



Technological developments for water resource efficiency

Tim Hess & Jerry Knox

13 June 2017, Brussels, Belgium

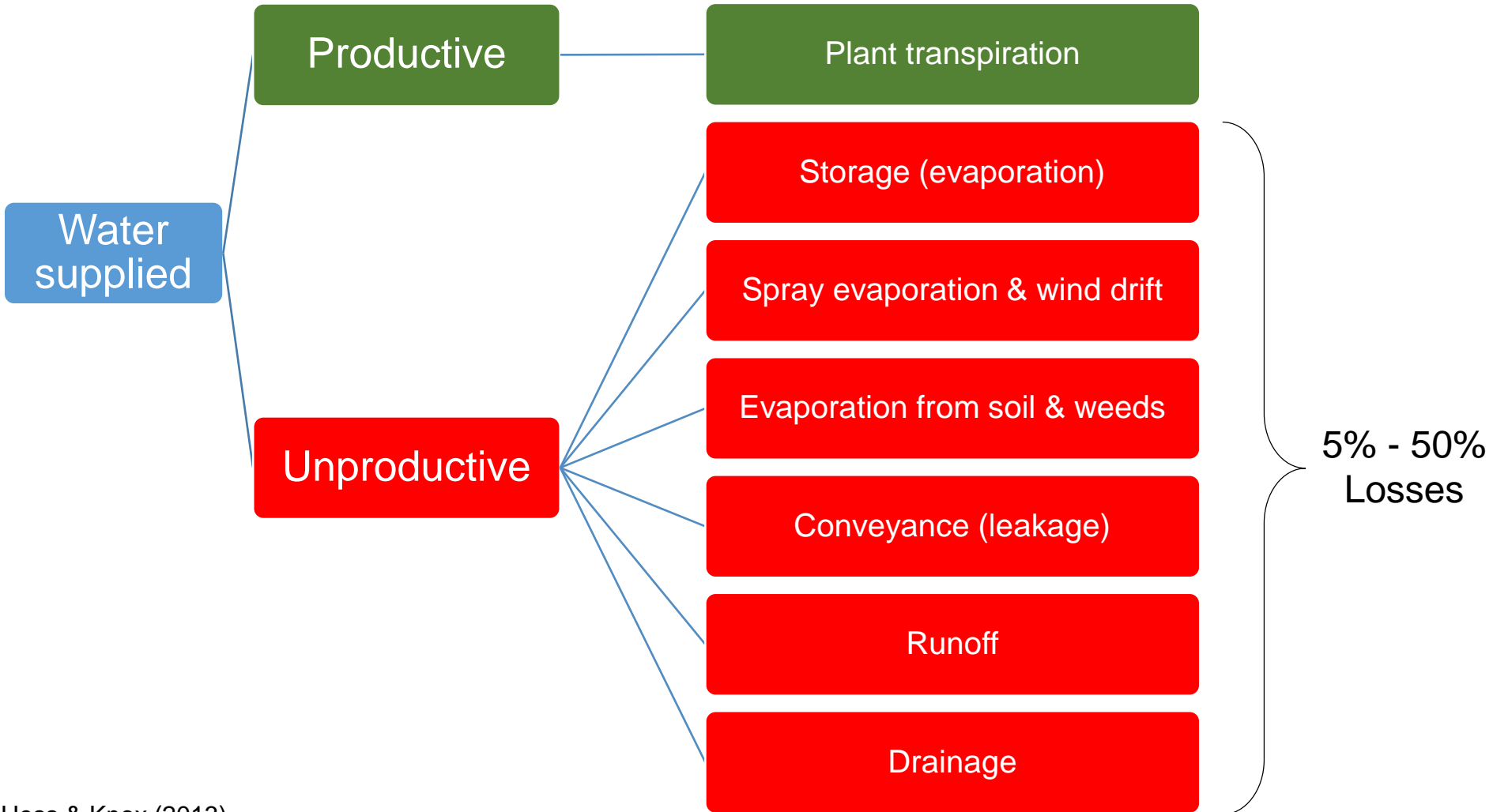
www.cranfield.ac.uk

Water for irrigation in the EU

- 24% of total water abstraction in Europe is used for agriculture (but ranges from 0 – 80%)
- Over-abstraction affects 10% of surface and 20% of groundwater bodies
- The most vulnerable areas are in the Mediterranean region
- Around 20 river basin districts face water stress during the summer
 - especially IT, ES, CY, MT
 - but also DE, UK, BE, PT, BG
- Climate change will increase irrigation needs and reduce water availability



