# Soil compaction can affect agricultural productivity

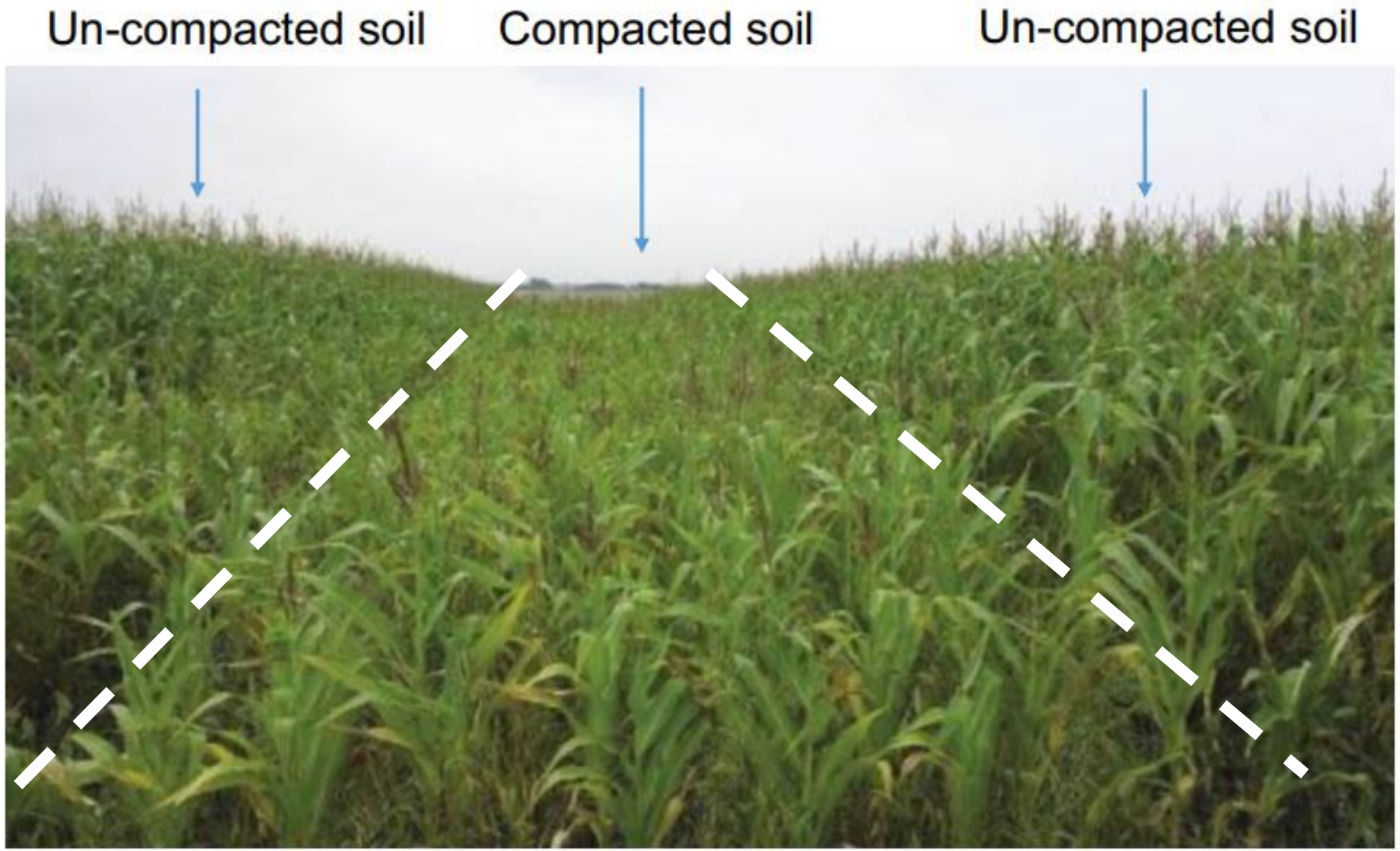



Photo by Fulton and Shearer of The Ohio State University.
Cited by Dyck et al. (2017). *Field Crop News*

# Soil compaction promotes soil erosion


Photo by Saurabhsawant. Wikimedia Commons

# Soil compaction promotes flooding

Sumatra, Indonesia


Photo by Zemp of University of Göttingen (2020)

# Soil compaction decreases groundwater recharge

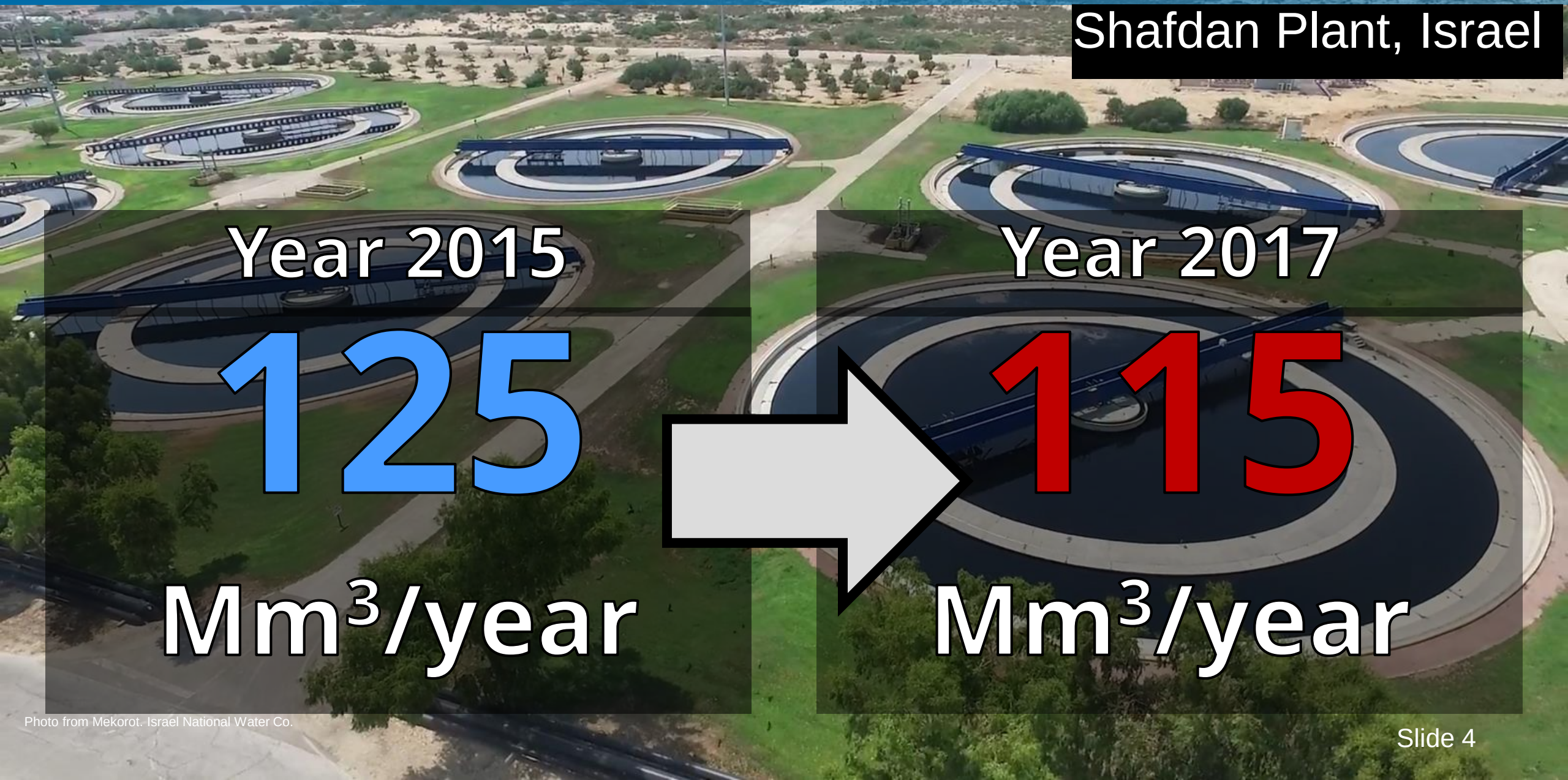
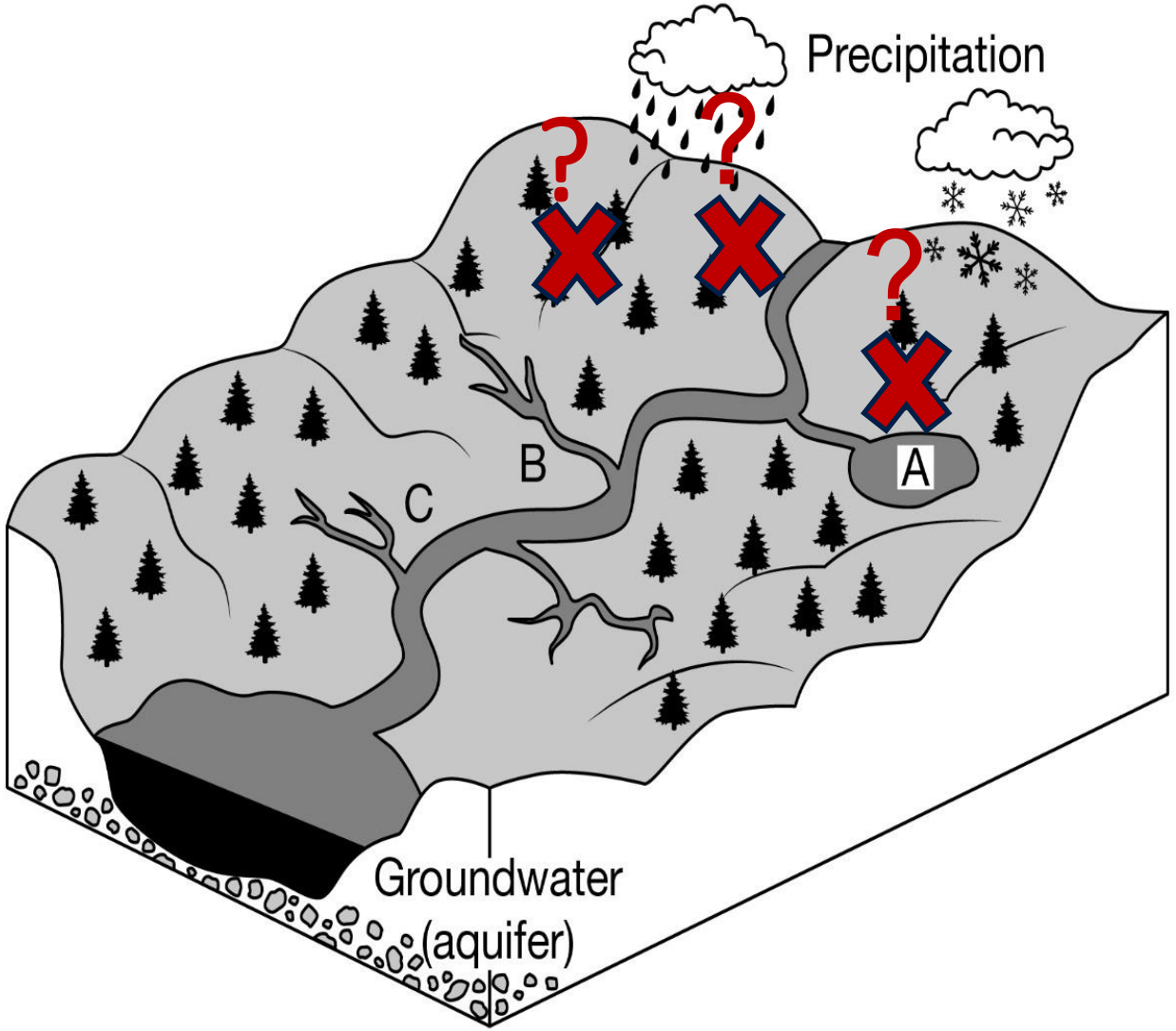



