

ENSO and Pomelo Agriculture in Thailand

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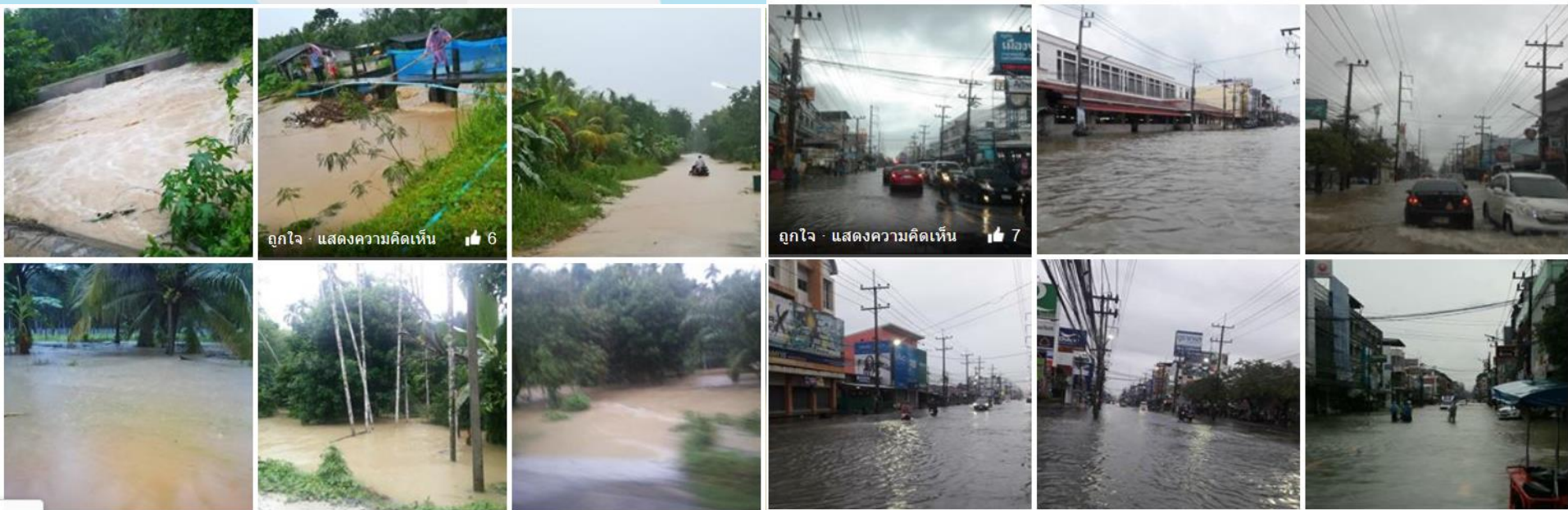
What impacts does water, above and below ground, have on our environment?

On Agriculture?



Pomelo Farming

Sever Flooding in NST in Dec 2017



What impacts of water on our environment?

- Is our area prone to flooding? Erosion? Landslides?
- How is the quality of our soil for growing crops?
- Are we seeing any changes in the amount of precipitation our location receives each year/each month- over the past five years?
- How did the amount of precipitation change during the recent El Nino?



- Siam Ruby Pomelo is the best pomelo in Thailand growing only in a small area in Nakhon Si Thammarat, Thailand.
- Red, Sweet and Juicy is the key.
- 1 Pomelo costs \$10 at the farm, \$50 in department stores in Bangkok.
- Export to China, Singapore and Hong Kong with millions USD/year.
- Flooding in NST causes sever damage to the orchard.

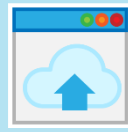
Wirat Suksaeng is the orchard owner

Water is so important



- Before harvesting, farmers stop watering Pomelo for 10-14 days.
- Keep soil moisture low, make pomelo very sweet.
- If soil moisture is too low, pomelo will damage causing 10% product loss.





Objective

- Deploying automatic weather station and soil station at the orchard.
- Measuring rain fall, air moisture, soil temp, soil moisture.
- Installing Eco-camera with online services
- Data visualization near real time online

การพัฒนาเทคโนโลยีเกษตรแม่นยำสำหรับสวนส้มโอทับทิมสยาม

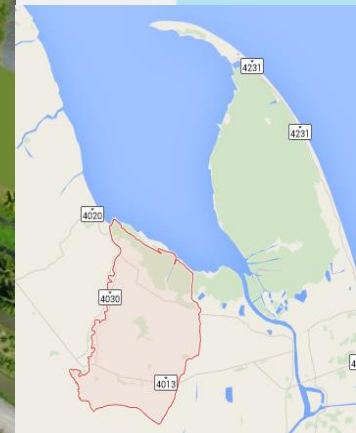
Precision Irrigation for Siam Ruby Pomelo Smart Farming

