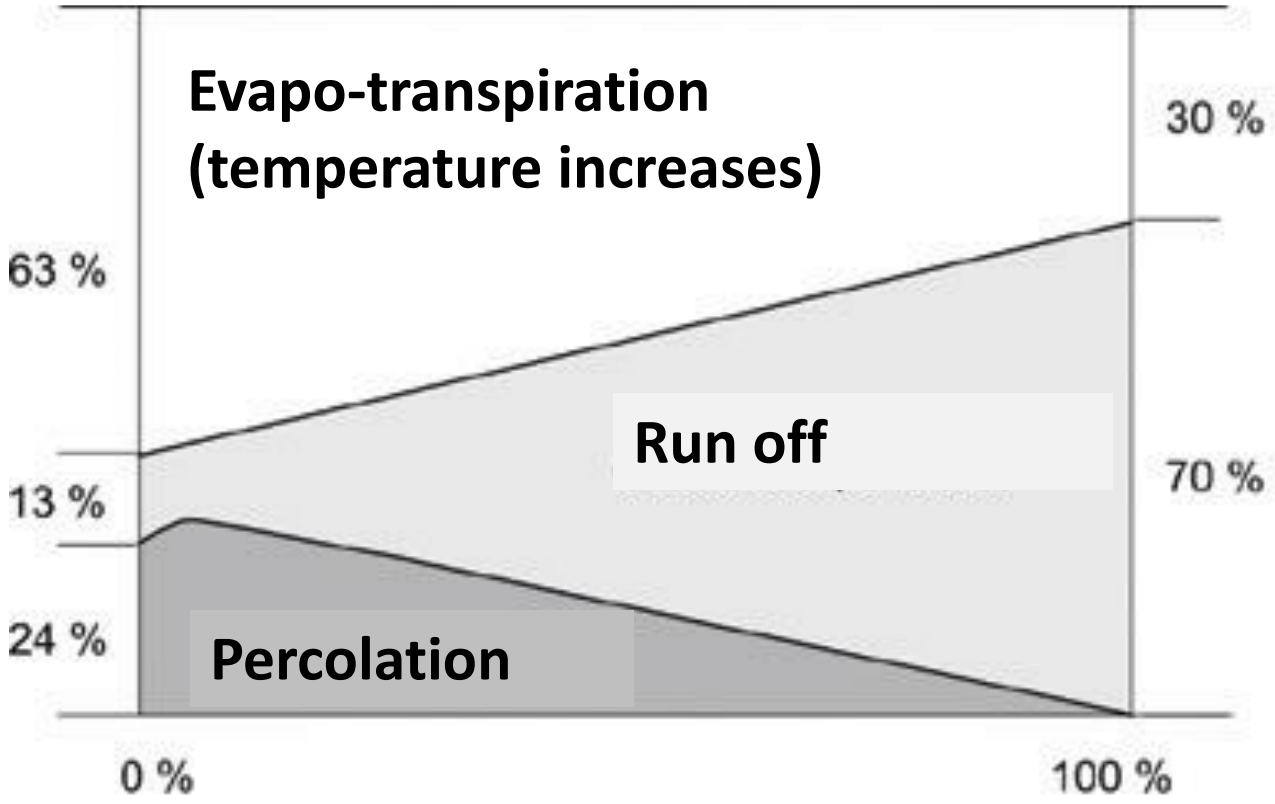
What happens at the land surface?

Modified from Di Fidio and Bischetti, 2012



Natural soil

Impermeable soil

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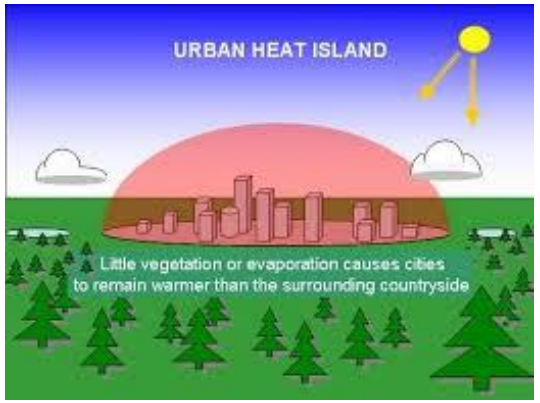
Urbanization…main effects

- Increasing run off and problems related to flood and drainage systems

- Decreasing evapo-transpiration and problems related to increasing temperature and Urban heat island



