mahlathini development foundation

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**Promoting collaborative, pro-poor agricultural innovation**

**2003-2018**

- Conservation Agriculture 2013-2018- Maize Trust;
  - KZN, EC -550 farmer led CA trials

- **Smallholder CSA Decision support 2017-2020 – WRC;**
  - 15 Village based sites across KZN, Limpopo, EC (200 participants)
  - (S&WC, agroecology- gardening, CA-field cropping, livestock and natural resource management)

- **Community CCA 2017-2019 – USAID (AWARD);**
  - 7 Villages in Lower Olifants' Basin (150 participants)






# Chameleons; water use efficiency

**Farmer Level Experimentation**

- 1 participant/ village
- 2 villages per area
- 3 provinces (Limpopo, KZN, EC)
  - Three sets each

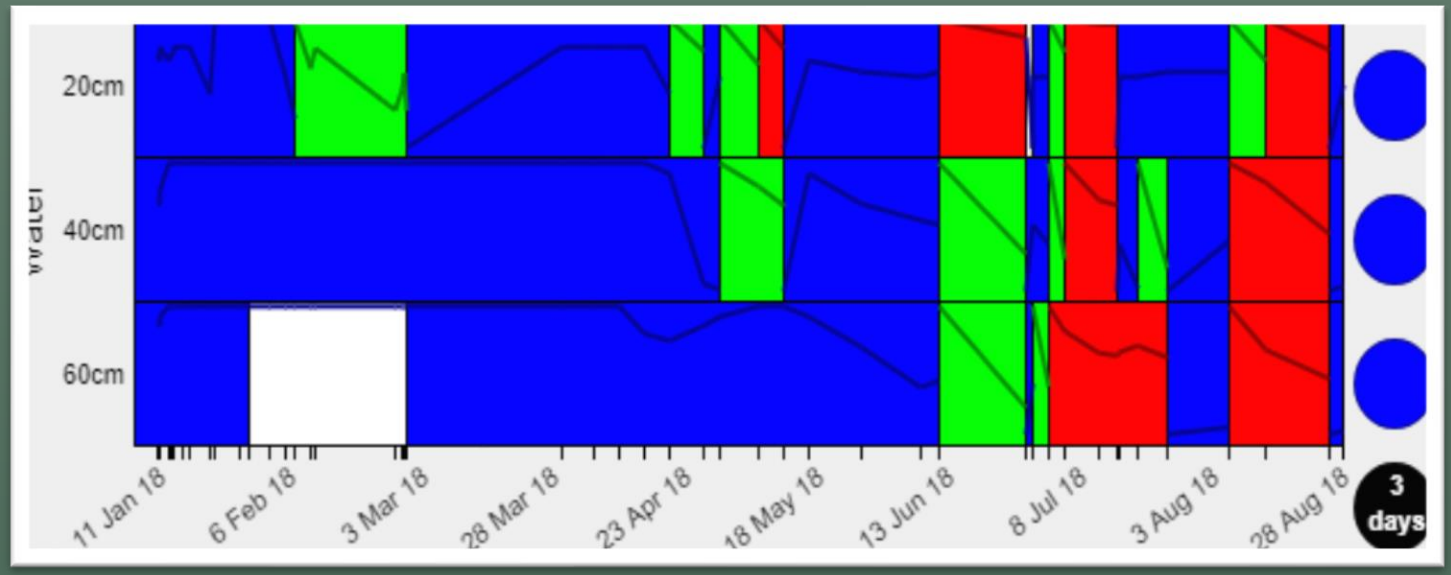
Experiment:

