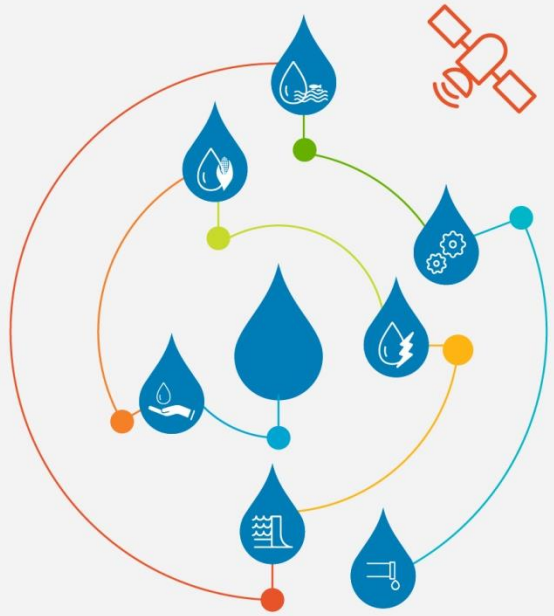
Sustainable use of groundwater in water scarce irrigation systems in Dry Zone of Sri Lanka



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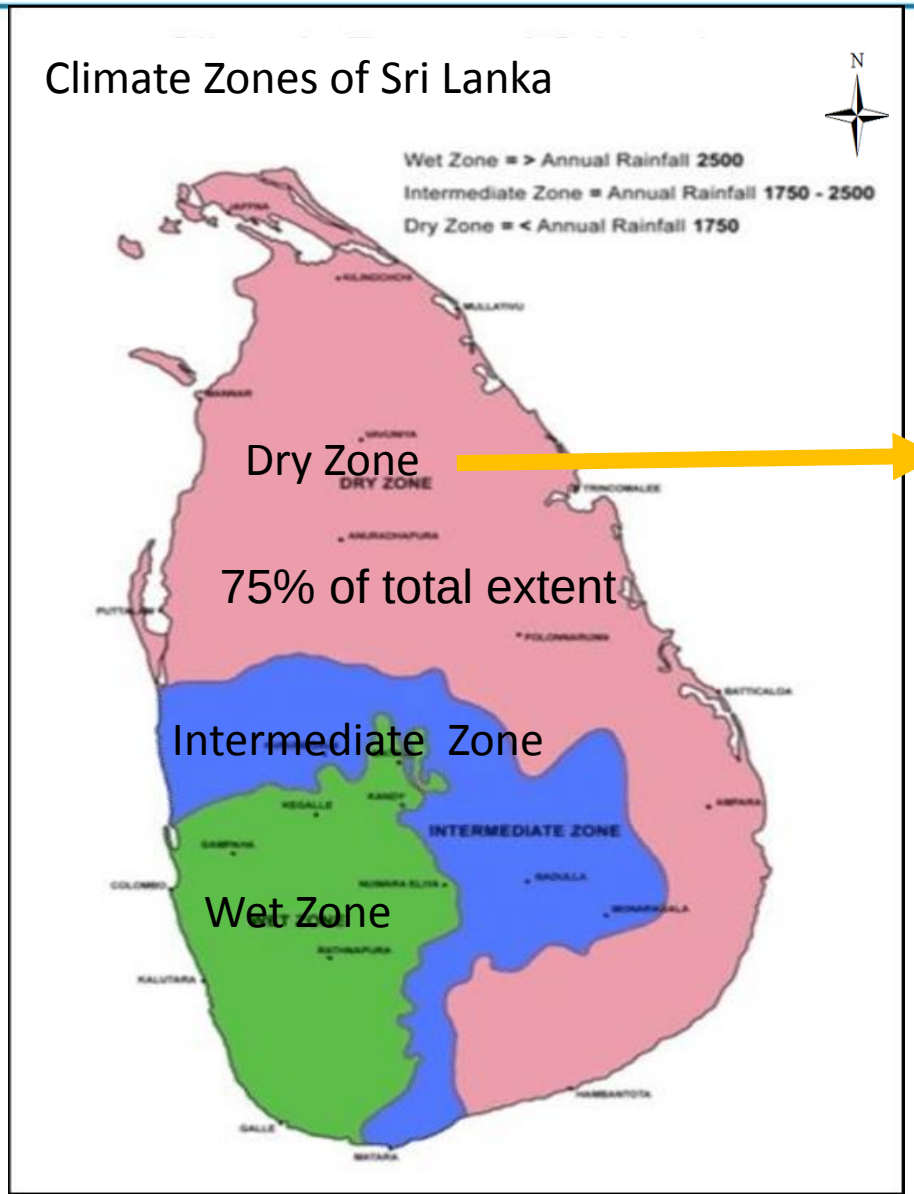
Sri Lanka Resident Mission
Asian Development Bank
03 Oct. 2018