Photo from Mekorot. Israel National Water Co.

# Soil compaction is a global issue in hydrology!

# Decompact on “crucial areas”?



# Decompacting compact sandy soils:
## soil water flow dynamics on experimental field scale


Presenter

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TURQUOISE Blauwgroenemaatregelen voor klimaatadaptatie

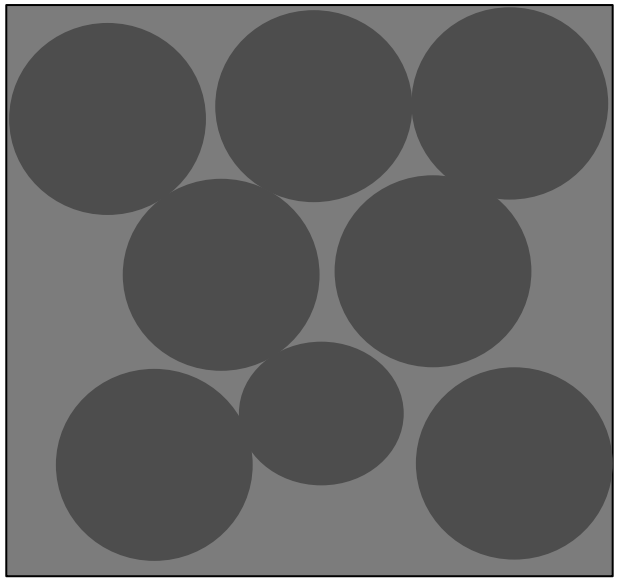
University of Antwerp | Faculty of Science

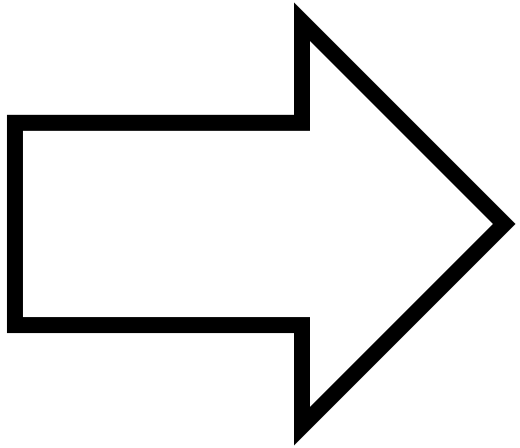
KU LEUVEN

# What is soil compaction?

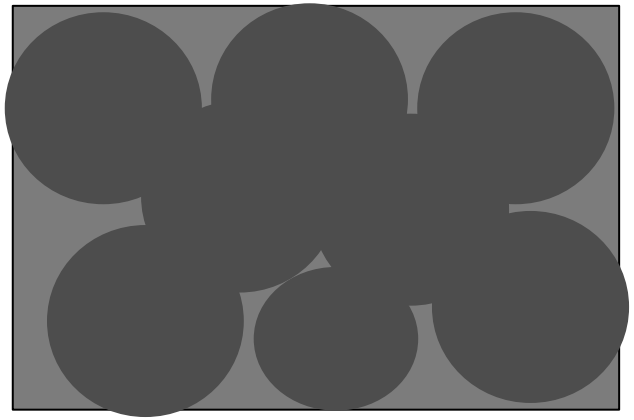
# Soil compaction = packing of soil, reducing pore volume