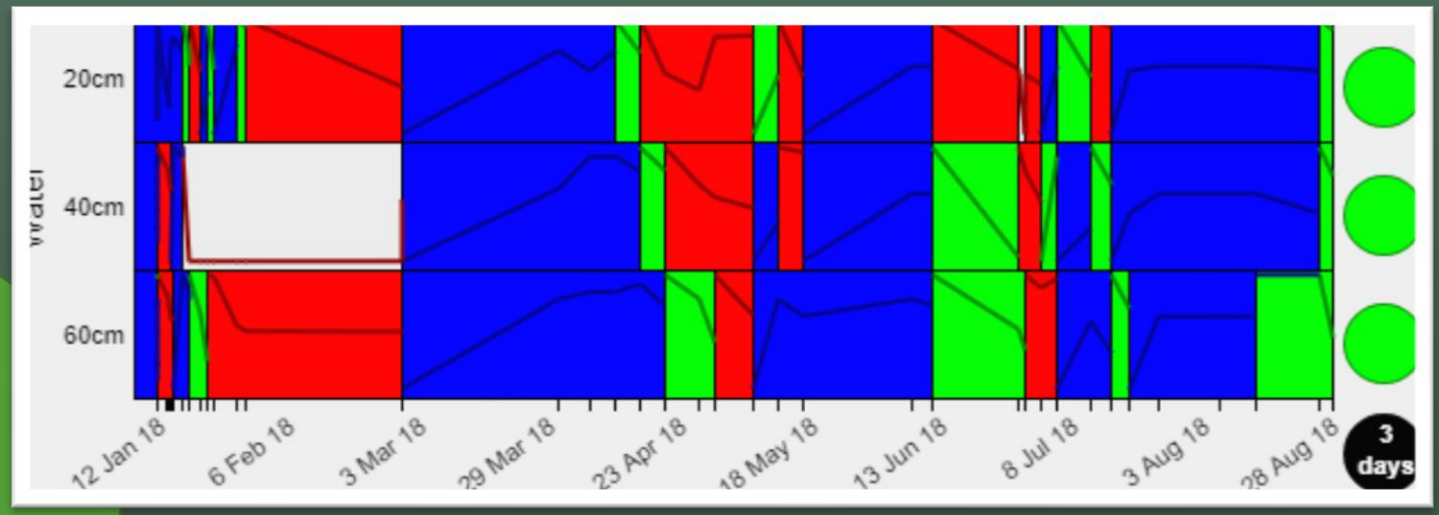
1. Trench bed inside shade cloth tunnel; mixed cropping, mulching
2. Trench bed outside shade cloth tunnel: mixed cropping, mulching
3. “Normal” bed outside shade cloth tunnel – normal planting practices

# Limpopo – Lower Olifant's –Sedawa- Christina Thobejane

- Measure the amount of water in the soil (20,40 and 60 cm deep)
- Tells you when and how much to irrigate

Applying water until the chameleon changes colour (goes blue) seems to be a good idea as this saves her some water and means that she only has to irrigate once a week (every 7 days). She has thus now changed her irrigation practice of watering a little every morning and afternoon, to a deep watering every 5-7 days.



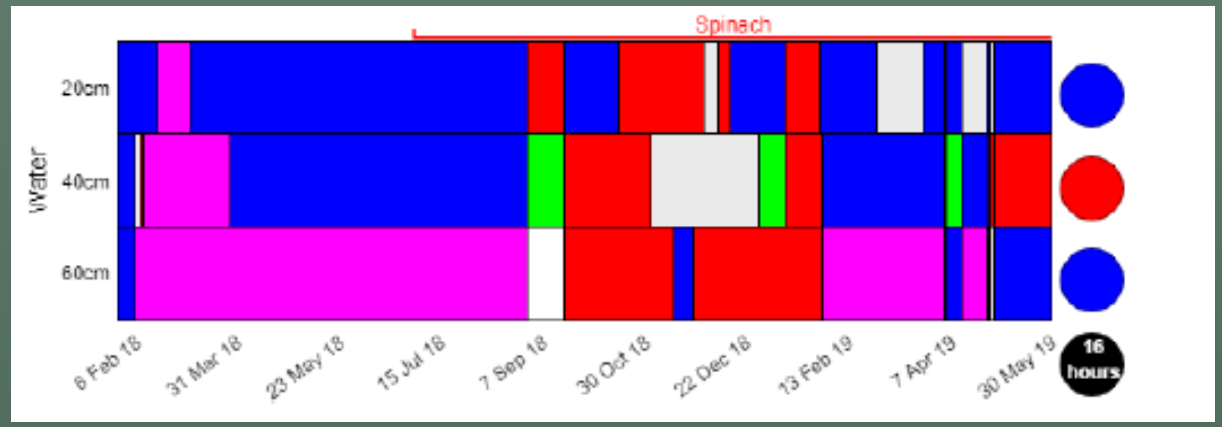




- Top: Chameleon in trench bed inside tunnel
- Bottom: furrows and ridges outside tunnel