Water use in Dry Zone of Sri Lanka



In Sri Lanka

- 85% of water developments- for agriculture
- 90% water use- for paddy cultivation

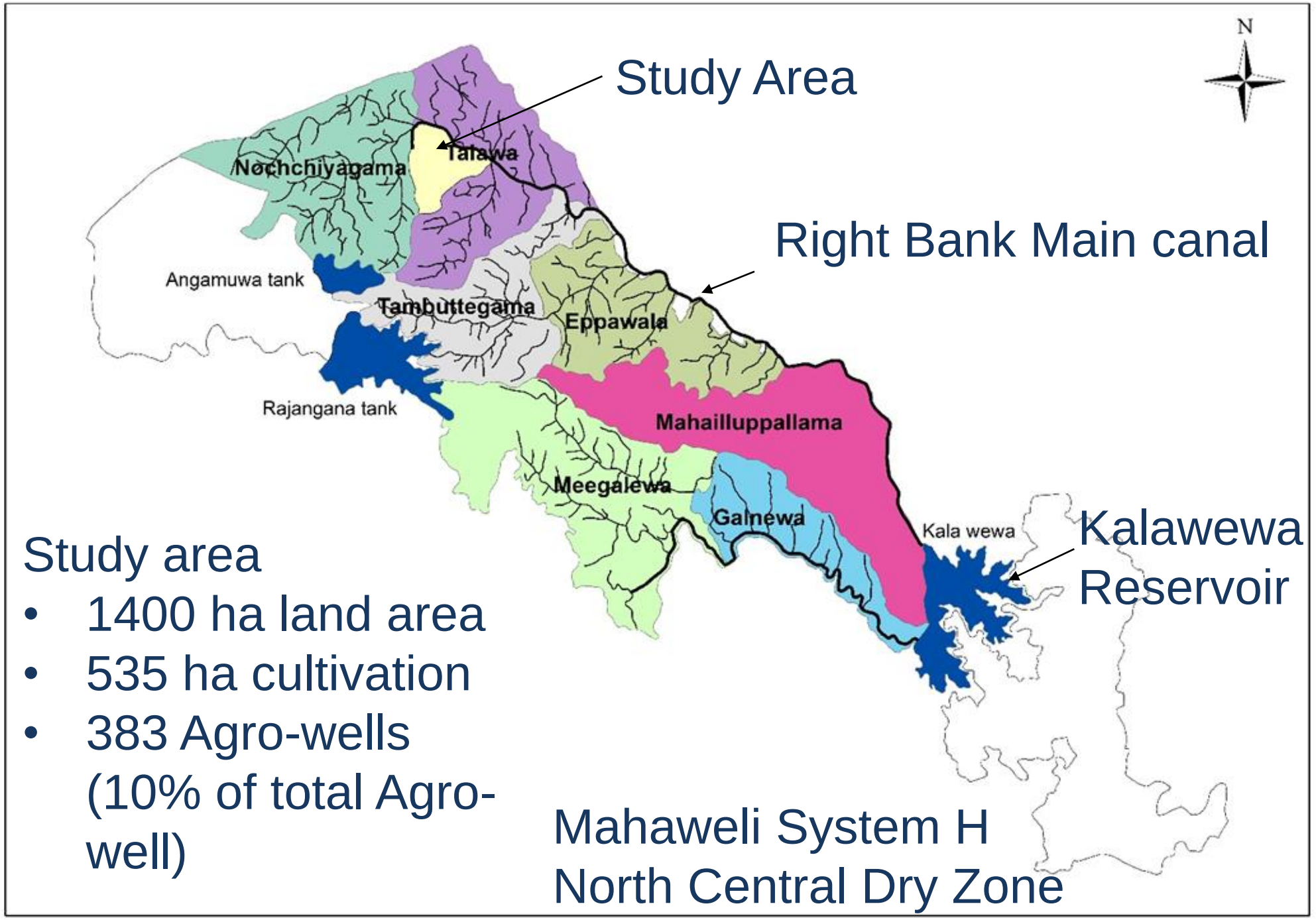
- Major income - Agriculture related activities
- Accounts 80% of the water demand
- Having 30% of the water resources

- Water deficit shall be compensated by surface water diversions and use of ground water resources

Research objectives:

(i) To assess the Environmental impact of ground water extraction in bulk (e.g salinity development)