Smart Farming Siam Ruby Pomelo



- ส้มโอทับทิมสยาม อายุ 3 ปี 20 ไร่
- 1 ส้มโอทับทิมสยาม อายุ 12 ปี 5 ไร่ (Smart Farming Siam Ruby Pomelo)
- 2 ส้มโอทับทิมสยาม อายุ 13 ปี 20 ไร่
- ส้มโอทับทิมสยาม อายุ 6 ปี 3 ไร่
- จุดติดตั้ง Weather Station ใน Smart Farming
- จุดติดตั้งกล้องถ่ายภาพแบบอัตโนมัติ 2 ชุด
- โรงเรือนเลี้ยงไก่
- อาคารอเนกประสงค์
- จุดติดตั้งเซ็นเซอร์ดิน
- จุดติดตั้งปั๊มน้ำบาดาล
- สวนกล้วย

ศูนย์ความรู้เฉพาะด้านนิเวศวิทยาเกษตรและการจัดการ มหาวิทยาลัยวลัยลักษณ์
 หัวหน้าโครงการ: รศ.ดร.กฤษณะเดช เจริญสุธาธิ
 ปิยะมิตรและประมวลผลภาพ: รศ.ดร.กฤษณะเดช เจริญสุธาธิ
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 กราฟิก: น.ส.ณิธิ เรืองรุ่ง