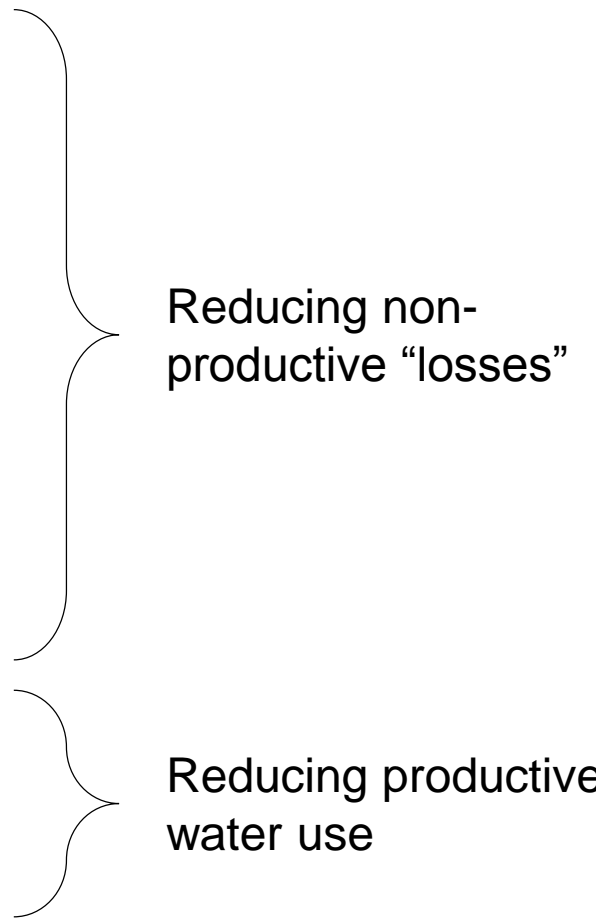
Where does the water go?



Hess & Knox (2013)

Scope for water savings

- System
 - **Improvement of irrigation systems**
 - Decreasing soil evaporation
 - Reducing runoff
 - Reduction of evaporation during storage
- Management
 - **Irrigation scheduling**
 - Deficit irrigation strategies
 - Water table management
- Cropping
 - Changing planting date
 - Crop selection



Reducing non-productive “losses”