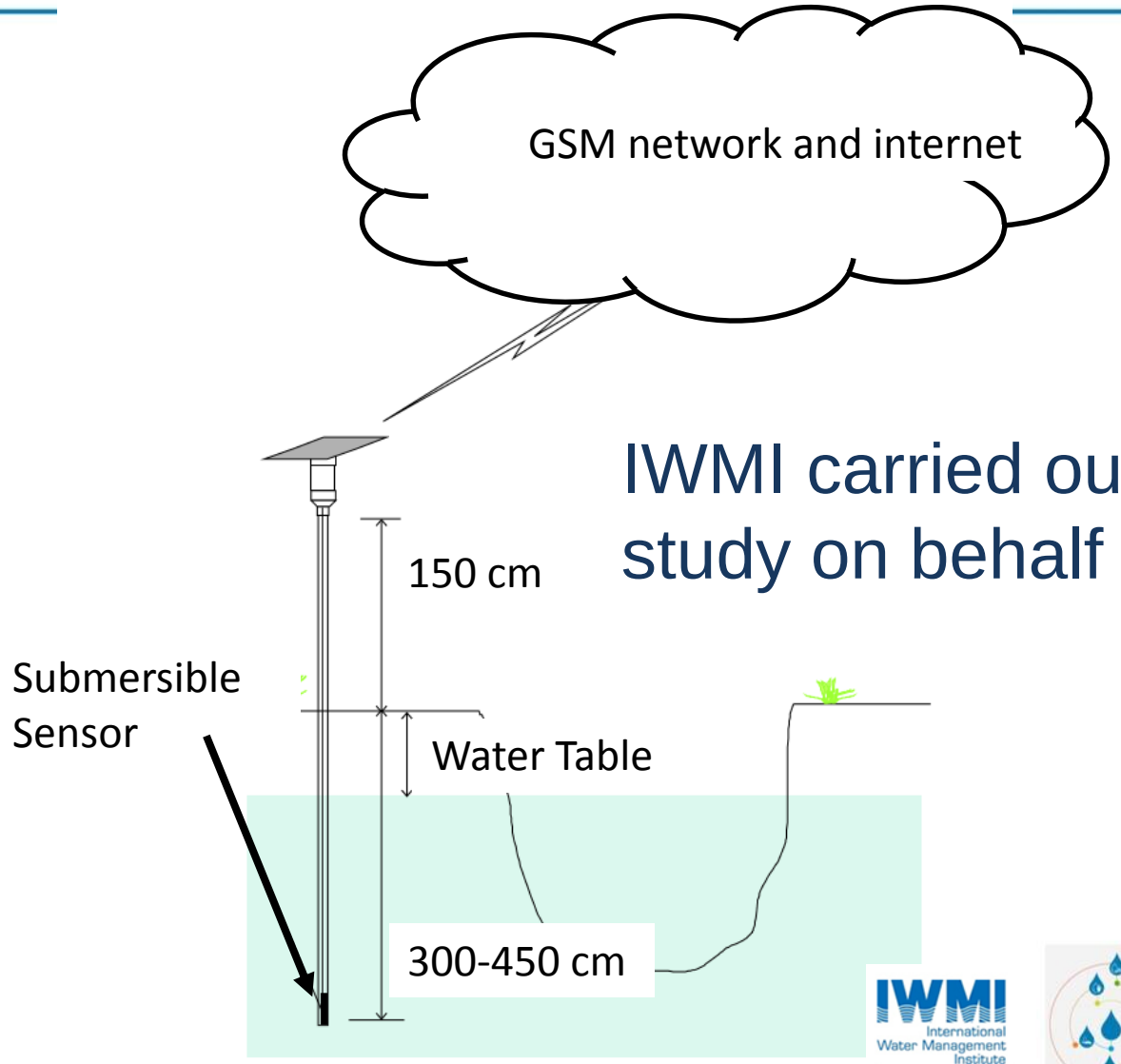
(ii) To recommend water institutions and agro-well users on best practices for the sustainable use of groundwater



Study area

- 1400 ha land area
- 535 ha cultivation
- 383 Agro-wells (10% of total Agro-well)