Drone photo mapping at NST, Thailand

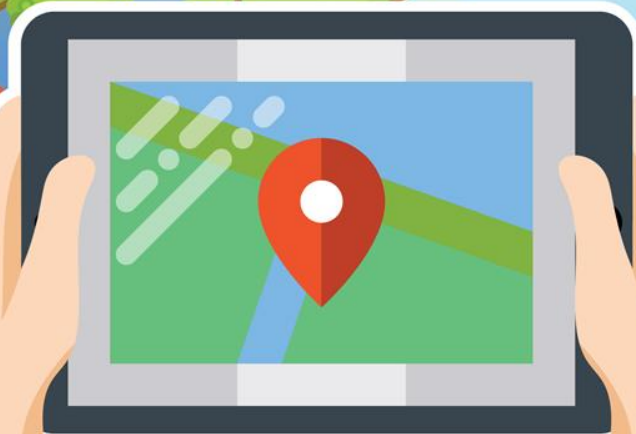


- Weather station
- Soil station
- Ecocamera





- Real time online visualization
- Drone Mapping

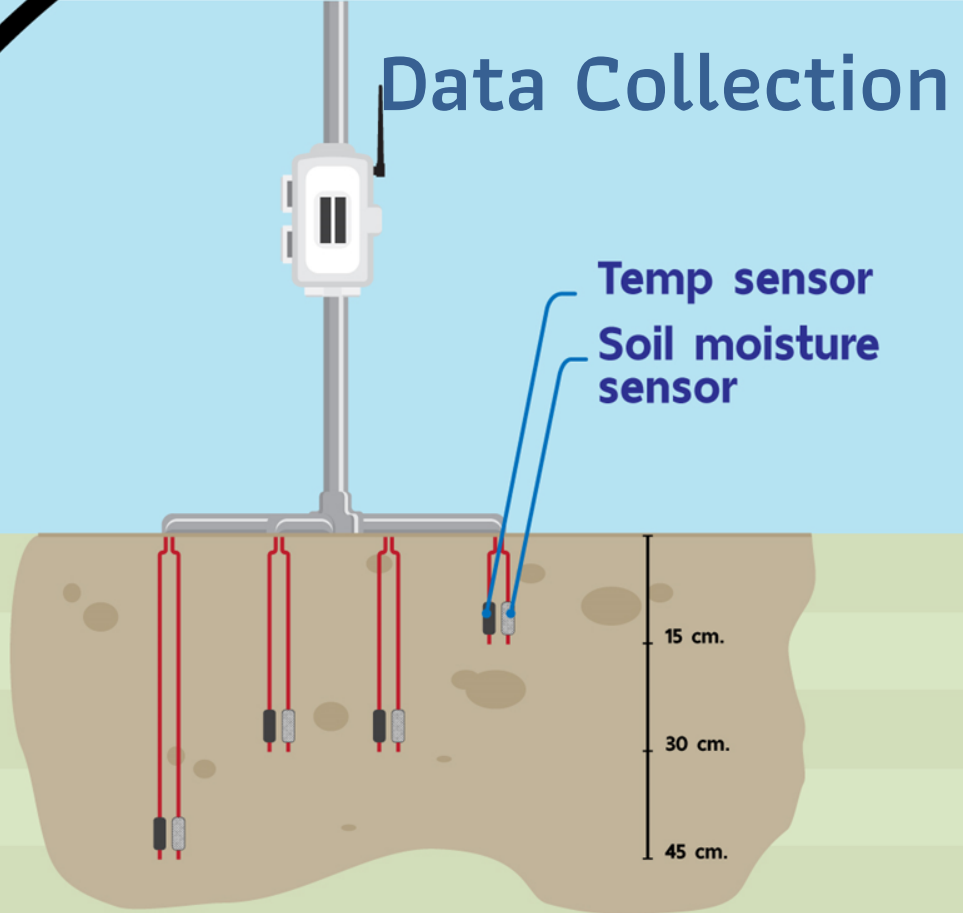


Automatic Weather station



Data Collection

Temp sensor
Soil moisture sensor



Soil station

Soil Sensor depth: 15, 30, 45 cm