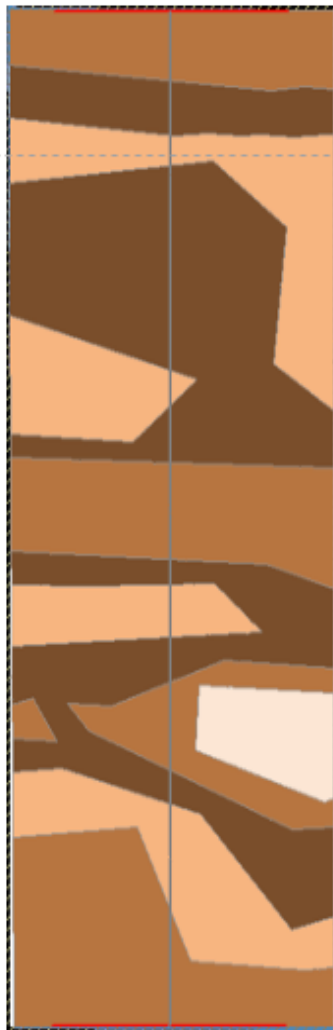
Reducing productive water use

Switching irrigation technology

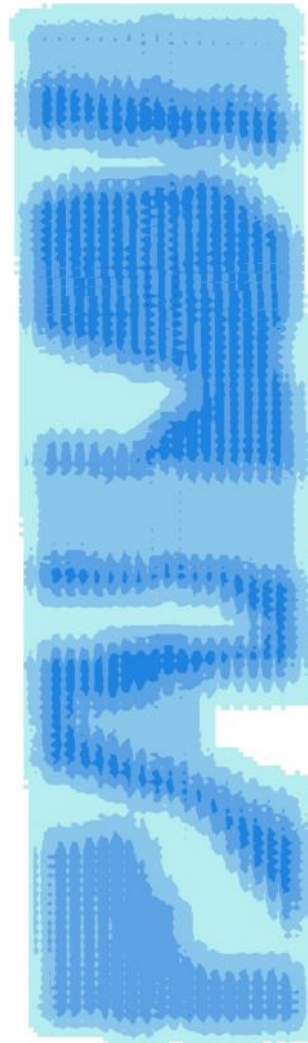
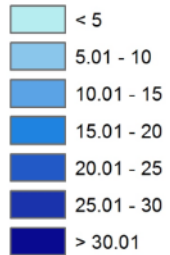
- Surface irrigation (often inefficient) dominates in places like [Bulgaria](#), [Croatia](#), [Italy](#), [Portugal](#) and is important in [Greece](#) and [Spain](#)
- Sprinkler or localised has the potential to be more efficient