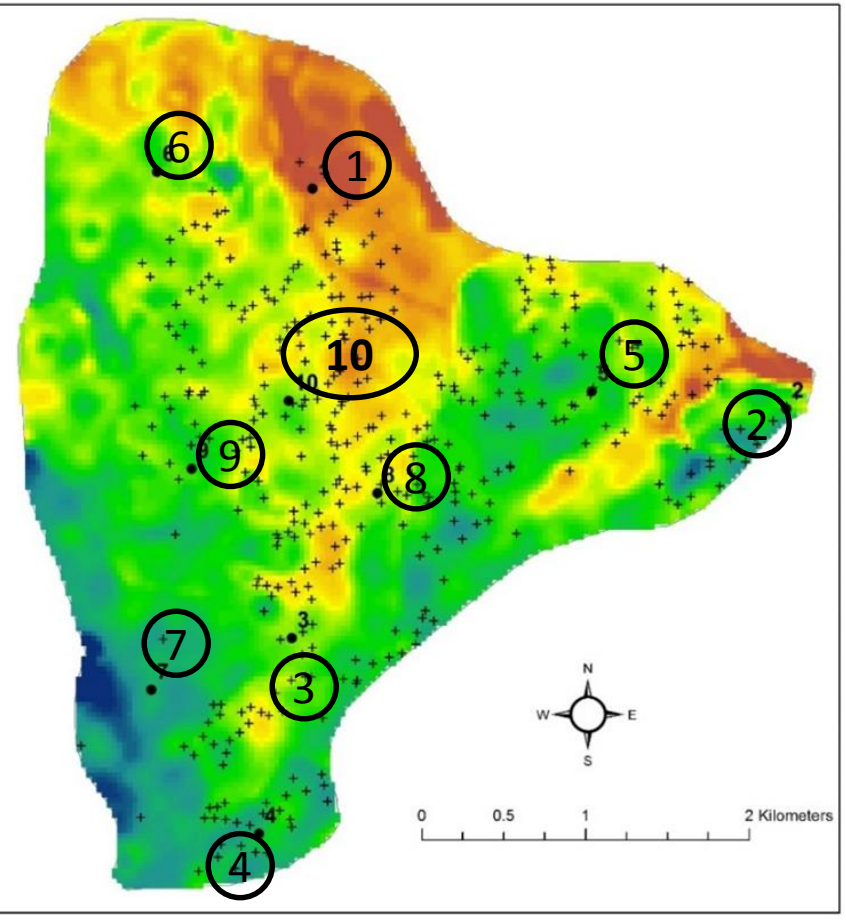
Instrumentation - Solar powered GSM base water level monitoring system



IWMI carried out the study on behalf of ADB

Ground water depth measurements

- Depth to the water table – measures in every 15 minutes
- 10 instruments scattered over the study area



- Additional 27 ground wells were used for taking manual measurements

Online Monitoring System

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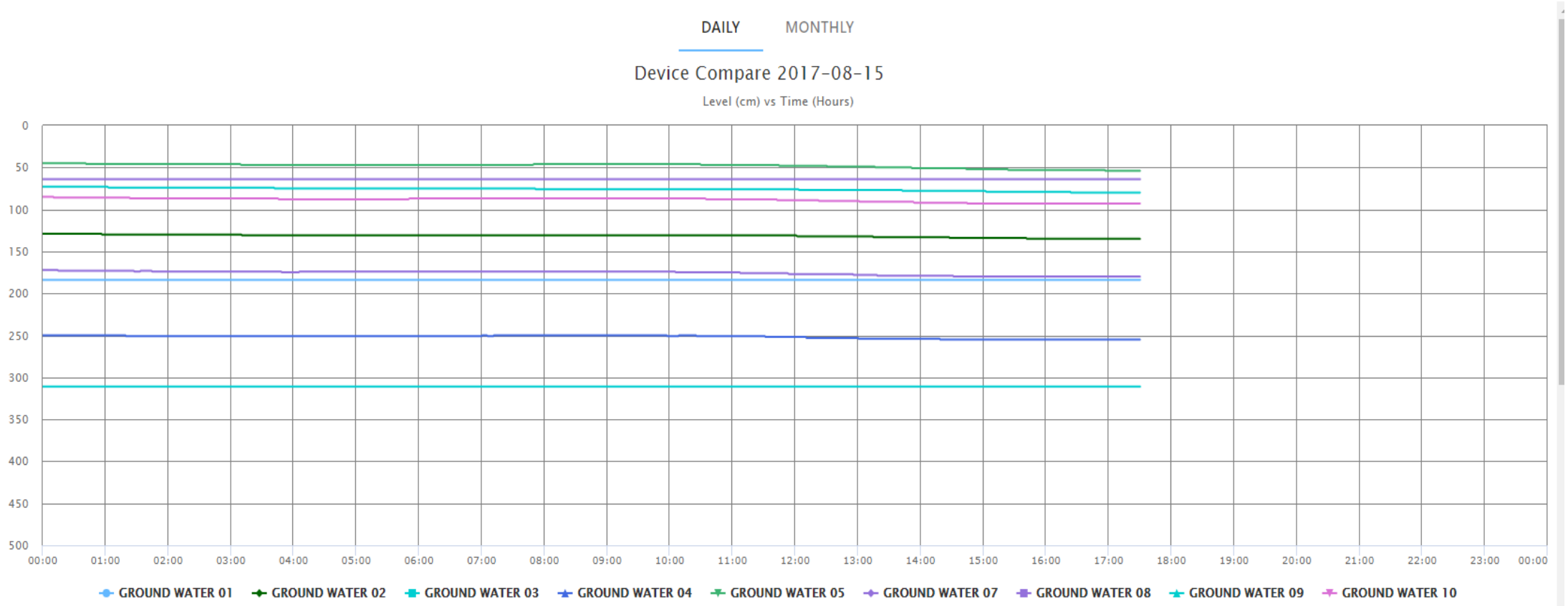
Reservoir Water Level
- KALAWEWA