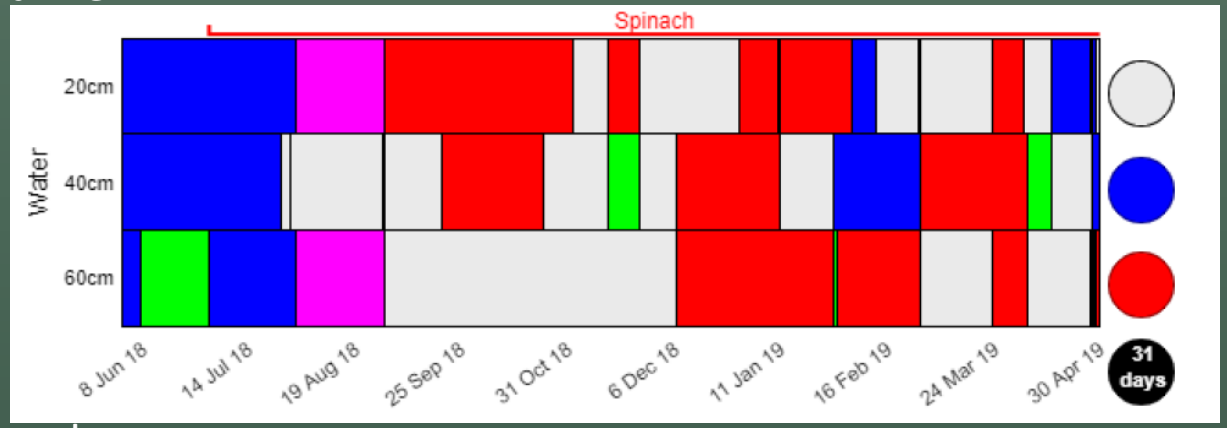
# Phumelele Hlongwane - irrigation

- Bucket drip kits provide 4mm irrigation per bucket – to be provided on a daily basis
- She used the chameleons to determine whether to irrigate daily and or whether to use more than one bucket
- Works the best in the trench beds inside the tunnel
- For the normal bed outside the tunnel – the deeper soil (40-60cm) remains dry
- Also included a manual form to assist with the farmer level analysis
  - To assess amount of water provided, linked to rainfall and chameleon sensor colours

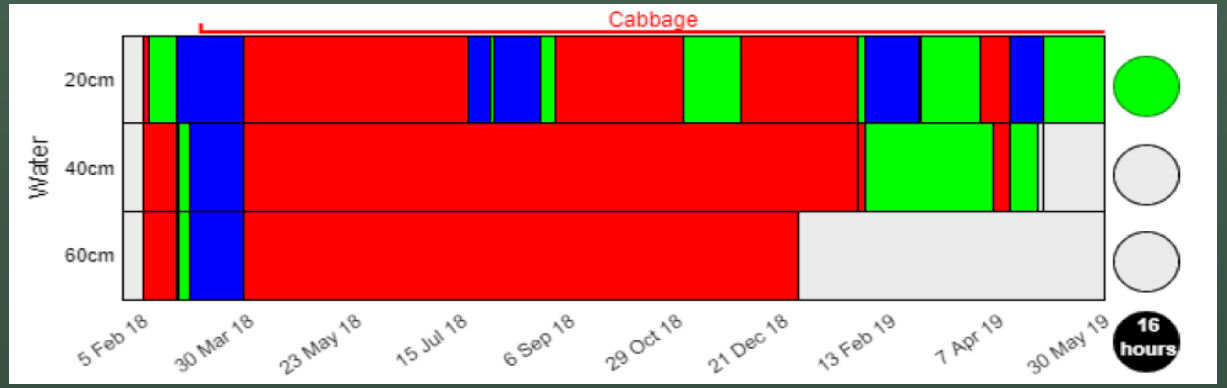
Growth inside tunnels visually much better than outside tunnels and much better than the 'normal' raised beds typical in the area; it is possible to get higher yields with less water… still need to compare over time how this works in different seasons with different crops