**Uncompacted**

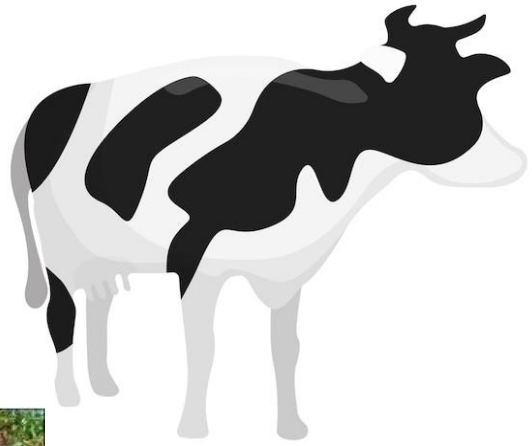


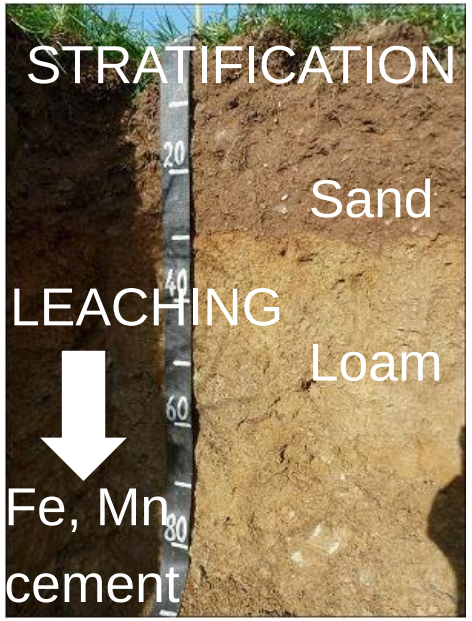


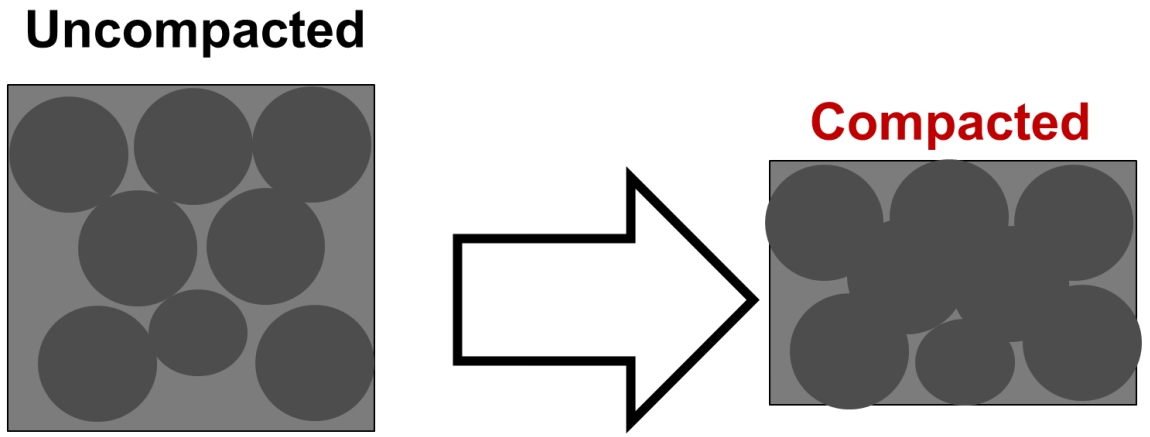
**Compacted**



# Causes can be anthropogenic or natural

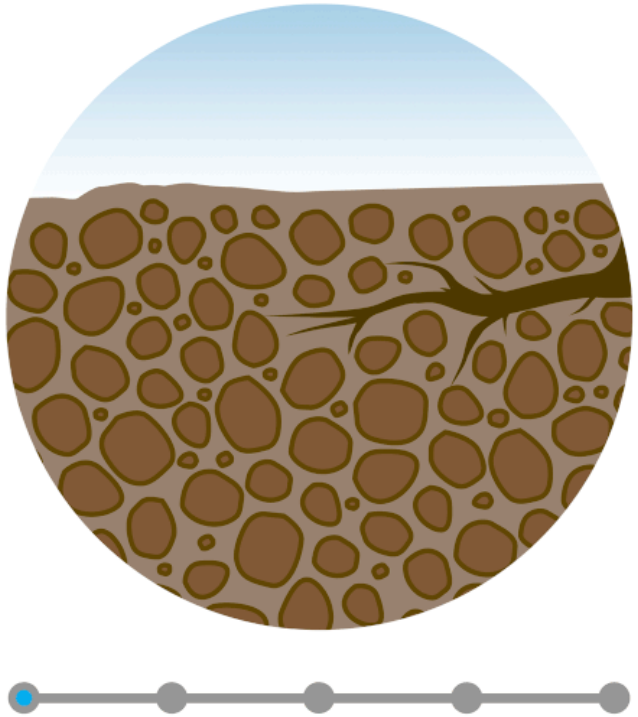




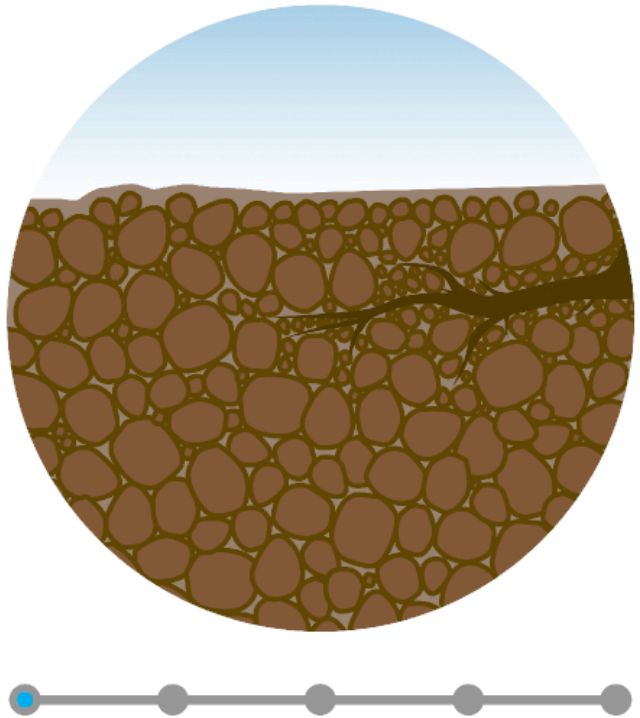



# Impacts to hydrology

## Uncompacted



## Compacted

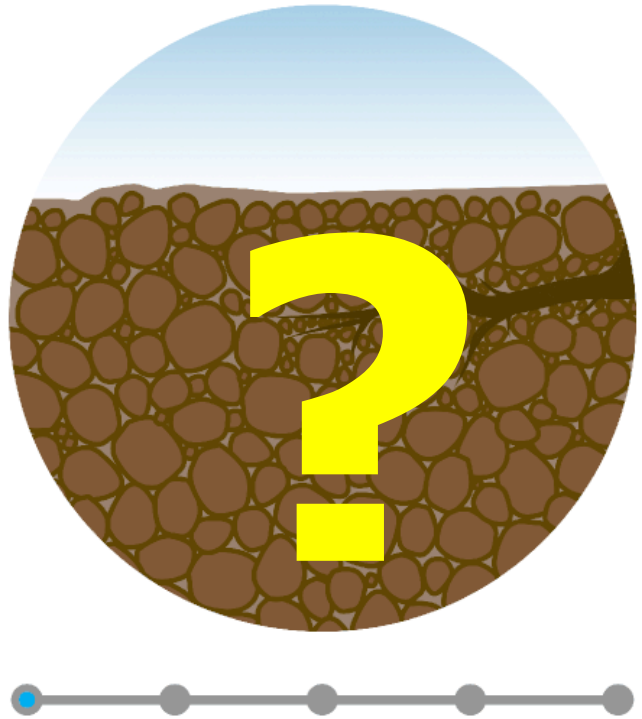


More runoff
Less groundwater recharge

# But how about the soil moisture content itself?

## Uncompacted


## Compacted



# Research Question and Objective

# Research Question:

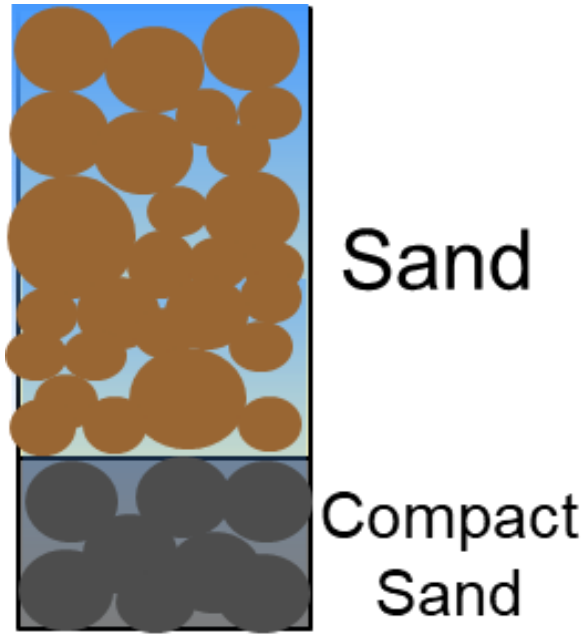
How does decompaction affect the soil water content dynamics?