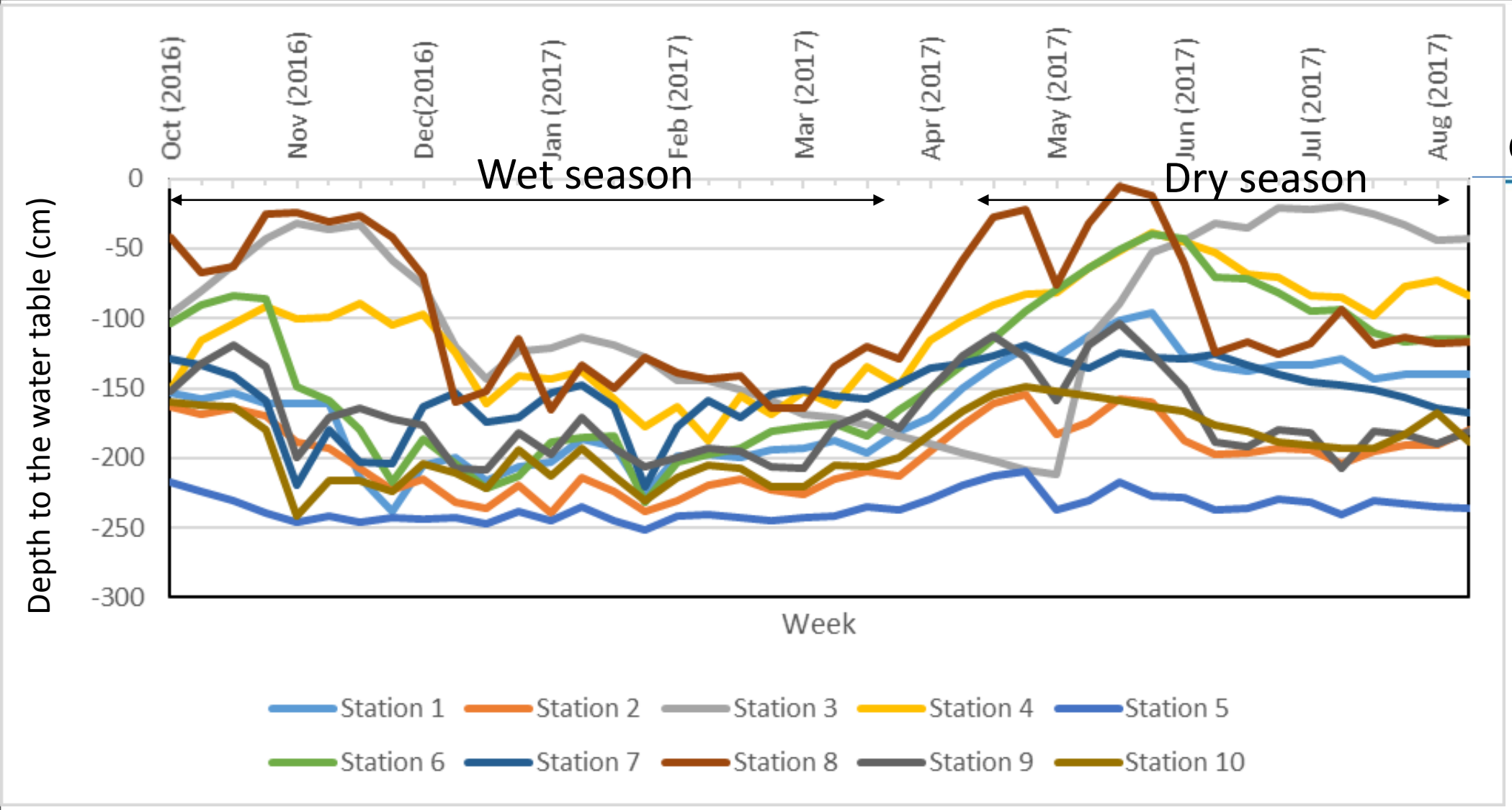
Cannel Water Level
- VIJITHAPURA
- 411/D2
- 402/D11
- BATUWATTE
- DOMBAWELAGAMA