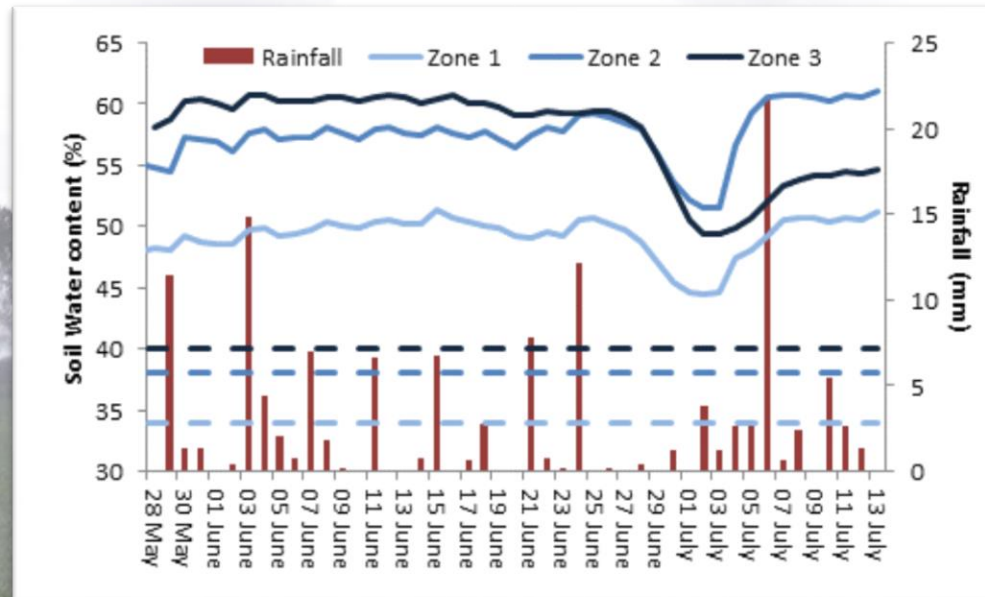
Precision irrigation



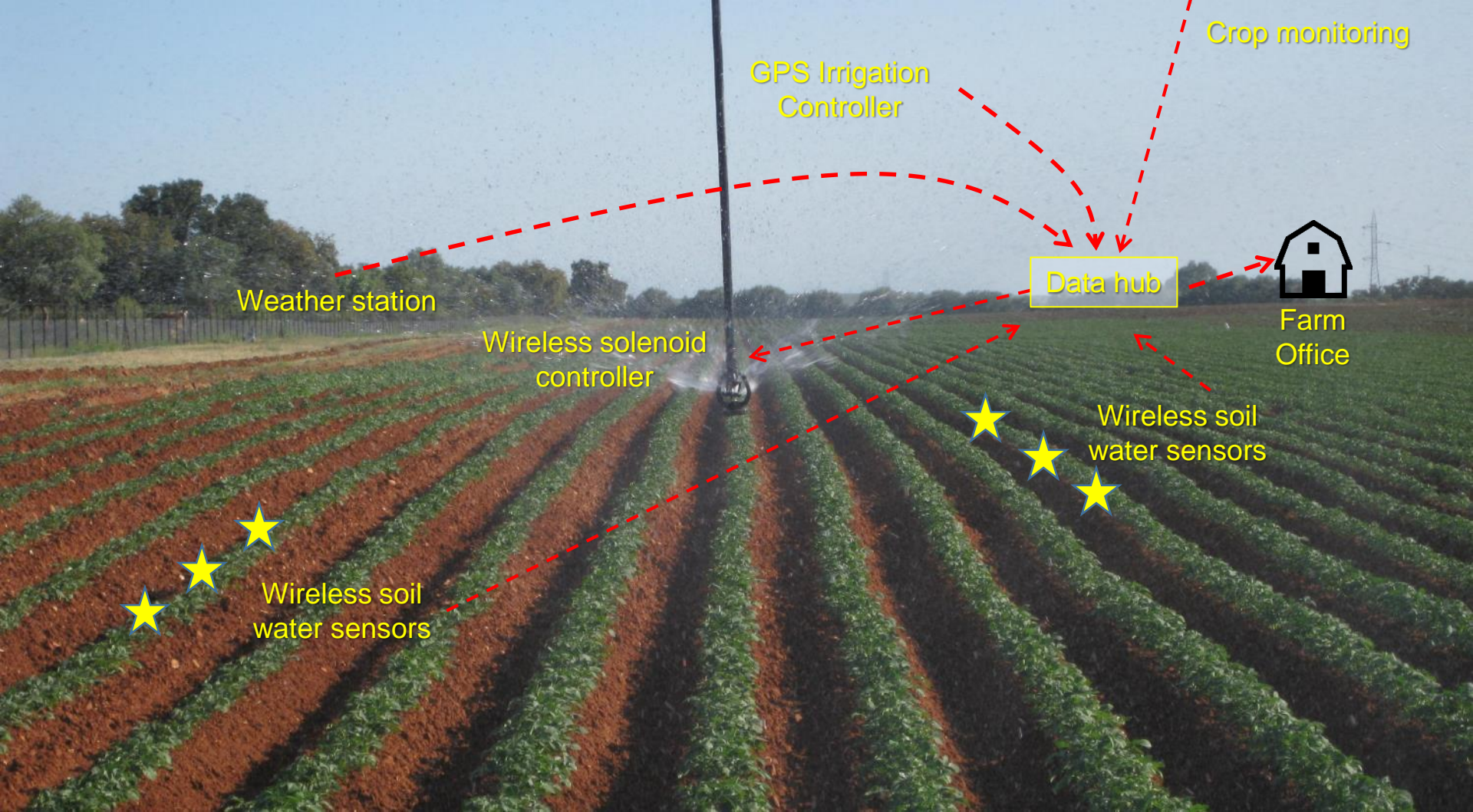
Water applied (mm)