Photo by Sedgemoor Tree Services. Ltd

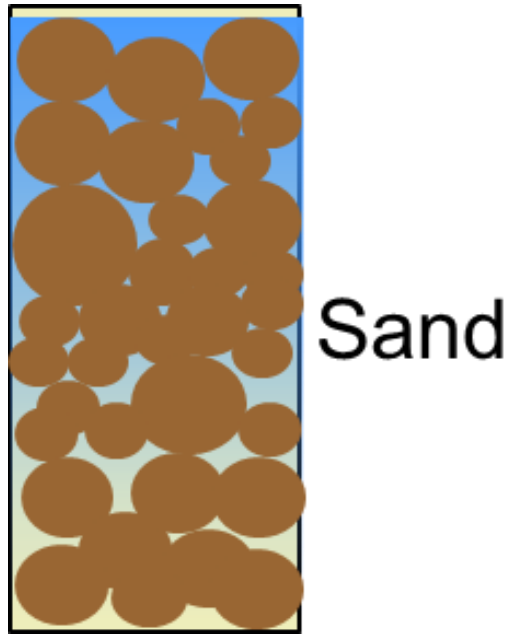
## Objective

-to determine differences of behavior of **soil moisture content**

### Compacted

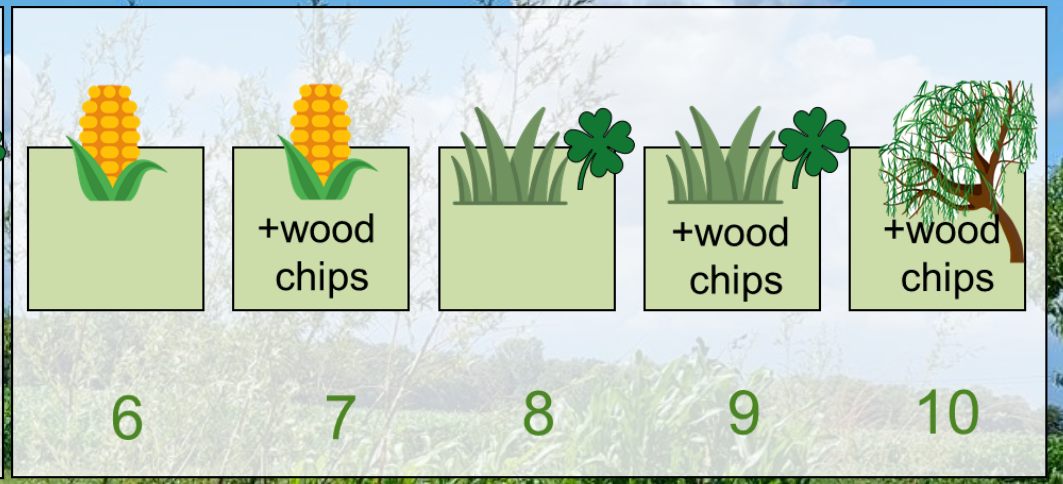


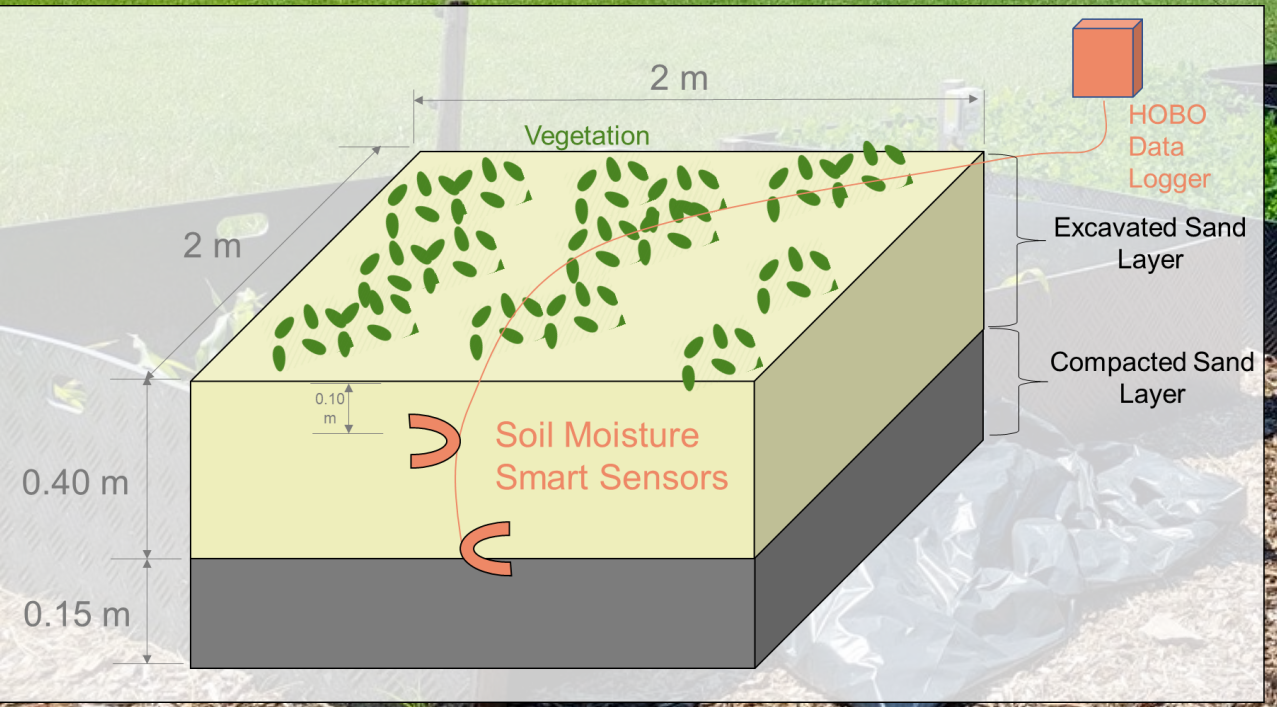

### Decompacted

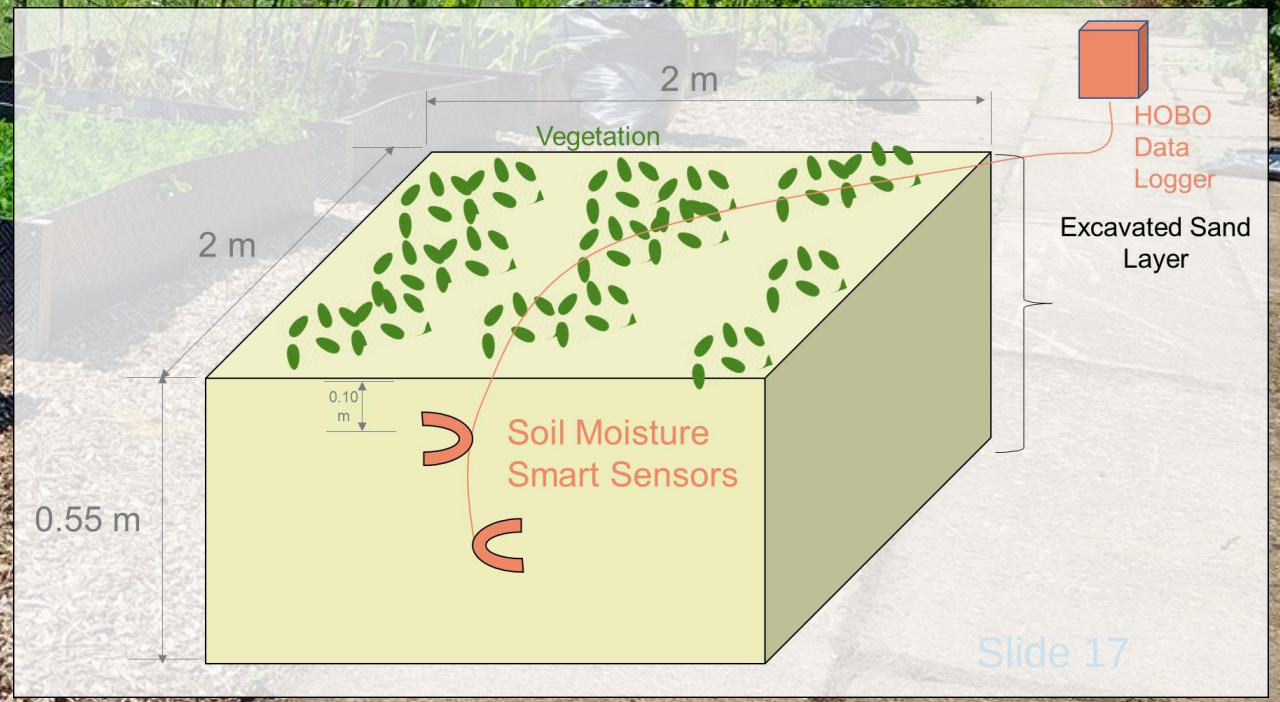


# Materials and Methods

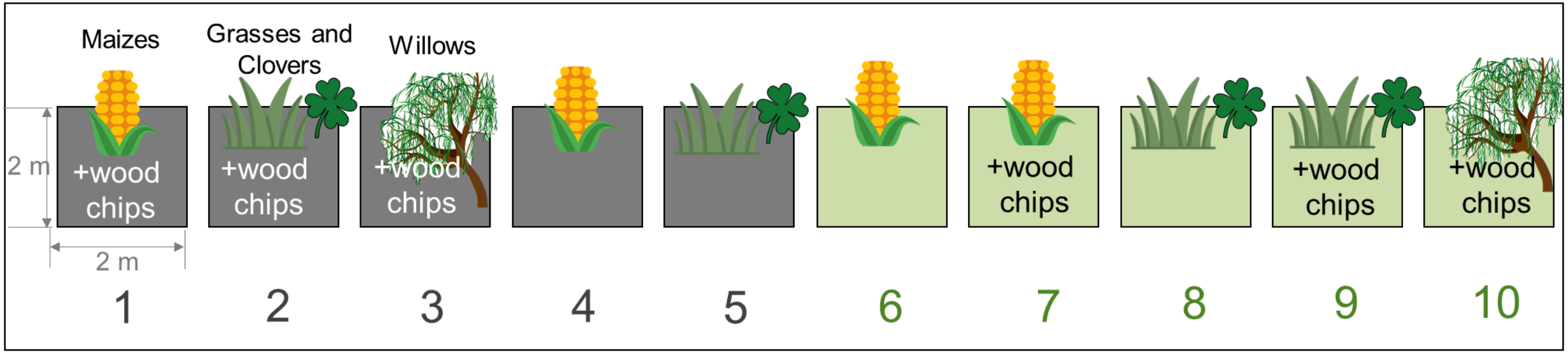
# 5 compacted and 5 decompacted plots monitored since summer