Ground Water Level
- ☑ GROUND WATER 01
- ☑ GROUND WATER 02
- ☑ GROUND WATER 03
- ☑ GROUND WATER 04
- ☑ GROUND WATER 05
- ☐ GROUND WATER 06
- ☑ GROUND WATER 07
- ☑ GROUND WATER 08
- ☑ GROUND WATER 09
- ☑ GROUND WATER 10

Conductivity
- GROUND WATER 05 CONDUCTIVITY

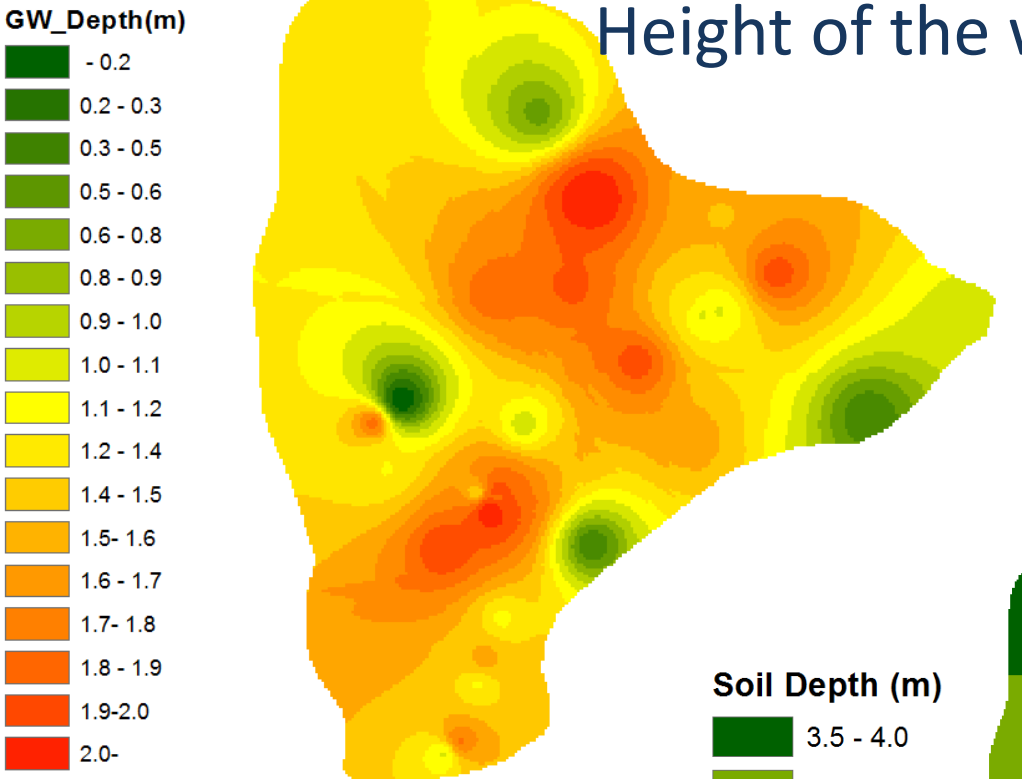
DAILY MONTHLY



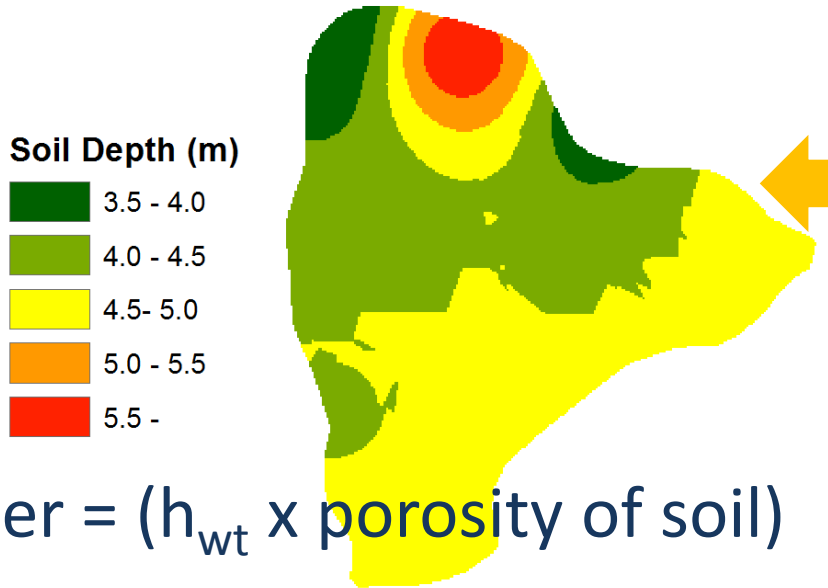


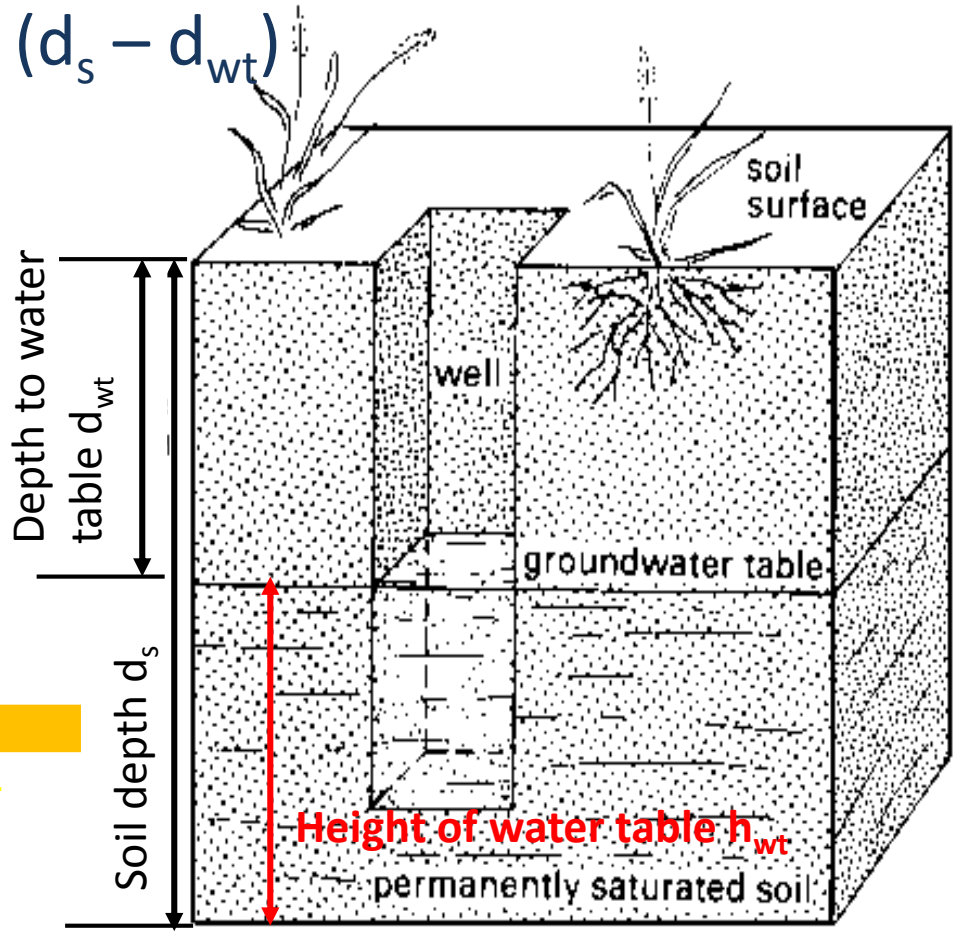
Results are in contrary with the first research objective