PH: Tunnel




PH: Trench




PH: Garden

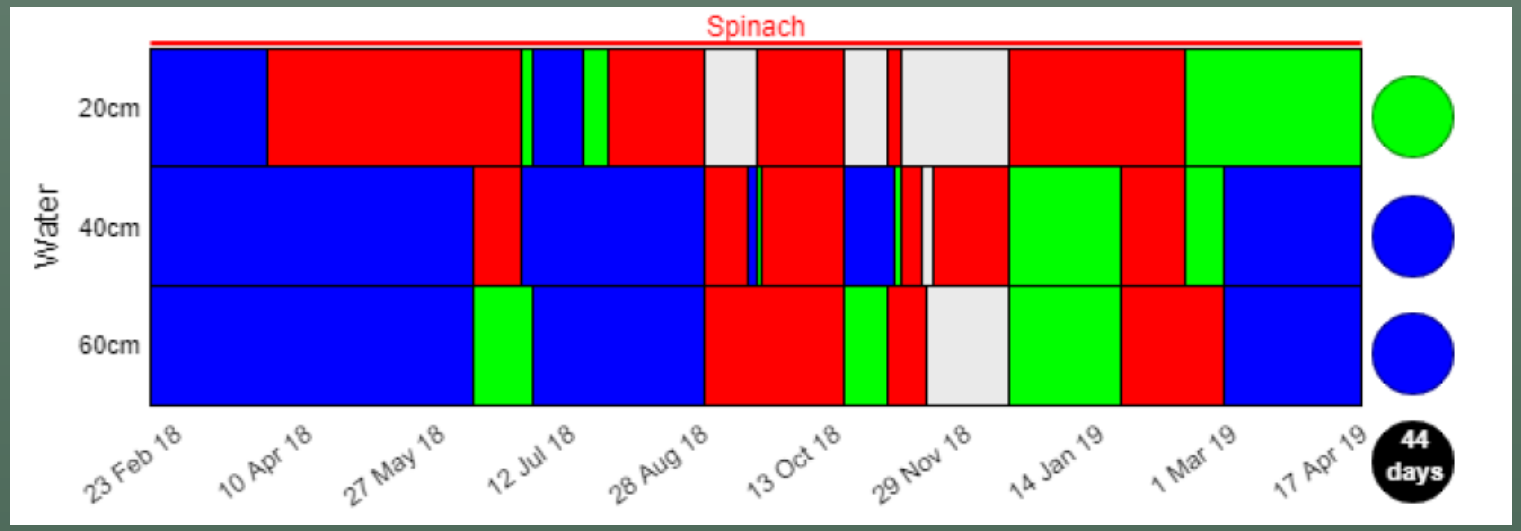
# Comparison; Watering practices

Ntombakhe Zikode:

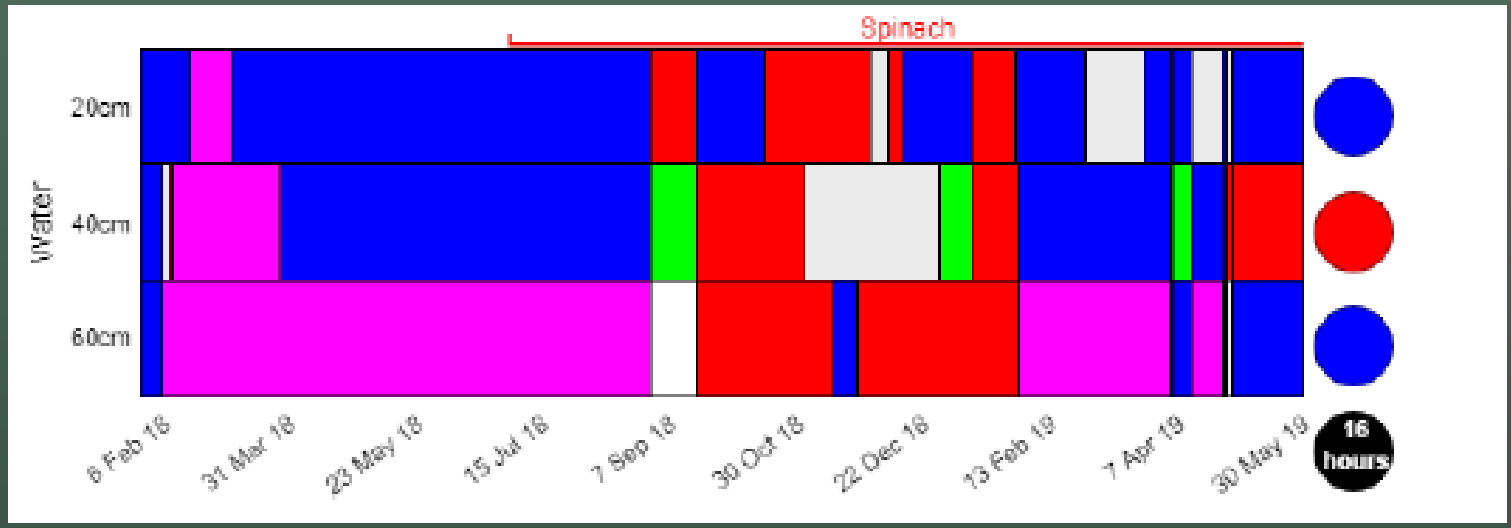
- For her tunnel Chameleon readings follow the broad trend of rainfall patterns in the area
  - Indicating that she is not able to use the sensor readings to adapt her watering practices..