What is (for me) Urban agriculture

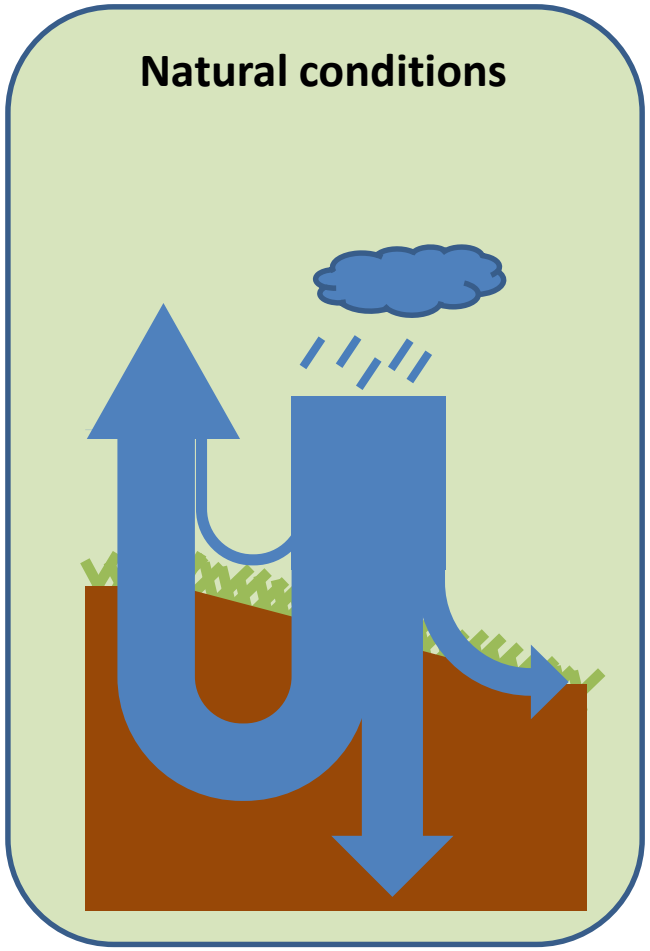
Urban agriculture, **urban farming**, or **urban gardening** is the practice of cultivating, processing and distributing food in or around **urban** areas (Wikipedia)

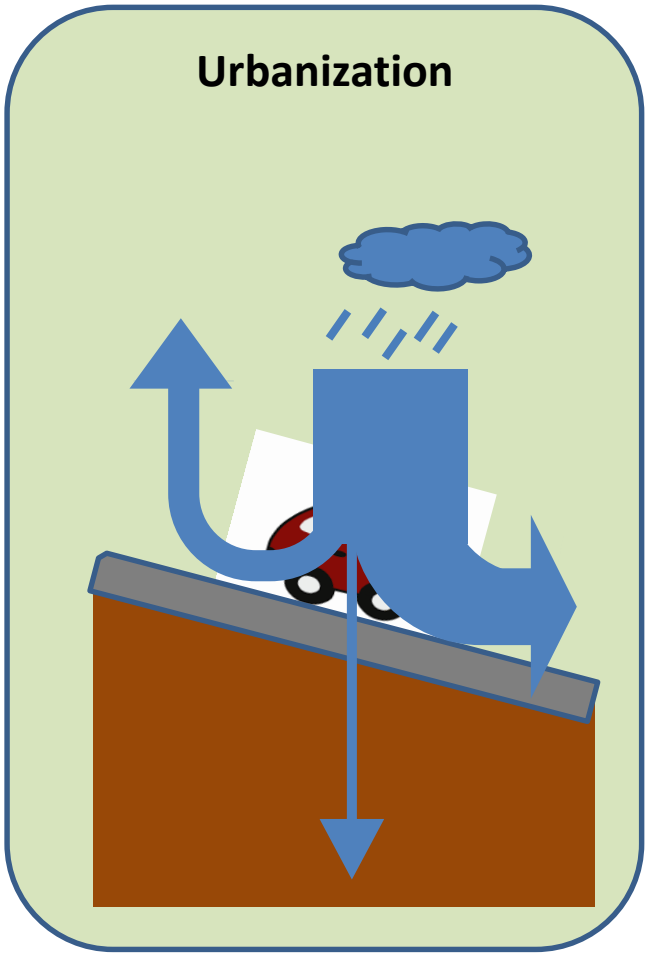
- Urban horticulture
- Urban Green infrastructure

Semi-natural areas designed and managed to deliver a wide range of ecosystem services