Real-time soil moisture monitoring using a wireless sensor network

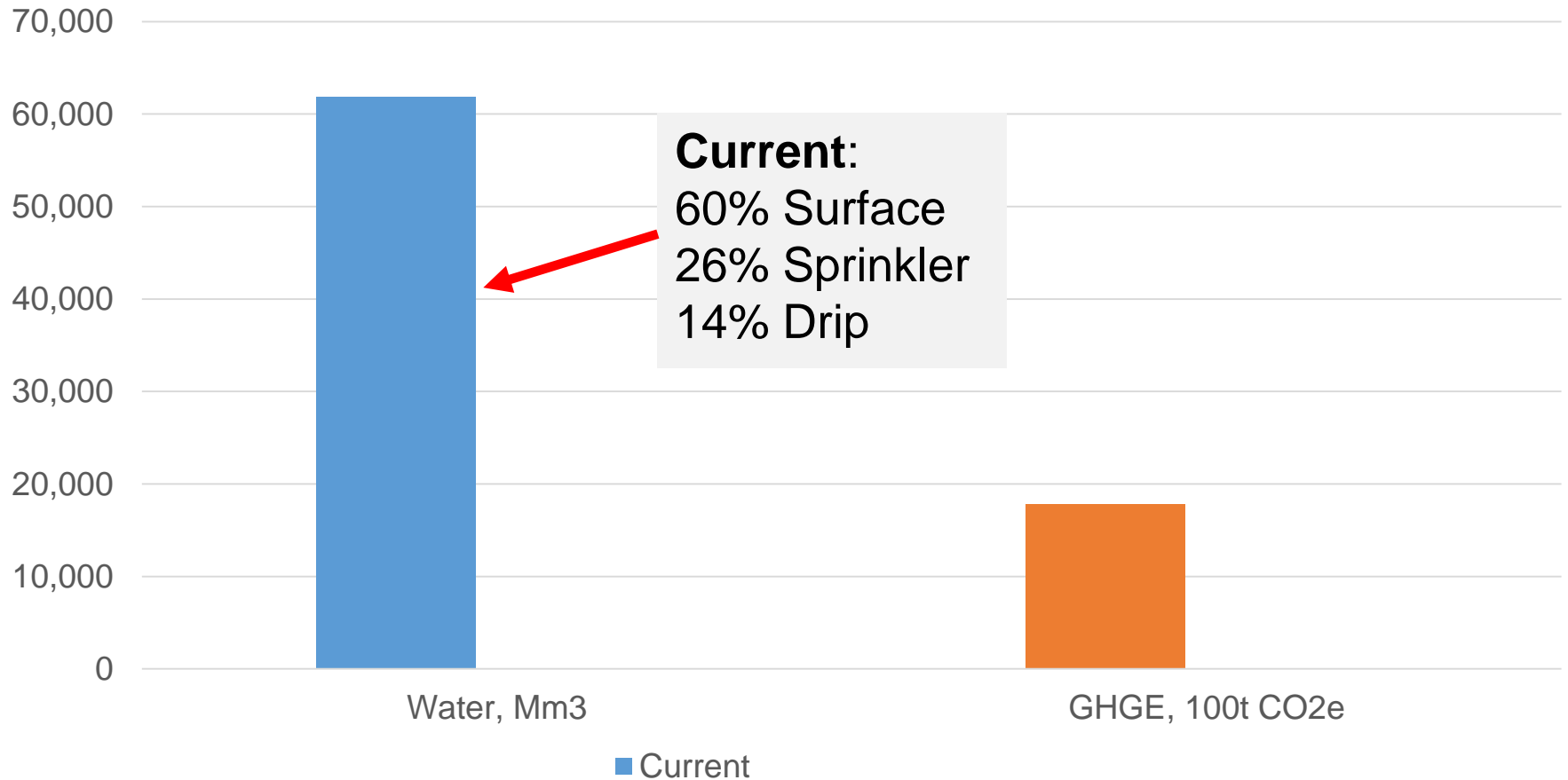


Real-time precision irrigation