Pakphanang Smart Pomelo Farm

34.2 °C

04 Sep 2017 02:00 PM

0.0 mm

-2.0 mb/h

61 %

06:11 AM 06:25 PM



Pakphanang Smart Pomelo Farm

34.2 °C

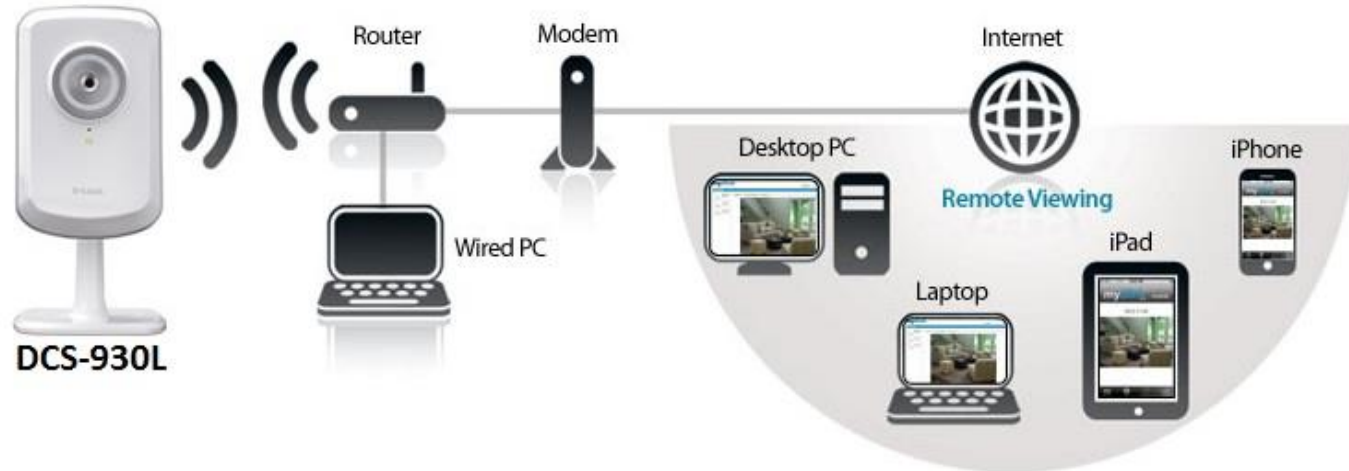
04 Sep 2017 02:00 PM

0.0 mm

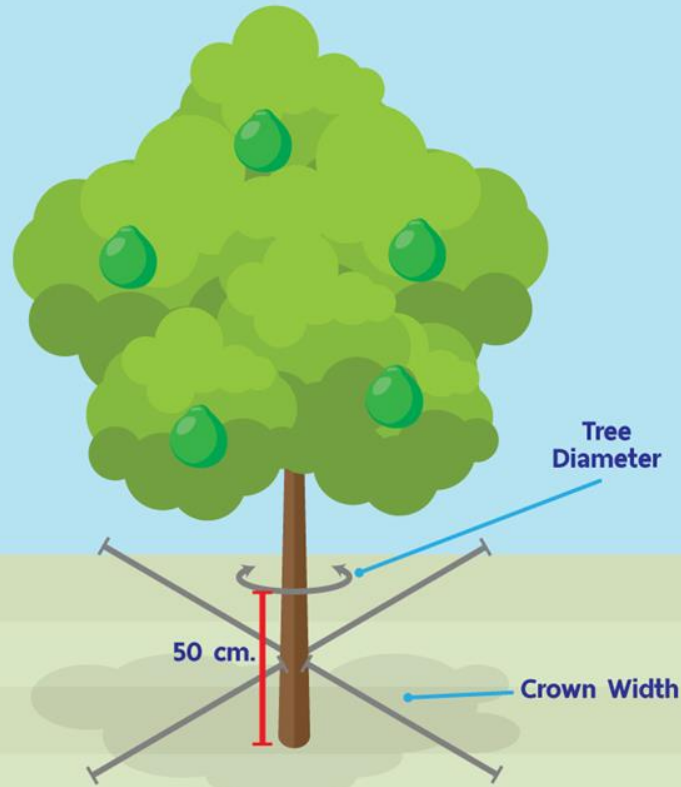
-2.0 mb/h

61 %

Eco-camera

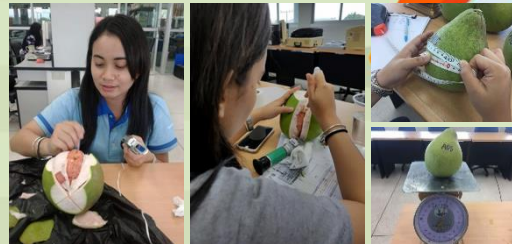
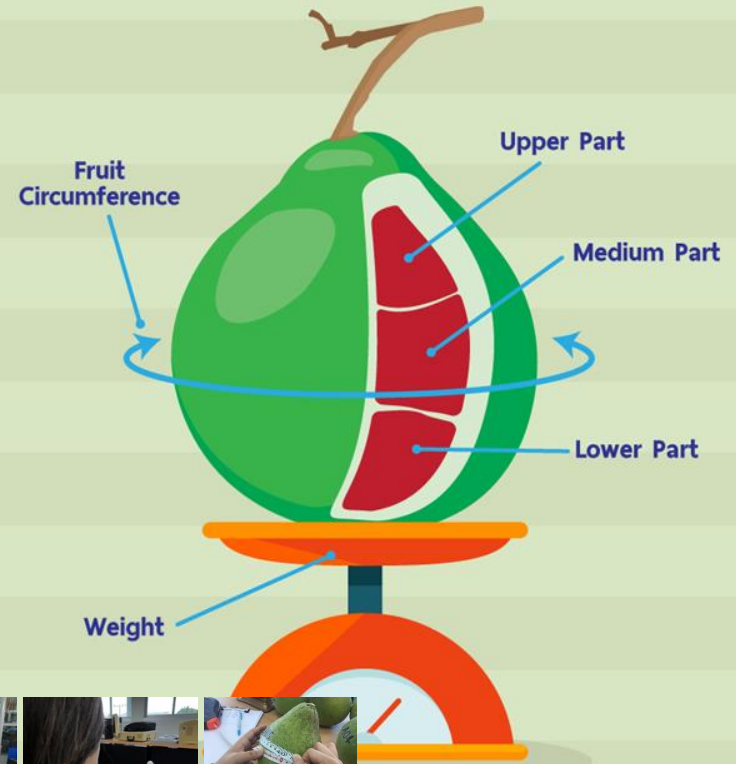