# We took average of readings




**Arithmetic mean for compacted setups**

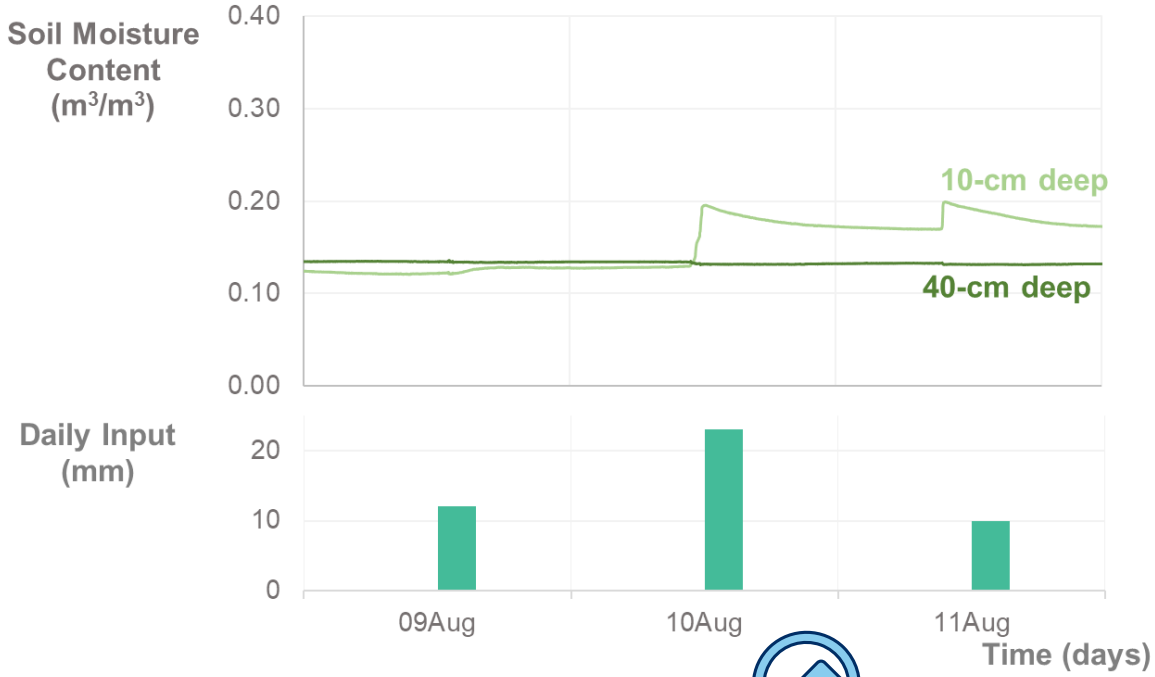
**Arithmetic mean for decompacted setups**

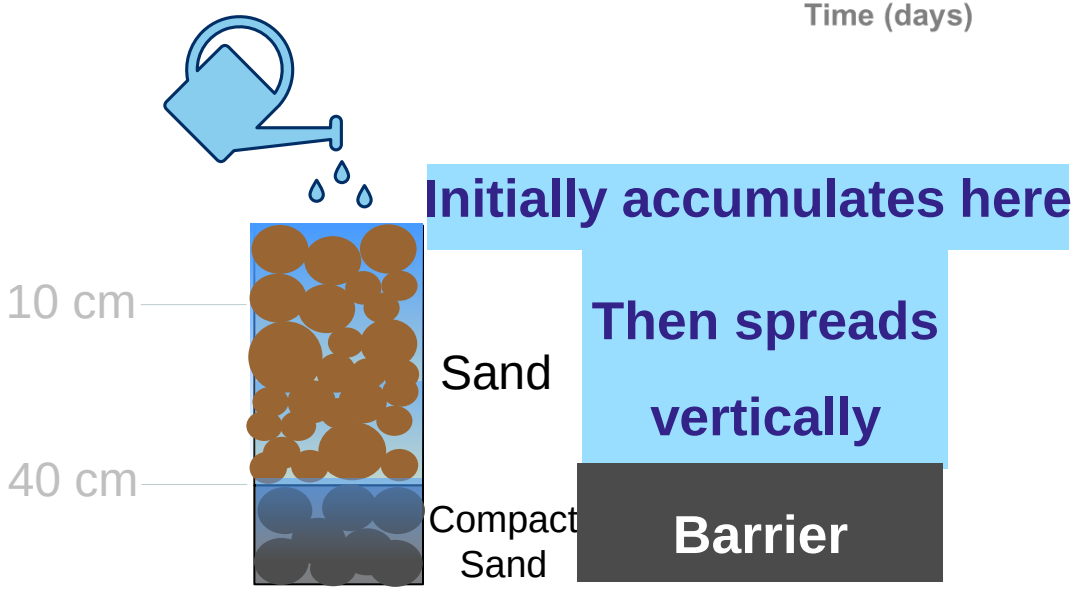
# During summer, we performed irrigation experiments

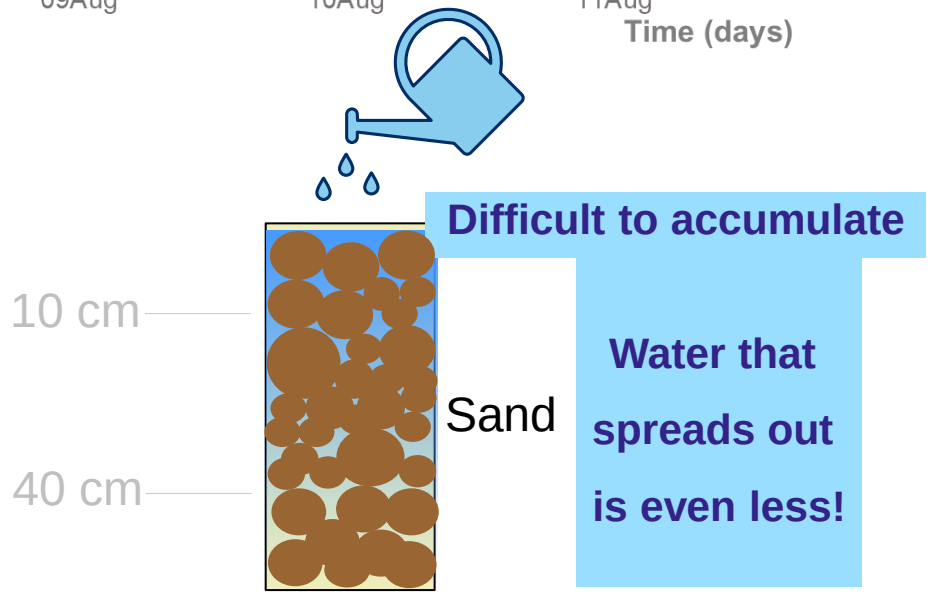
- Based on past extreme rainfall events

# Results

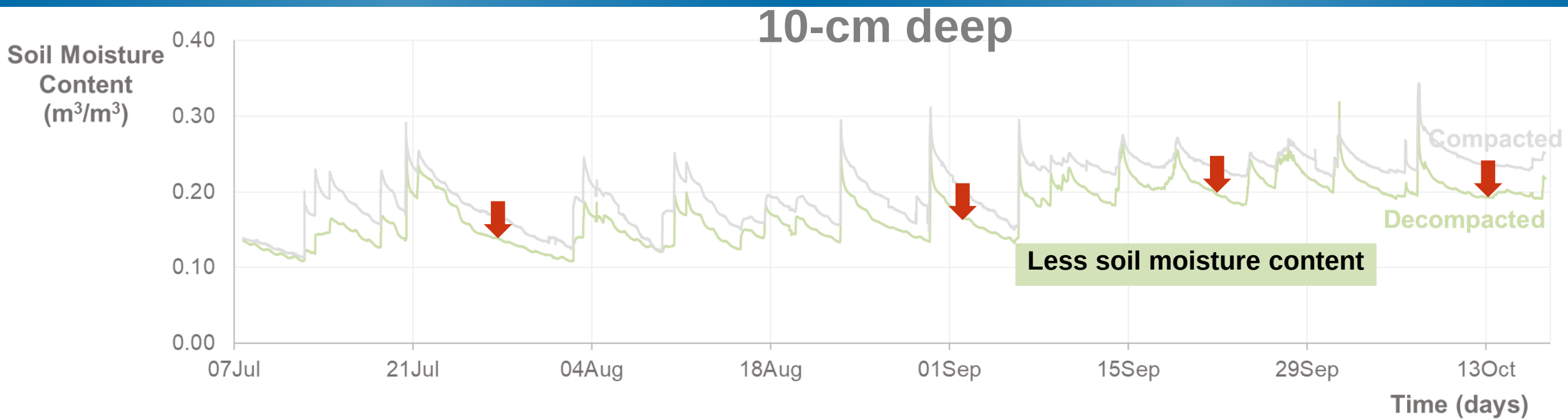
# Soil moisture content increases with irrigation/rainfall