Interpolated Ground water depth, soil depth and Ground water volume



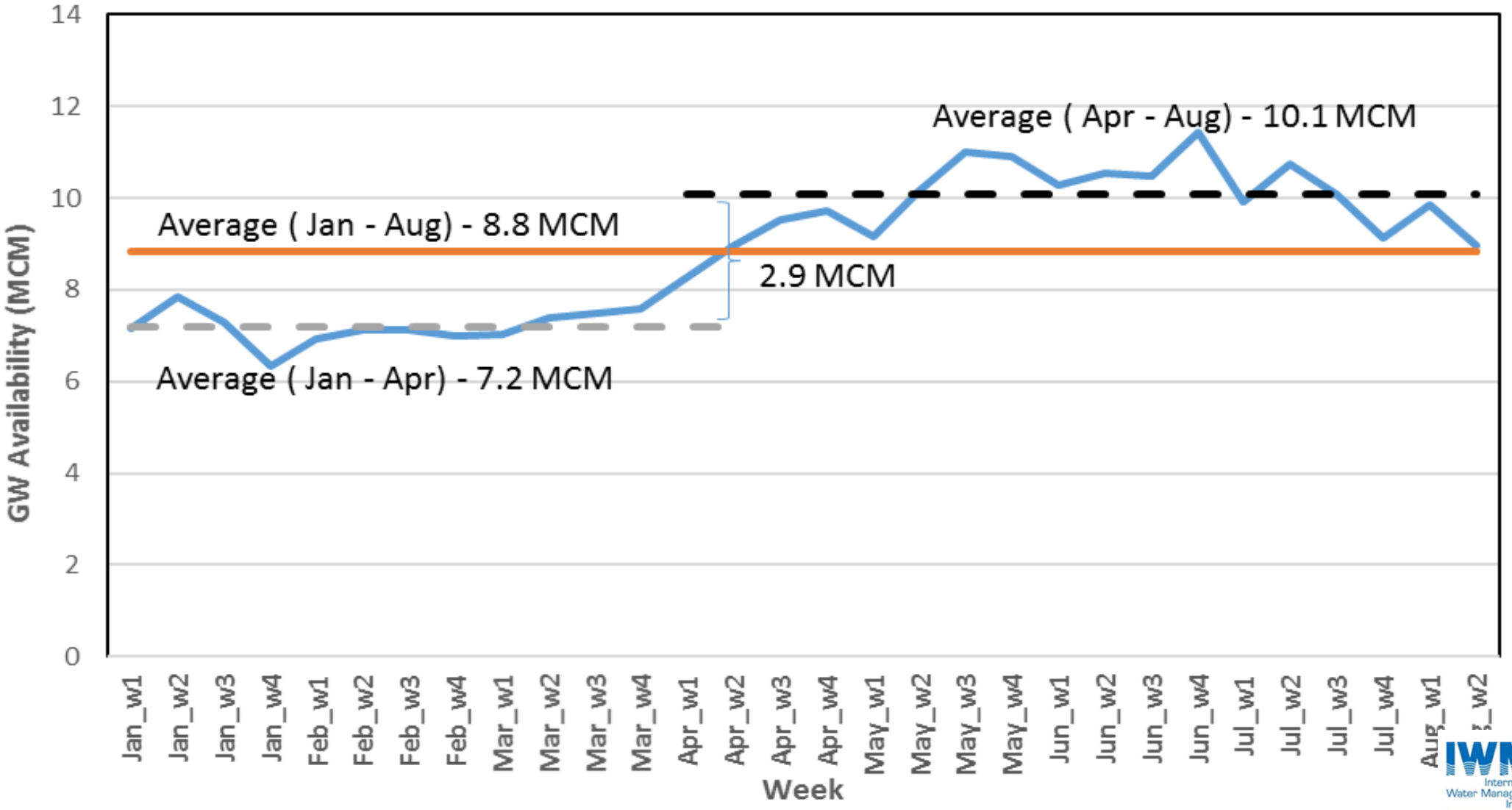
Height of the water table $h_{wt} = (d_s - d_{wt})$





Volume of ground water = (h_{wt} x porosity of soil)

Results- Ground Water availability in volume



Evaluation of results

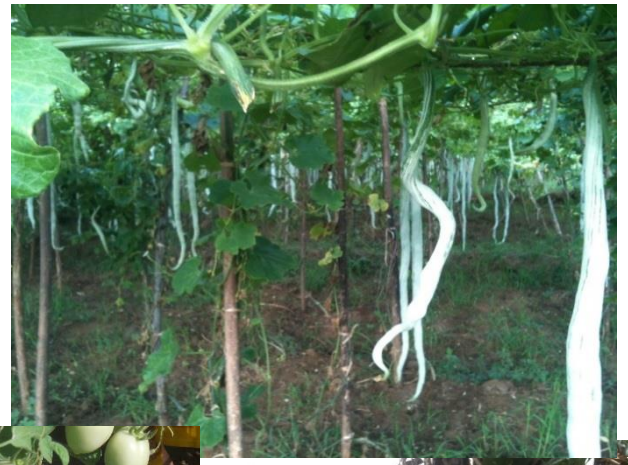
- Dry season (2017) irrigation duty =1900 mm (very high – Av 1100 mm)
- Dry season ground water recharged above Wet season = 2.9 MCM
- Equivalent cultivable area (*under prevailing conditions)* = 152 ha (28%)

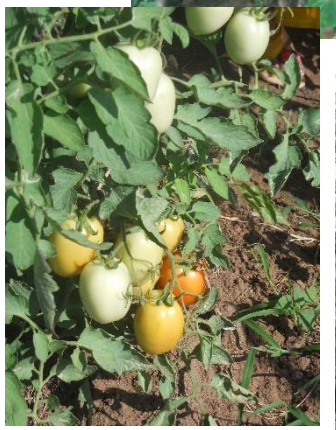
Recommendations

•Micro irrigation systems Vs bulk pumping

- Improved water delivery systems

- Less water consuming crops





Best practices for the sustainable use of groundwater

- Use of ground water is not so vulnerable as predicted
- System rehabilitation will improve over (re)charging of ground water table
- Micro irrigation practices will improve water use efficiency
- In water scarce situations, crop water requirement can be minimized by introducing less water consuming crop types
- Market driven cropping patterns against producer (farmer) driven cropping pattern will improve the farmer's ROI