What can a tree do

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SOLAR ENERGY 1000 W m\(^{-2}\)

Legend
- R - reflectance
- G - heat flux to the soil
- ET - evapotranspiration
- H - sensible heat

harvesting of the field or after a few hot days

**Dry Land**
urban zone or harvested field (Fig. 1)
- \( \uparrow R \)
- \( \uparrow H \)
- \( \uparrow ET \)
- vertical profile of temperature
  - high \( T \) on the ground
  - water drained

**Crop Field**
with bare soil (Fig. 2)
- \( \uparrow R \)
- \( \uparrow H \)
- \( \uparrow ET \)
- \( T \) high on ground
  - long water cycle
  - water sent away as water vapour

**Vertically Structured Vegetation**
forest (Fig. 3)
- \( \uparrow R \)
- \( \uparrow H \)
- \( \uparrow ET \)
- \( T \) high on top
  - \( T \) low on the ground
  - short water cycle
Long to short water cycle

• During rainfall
  – interception
  – increasing of surface roughness

• Vegetation cools actively
  – decreasing of evaporation
  – increasing of cloud cover

877 W/m²
51 °C
20 l per hour
14kW cooling

82 W/m²
26.9 °C
Long to short water cycle

• During rainfall
  – interception
  – increasing of surface roughness

• Vegetation cools actively
  – decreasing of evaporation
  – increasing of cloud cover

• Undergrowth water cycle
  – water condensation in growth
  – change of atmospheric pressure and air flow („biotic pump“)
Inverze teplot ve dne v lese udržuje vodu v porostu
V korunách 31 C
Při zemi 21 C
Teplý vzduch unáší vodní páru vzhůru – porost se vysušuje

Teplota na povrchu porostu 33 C, teplota půdy až 49 C
Long to short water cycle

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- Undergrowth water cycle
  - water condensation in growth
  - change of atmospheric pressure and air flow („biotic pump“)
- No temperature extremes
  - less probably extreme phenomena
Long to short water cycle

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• No temperature extremes
  – less probably extreme phenomena

• Minimum costs, long-term sustainability
Darewadi, India

Darewadi v r. 1996

...a v r. 2009
What is better?

www.waterparadigm.org

http://www.treeoftheyear.org/ETY/media/Trees/70506a.jpg

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Thank you for attention