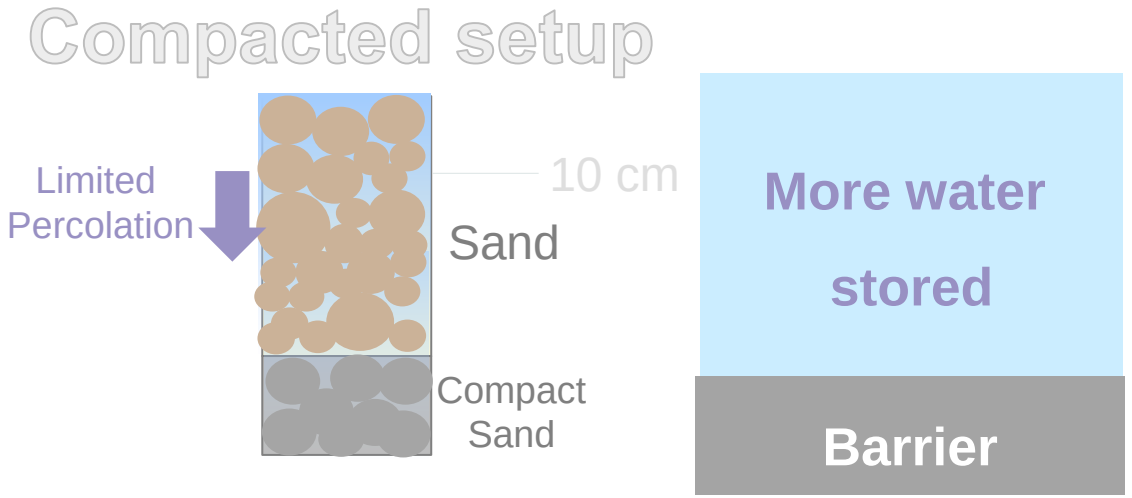



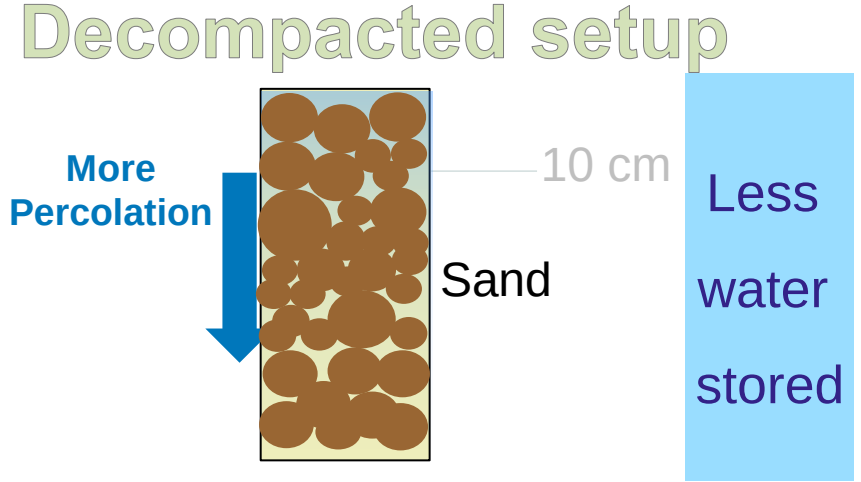



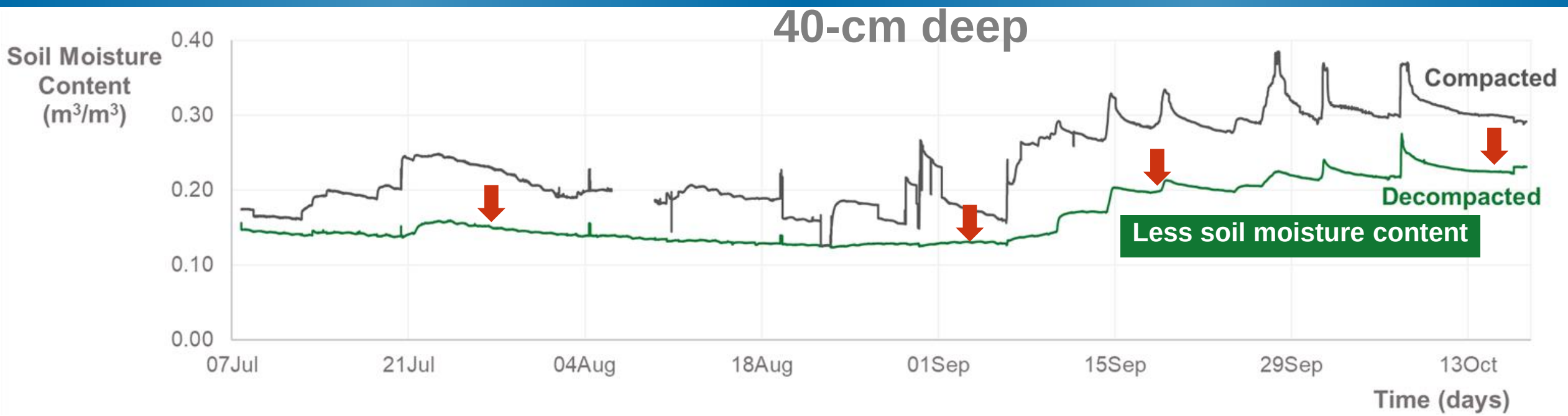
# Decompacted setups have less soil water content