Ecocam for monitoring weather, soil, leaf, and fruit condition

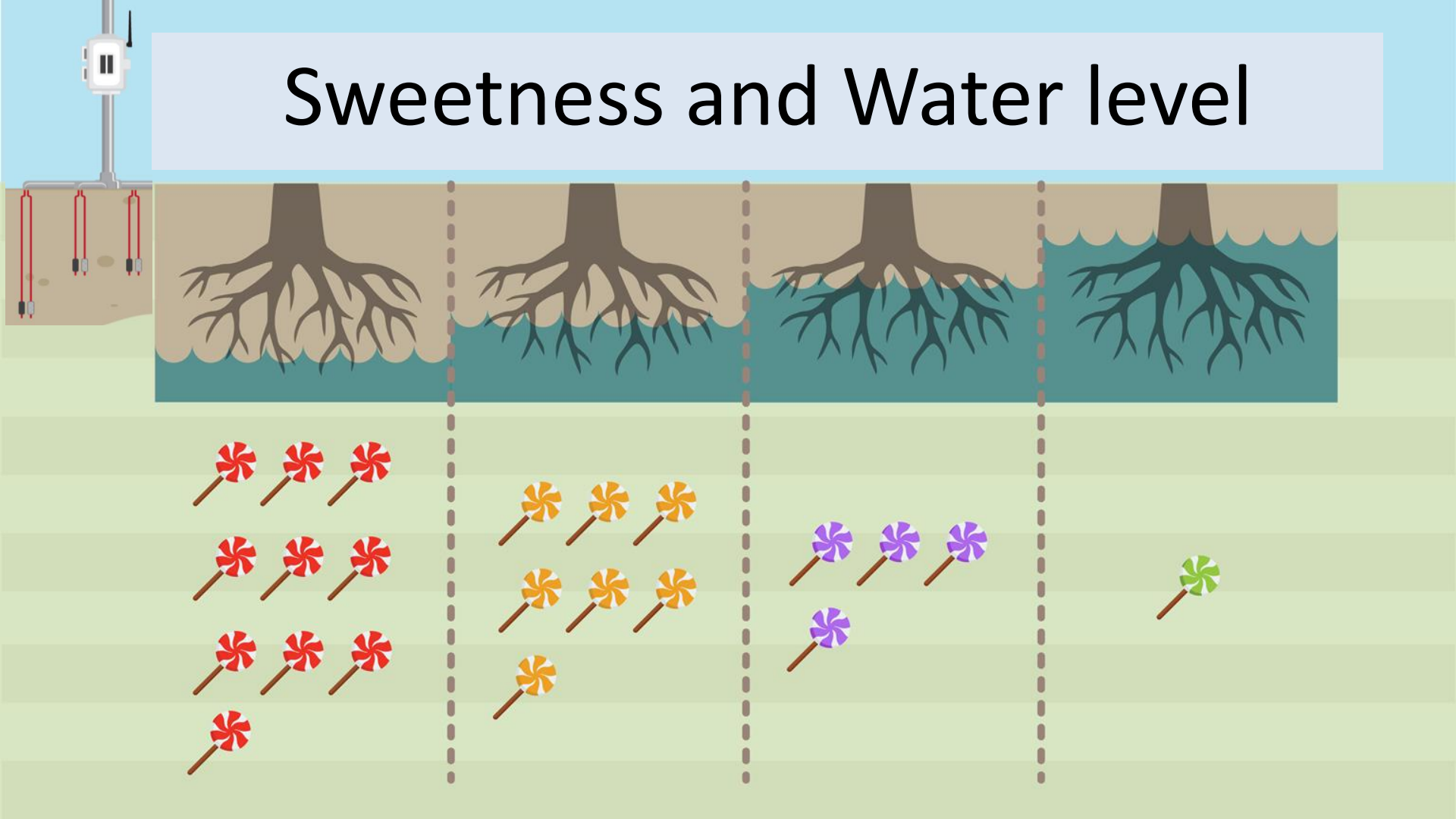


Tree DBH and crown width

Fruit Sweetness

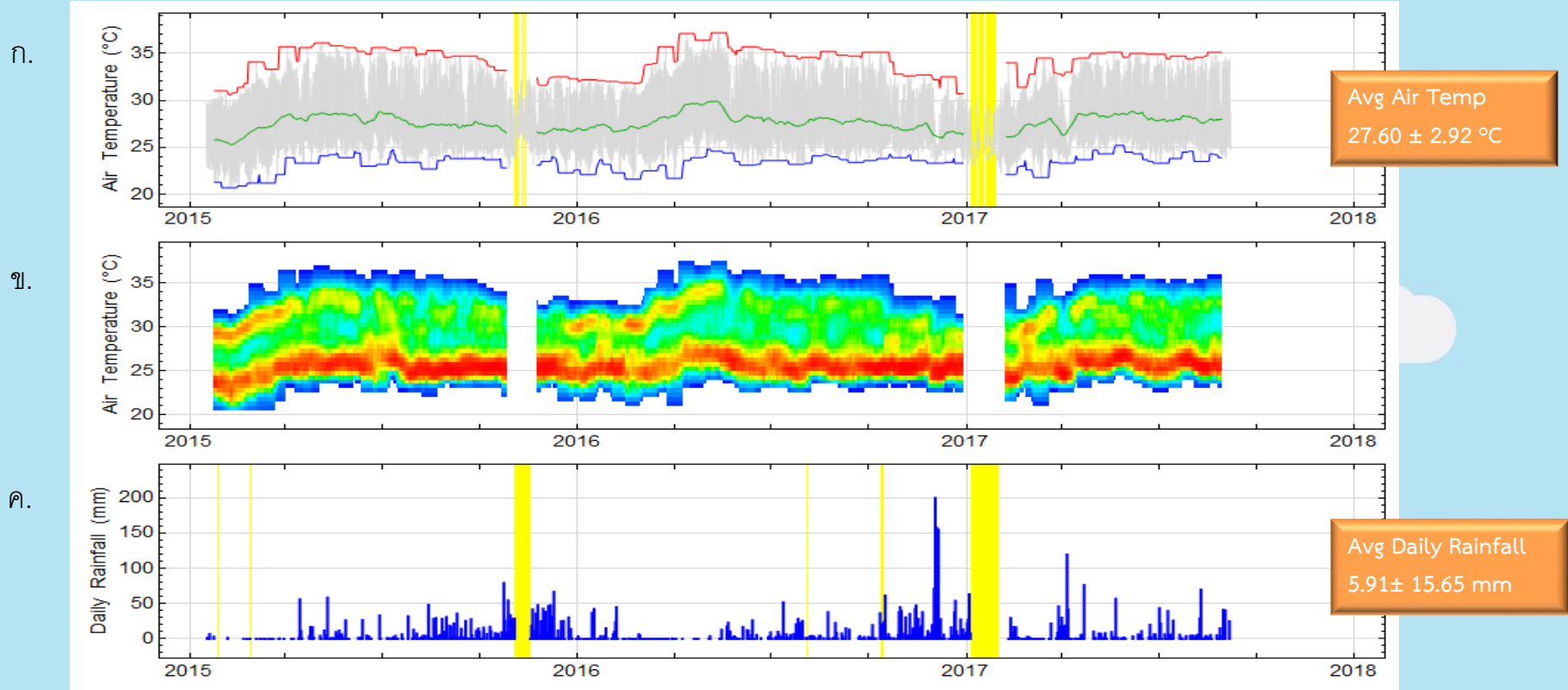


Sweetness and Water level



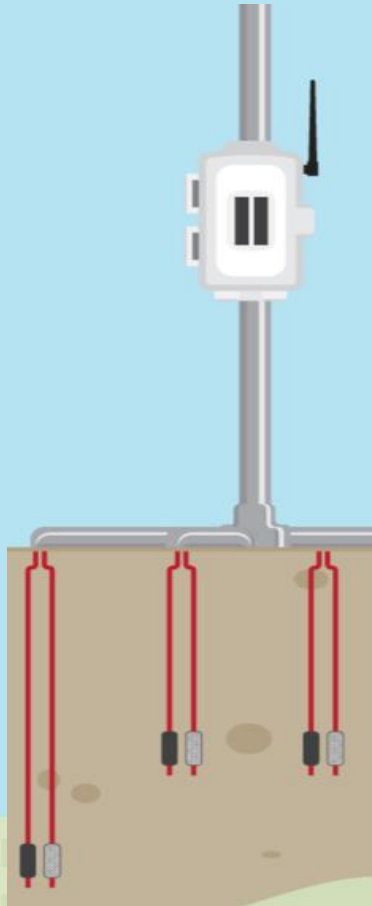