https://www.pinterest.com/pin/373024781606135763/

What is (for me) Urban agriculture





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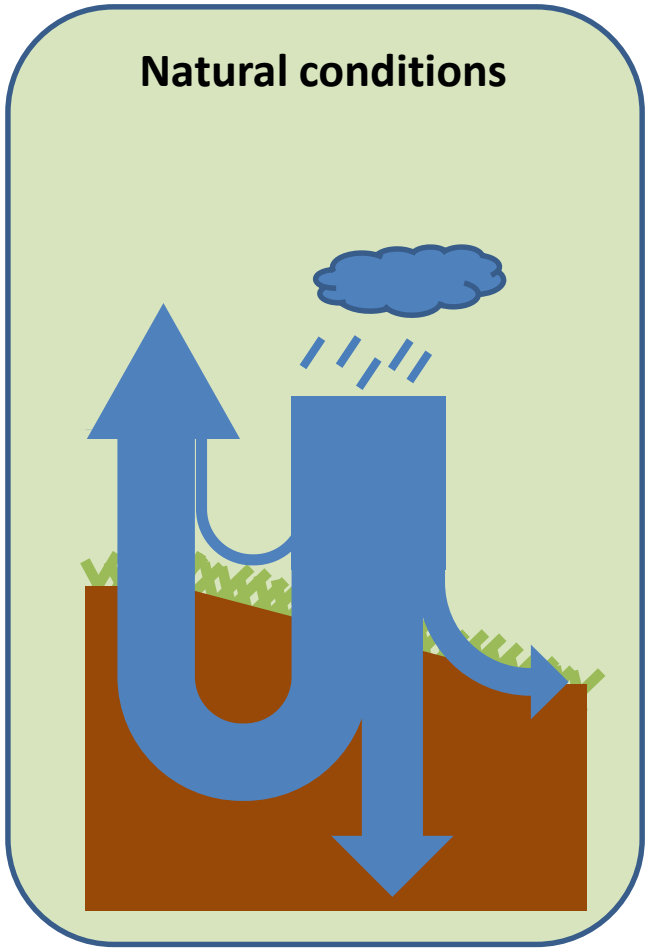
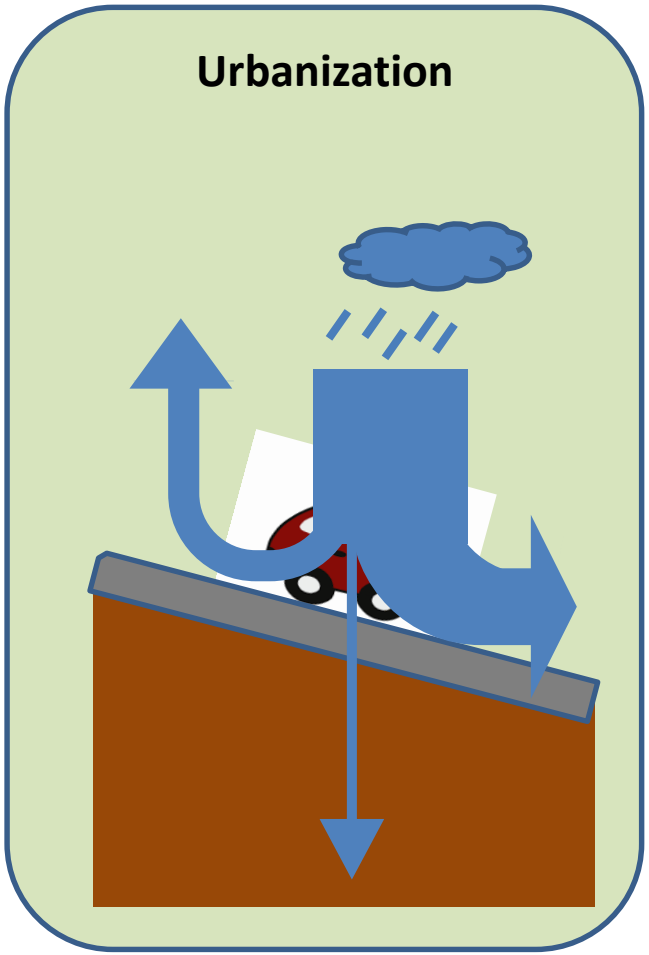


Urban agriculture as the opportunity to manage hydrological processes



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The role of urban agriculture and green infrastructure

It is already acknowledged that urban agriculture and urban green infrastructure could be promising strategies for, e.g.,

- Mitigate run off
- Micro-climate regulation
- reduce pollution
- increase biodiversity
- increase cooling
- carbon sequestration

http://theconversation.com/how-buildings-in-johannesburg-could-benefit-from-green-roofs-122877

So what are the problems?

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Quantify the multi-functional value of urban agriculture

- Existing efforts aimed at greening cities (tree planting, parks, green buildings, urban agriculture, etc) are often guided by **aesthetic, conceptual, and qualitative principles** rather than a quantitative understanding of the underlining biophysical processes, scales and feedbacks

- Solutions are adopted when we **can quantify their added value**

- If the perception of the potentiality is (almost) clear, questions remain in terms of **quantitative understanding** of the functionality, e.g.,

Quantify the multi-functional value of urban agriculture

MENU

nature

Article | Published: 04 September 2019

Magnitude of urban heat islands largely explained by climate and population

Gabriele Manoli, Simone Fatichi, Markus Schläpfer, Kailiang Yu, Thomas W. Crowther, Naika Meili, Paolo Burlando, Gabriel G. Katul & Elie Bou-Zeid

Mitigation strategies aimed at increasing green cover and albedo are more efficient in dry regions, whereas the challenge of cooling tropical cities will require innovative solutions.

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What is a road map…

- We learn by doing experiments…UrbanFarm
- We should try as much as possible **to monitor** the different functionality of the strategies adopted (e.g., water retention of green roof).
- This would allow:
  - to **better understand the processes** and the effect of our solutions
  - To be able to **compare the different solutions** in the different contests
- Only this would provide a comprehensive vision on the value of what we believe is the right path

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