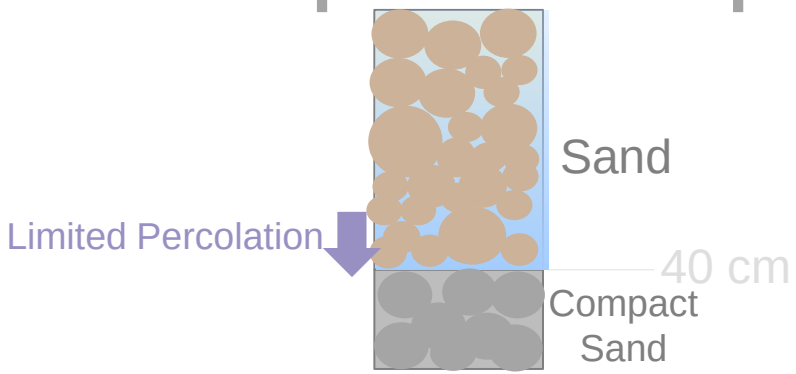



# Decompacted setups have less soil water content

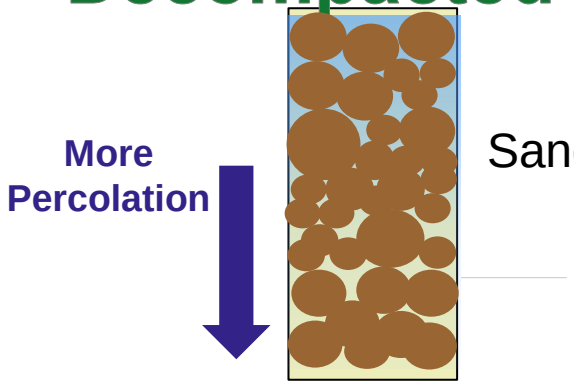



## Compacted setup



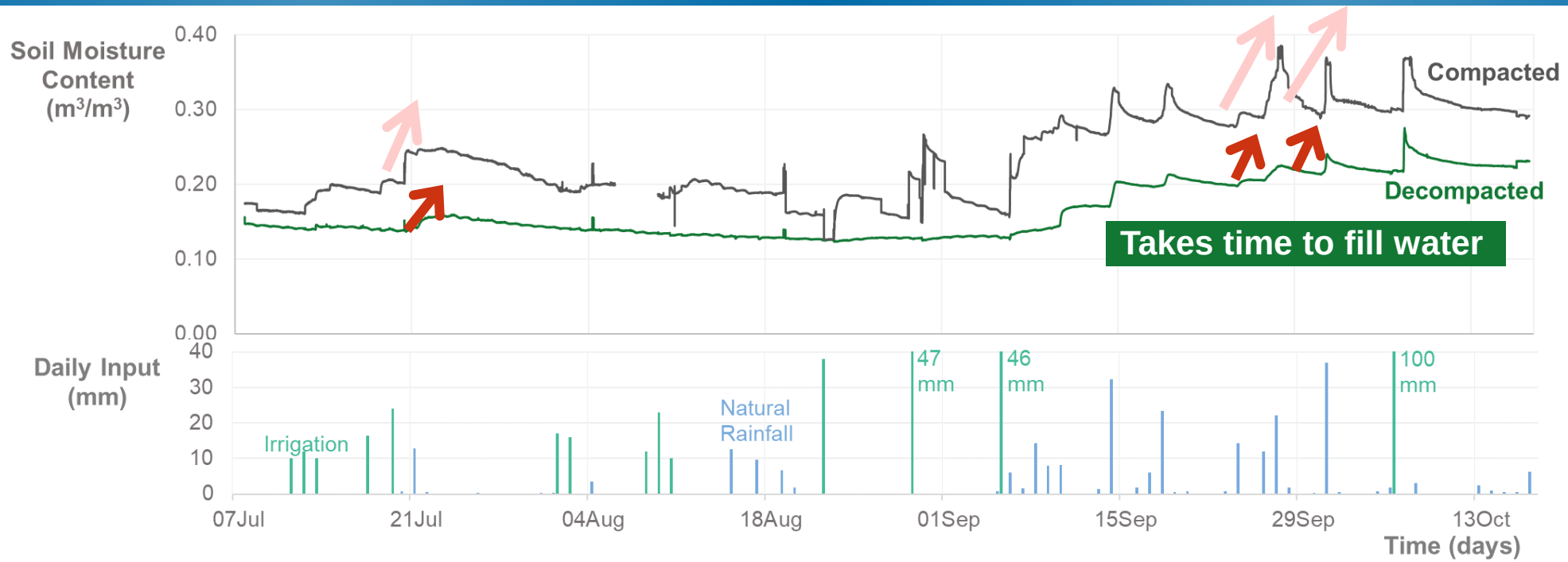

**More Accumulation**

## Decompacted setup

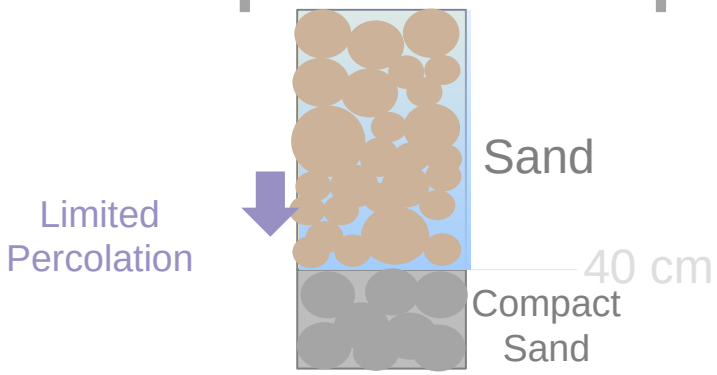



Less Accumulation

# 40-cm depths:
## Decompacted setups had smaller increase with rainfall/irrigation.




## Compacted setup




**More Accumulation**
**More storage**

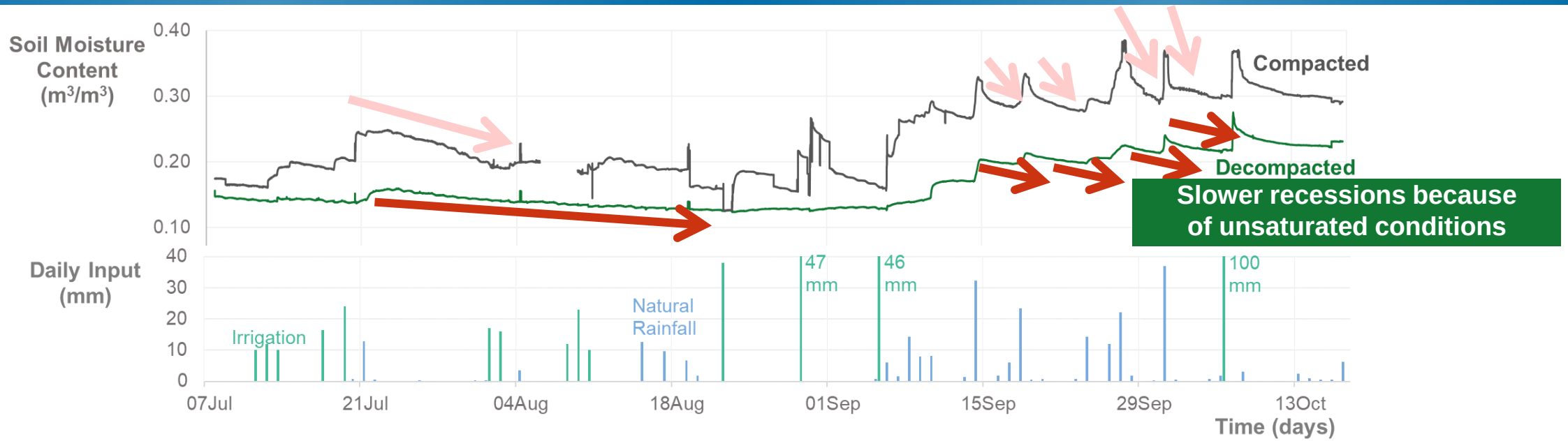
**Barrier**

## Decompacted setup

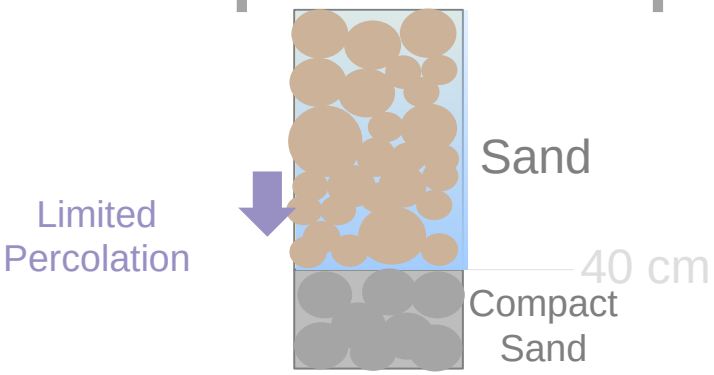

Harder to Accumulate

Less storage

# 40-cm depths:
## Decompacted setups receded slower



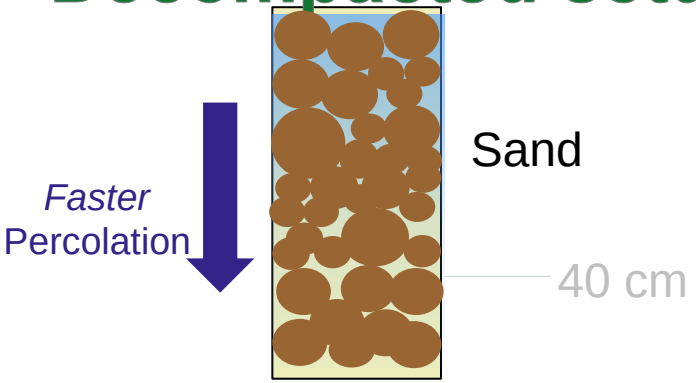

## Compacted setup




**More Accumulation**
**More storage**

**Barrier**

## Decompacted setup




Harder to Accumulate

Less storage

# Conclusion

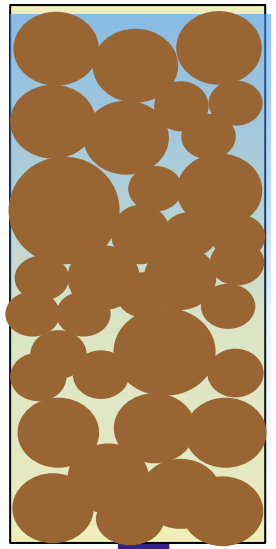
# RESEARCH QUESTION:
## *How does decompaction affect the soil water dynamics?*

**Answer:** In soil profiles of decompacted setups:

1. Less water accumulates
2. Takes time to saturate
3. More water percolates
4. Deeper parts are likely **less** sensitive to rainfall events