Warning #1: Water / energy trade-offs

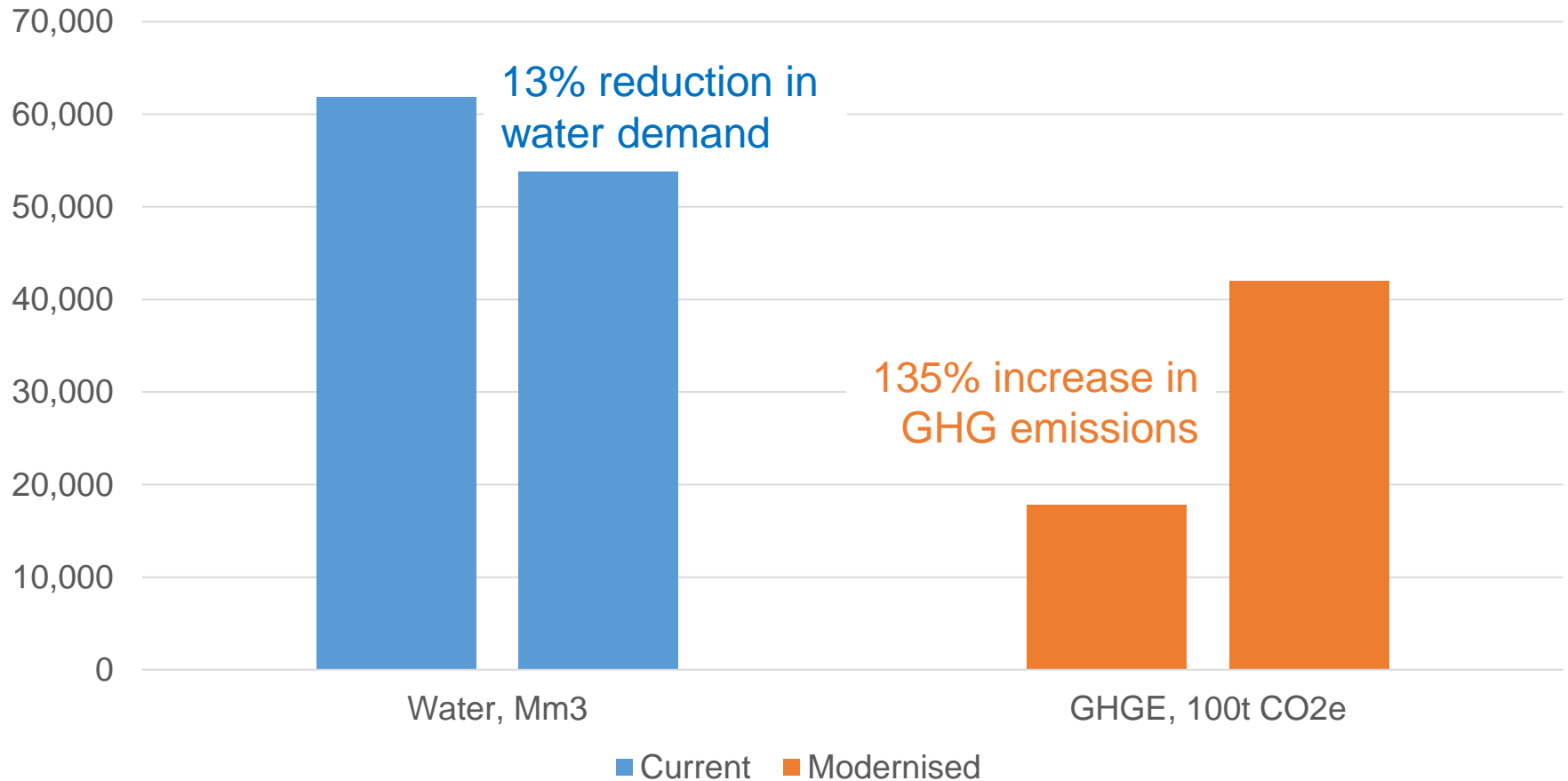
Water use and GHG emissions in the Mediterranean region



Daccache et al. (2014)