Phumelele Hlongwane

- For her tunnel, she has tried hard to use the sensor readings to adapt her watering practices
  - To some extent she has over watered somewhat – generally she has managed to keep her soil profile  well wetted




NZ: Tunnel




PH: Tunnel

# Water productivity- gardening

**Table : Water productivity for gardening practices for two participants from Bergville; July-Aug 2018**

| Bgvl June-Sept 2018 | Simple scientific method (ET) | | | Farmers' method (Water applied) | | |
|---|---|---|---|---|---|---|
| Name of famer | water use ($m^3$) | Total weight (kg) | WP ($kg/m^3$) | water use ($m^3$) | Total weight (kg) | WP ($kg/m^3$) |
| Phumelele Hlongwane trench bed inside tunnel | 1,65 | 21,06 | 12,76 | 1,85 | 21,06 | 11,38 |
| Phumelele Hlongwane; trench bed outside tunnel | 0,83 | 5,32 | 6,45 | 1,75 | 5,32 | 3,04 |
| Ntombakhe Zikode trench bed inside tunnel | 1,65 | 17,71 | 10,73 | 2,37 | 17,71 | 7,47 |
| Ntombakhe Zikode; trench bed outside tunnel | 0,50 | 3,35 | 6,76 | 0,53 | 3,35 | 6,33 |

**Table: Water productivity for gardening practices for two participants from Limpopo (Sedawa); April -July 2018**

| | Simple scientific method (ET) | | | Farmers' method (Water applied) | | |
|---|---|---|---|---|---|---|
| Name of famer | water use ($m^3$) | Total weight (kg) | WP ($kg/m^3$) | water use ($m^3$) | Total weight (kg) | WP ($kg/m^3$) |
| Christina Thobejane (Tunnel; trench beds, with mulch) | 0,8 | 48,9 | 65 | 1,10 | 48,9 | 56,7 |
| Christina Thobejane (Furrows and ridges with mulch) | 0,5 | 24,5 | 46,4 | 3,91 | 24,5 | 5 |
| Christina trench outside | 0,8 | 14,7 | 18,4 | 2,93 | 14,7 | 11,3 |
| Nora Mahlako (Tunnel; trench beds without mulch) | 0,8 | 19,6 | 26 | 9,47 | 19,6 | 5 |

WP for trench beds substantially higher than "normal bed". WP in tunnels substantially higher than outside; around 5 x more in Limpopo and around 3 x more in KZN

# Some issues with using chameleons

- Difficult soil types
- Interference by organic matter placed in the soil
- Lack of easy access to unlimited water
- Lag time between irrigation and sensor reading – still working on what that should be…

- Fear of tech
- Difficulty in interpretation of results
- Can’t tell in the field where the problem lies when a sensor is not reading
- Can’t tell when the reader is charged or not- only from the internet interface
- Sometimes the readers indicate an upload is complete, but data somehow is not reflected on the site.

# Conclusions

- Chameleons work well as a learning tool to understand the movement of water in the soil related to weather conditions and different soil types
- Chameleons can be used to experiment with watering schedules  to learn better practices but
- Managing chameleons in the field (by field staff and farmers alike) somewhat problematic – trouble shooting and ‘fixing” sensors that aren’t reading is often a reasonably complex task.