# So what?

# IF WE DECOMPACT…
# Less soil water, more goes to groundwater recharge

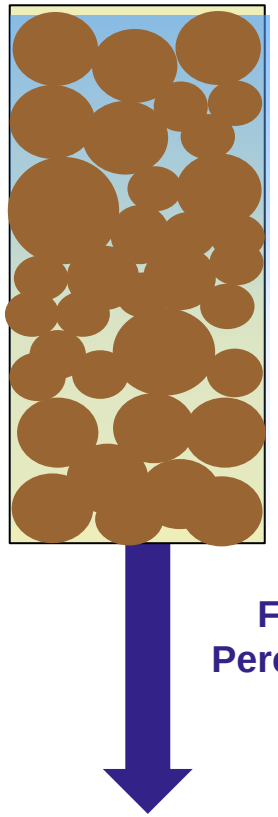


Sand

*Faster*
Percolation

# IF WE DECOMPACT…
# Less soil water, less tendency to flood and erode

## Decompacted setup



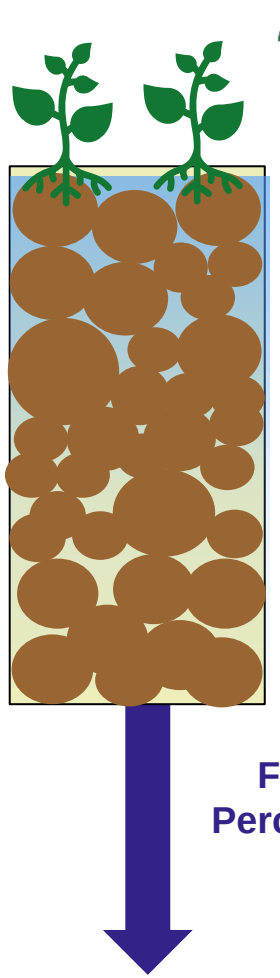
Sand

Less Accumulation

**Faster Percolation**

# IF WE DECOMPACT…

## However, less soil water, less goes to shallow rooted crops?



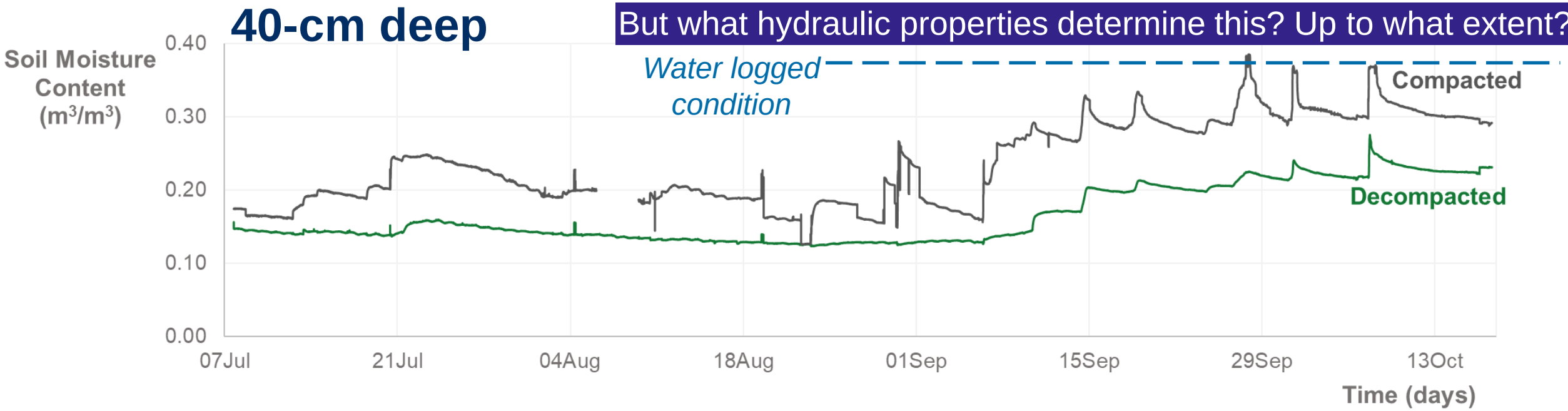

**Which vegetation to plant then?**

# When decompacting, there might be trade-offs

# Outlook

# Monitor for autumn, winter, spring

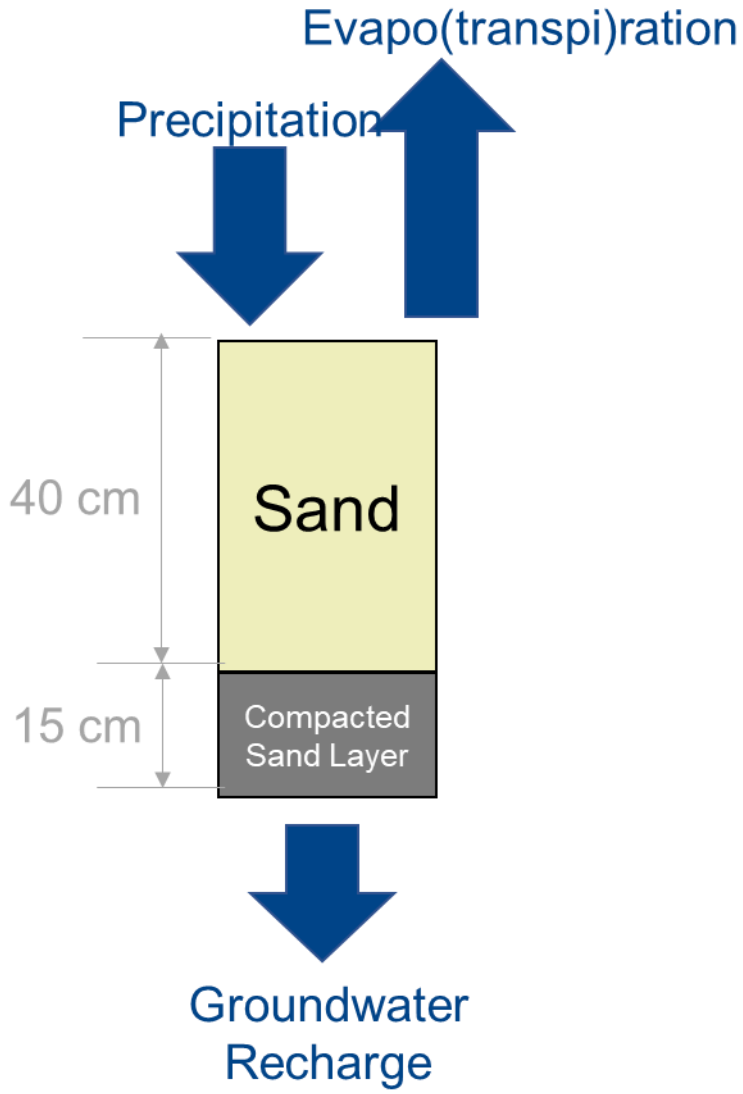
# How can (de)compaction affect hydraulic properties?



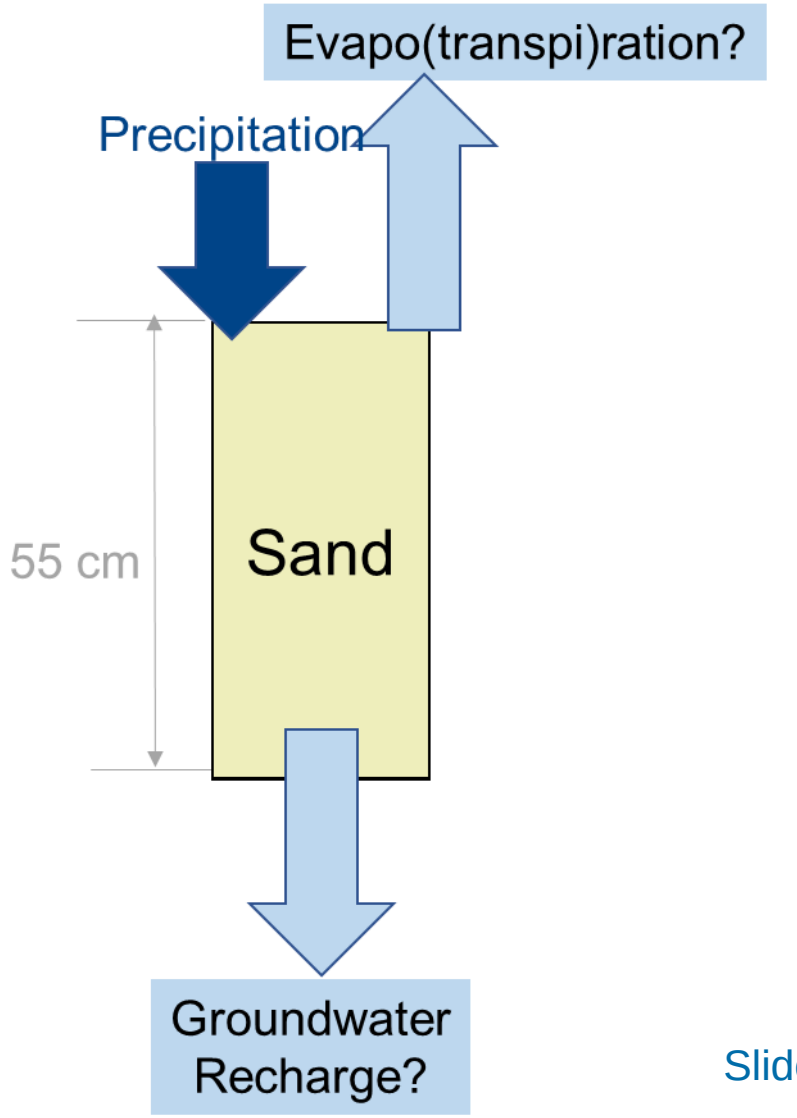

- Hydraulic conductivity?
- Water retention?
- Something else?

# Develop numerical models

## Compacted setups




## Decompacted setups



# ...and upscale these models to catchment scale