Warning #1: Water / energy trade-offs

Water use and GHG emissions in the Mediterranean region



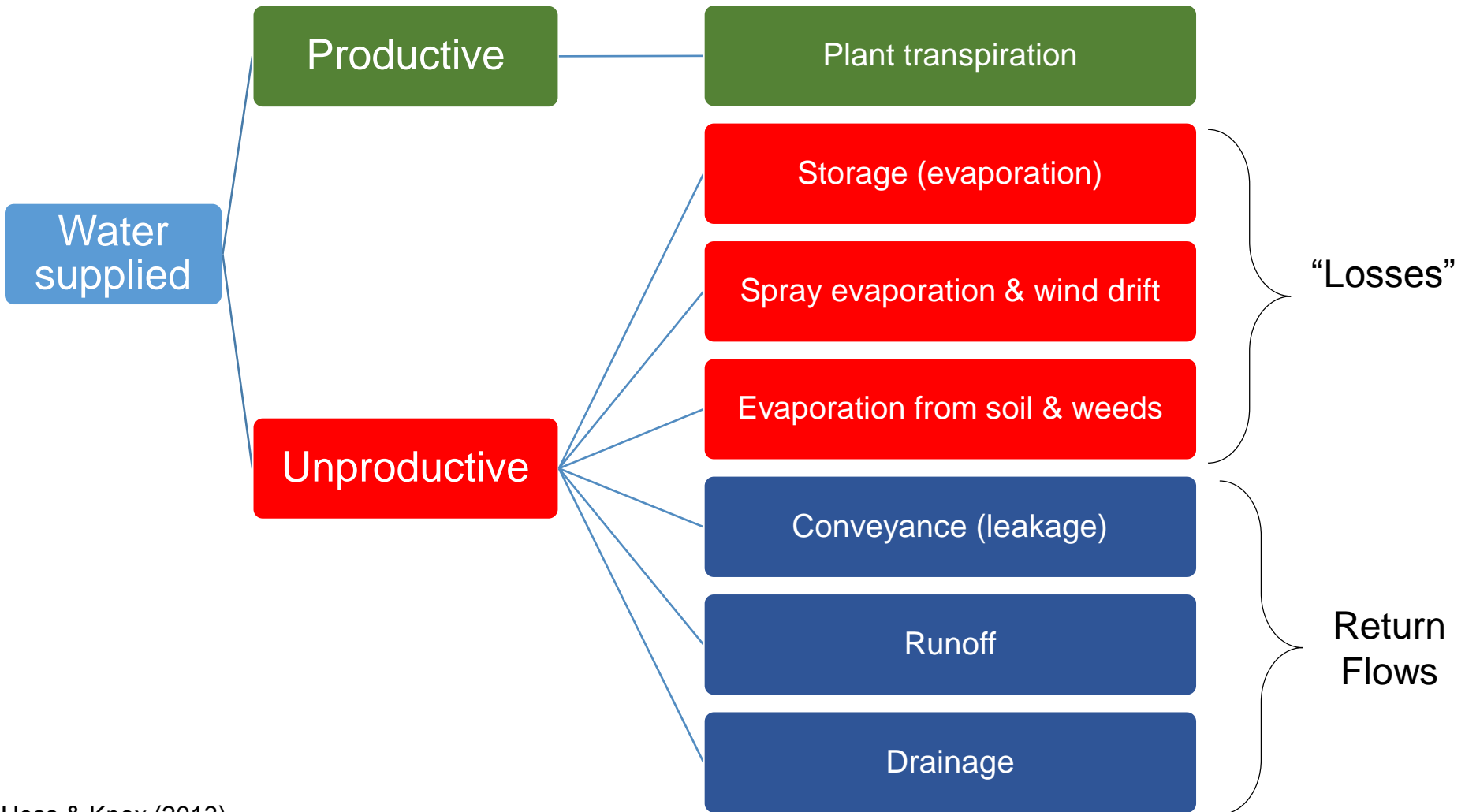
Daccache et al. (2014)

Irrigation modernisation in Spain

- In 2002, the Spanish government implemented a national plan to modernize irrigation infrastructure
 - Allocated gravity distribution → on-demand pressurised systems
 - 2 mil ha
 - €7,400 mil
- Effects
 - Energy demand / ha has increased +657%
 - Energy costs (per kWh) have also increased
 - Increased cost of watering drives a move to more water intensive crops (higher € per m³) and greater evapotranspiration



Warning #2: “Real” water losses



Hess & Knox (2013)

Water efficiency and water saving

- Most losses are returned to the environment and therefore available for other uses
- Water productivity (kg/m^3) at the farm level increases
 - Encourages expansion of irrigation area to use available water
 - Does not reduce water use
- Few document studies of irrigation modernisation, but most showed no water savings
- Water use reduction requires good governance and water stewardship

Multi-level working

Example: Berry production in Huelva, Spain

Farm level

1. Scheduling tool
2. Grower workshops
3. Publications
4. Social media

Estimated water saving
= 2,300 MI/year



Basin level

1. Working with local government to manage water allocations