❖ Air Temp and rainfall 3 years [2015-2017]

Results



5 Flooding events in 2017, 1 Flooding event in 2018

❖ Soil moisture 3 years [2015-2017] at 15, 30 & 45 cm



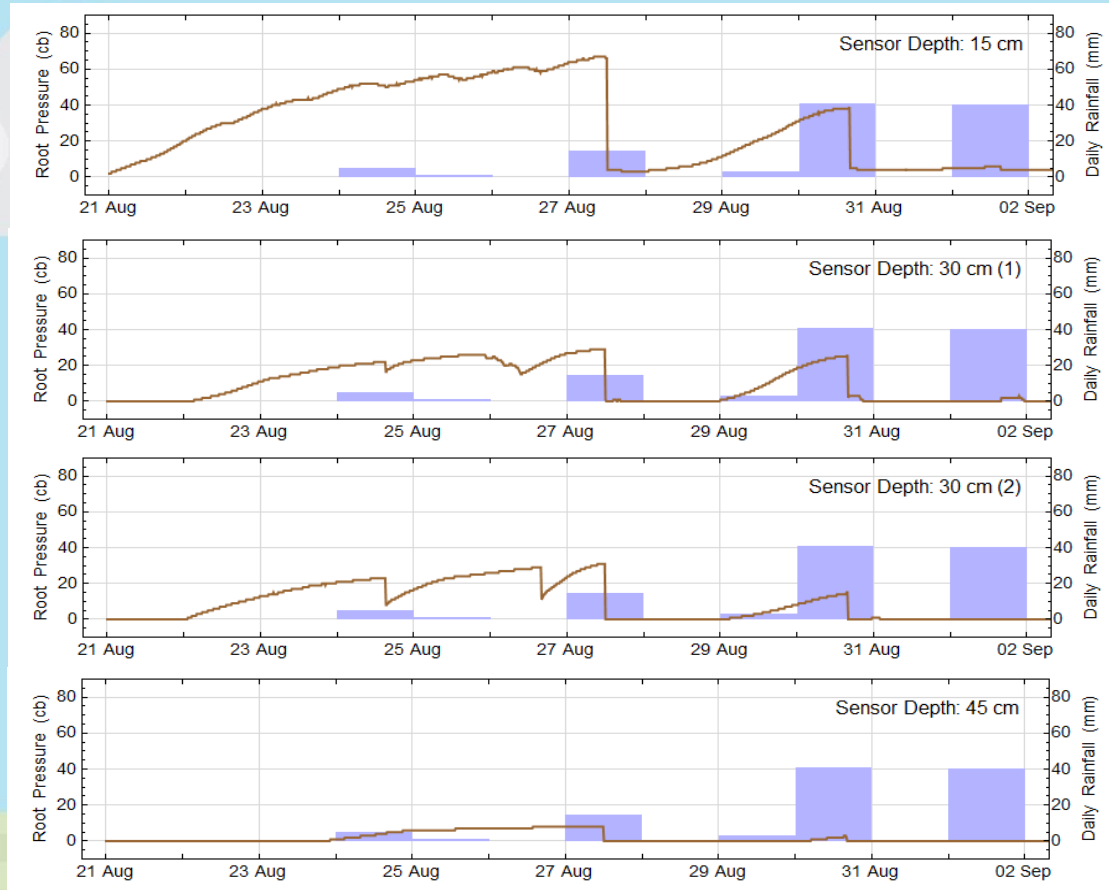
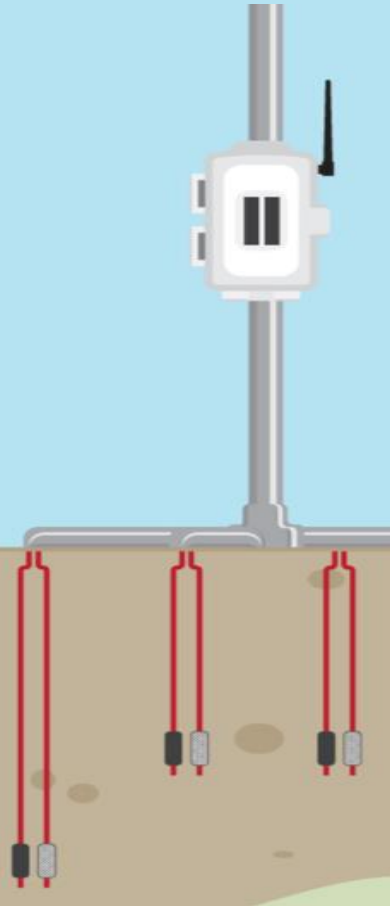
Soil Moisture
 32.44 ± 58.79 cb

Soil Moisture
 13.79 ± 30.16 cb

Soil Moisture
 8.77 ± 18.95 cb

Soil Moisture
 5.11 ± 8.85 cb

❖ Soil moisture at 15, 30 & 45 cm and daily



Dry



Soil moisture
 28.82 ± 22.09 cb

Wet

Dry



Soil moisture
 10.44 ± 10.49 cb

Wet

Dry



Soil moisture
 9.55 ± 10.30 cb

Wet

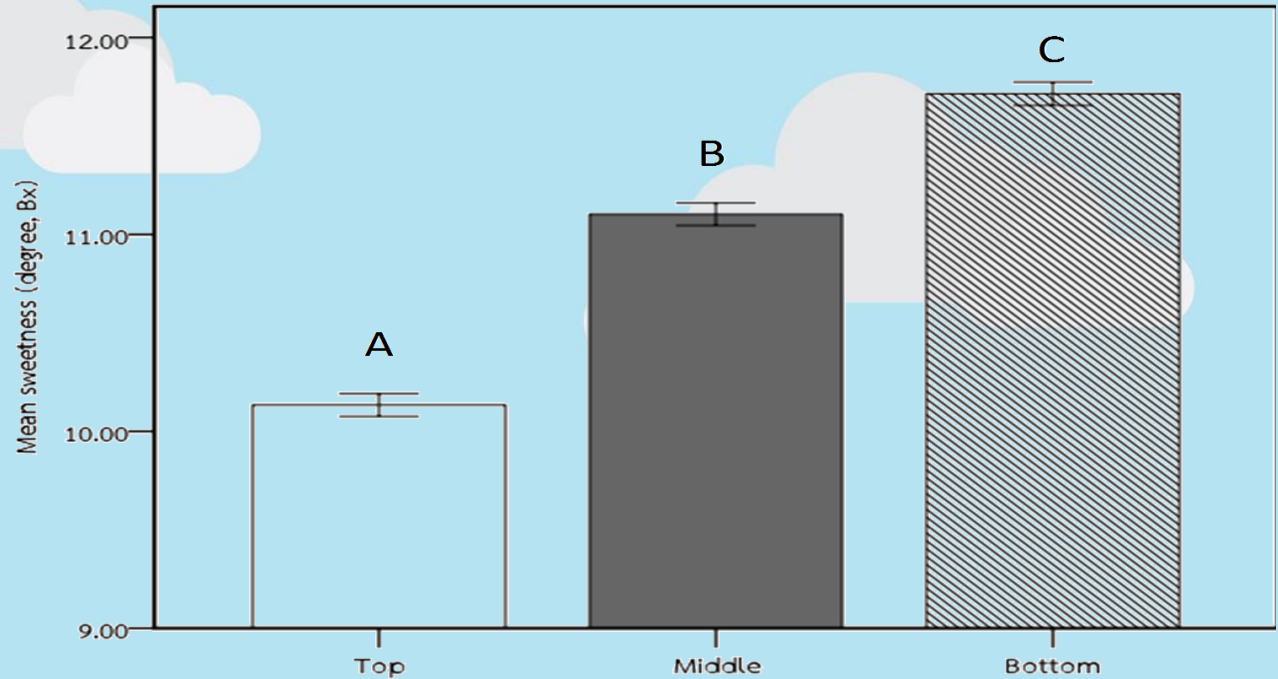
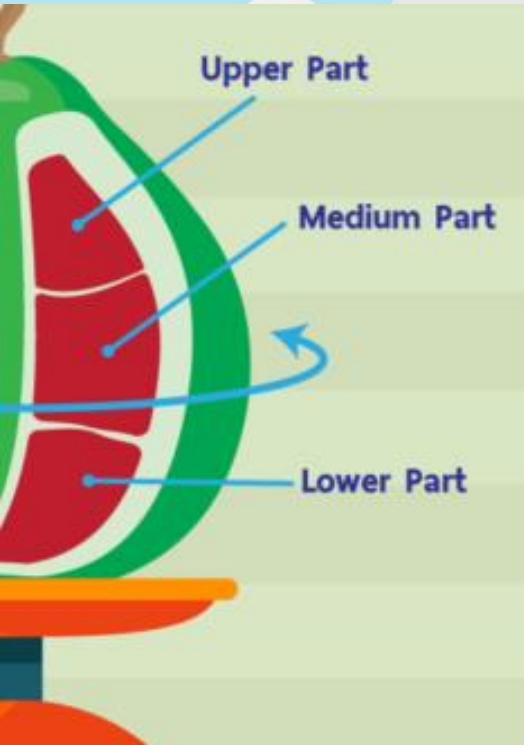
Dry



Soil moisture
 1.85 ± 2.95 cb

Wet

❖ Sweetness depending on fruiting parts

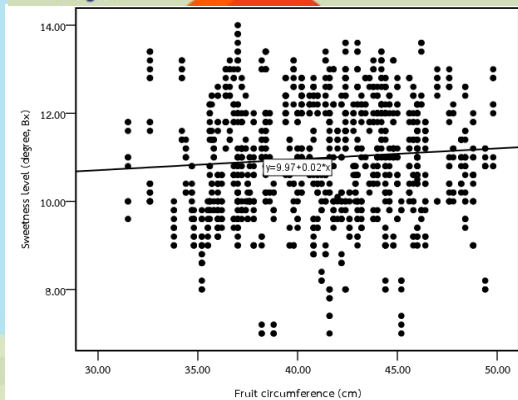
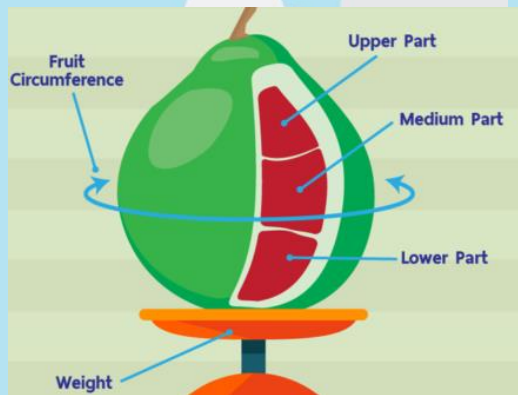


[A] Upper Part

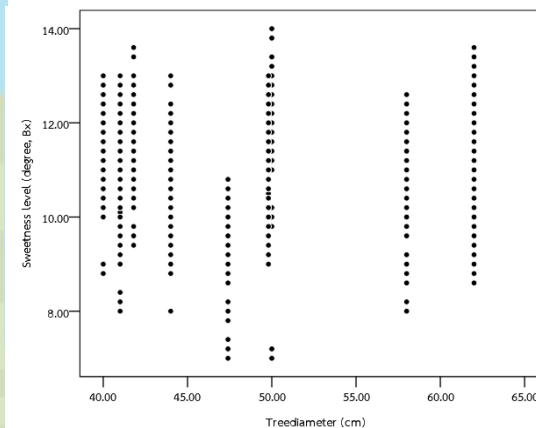
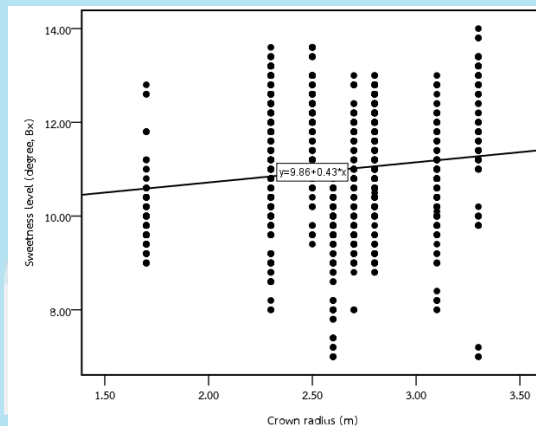
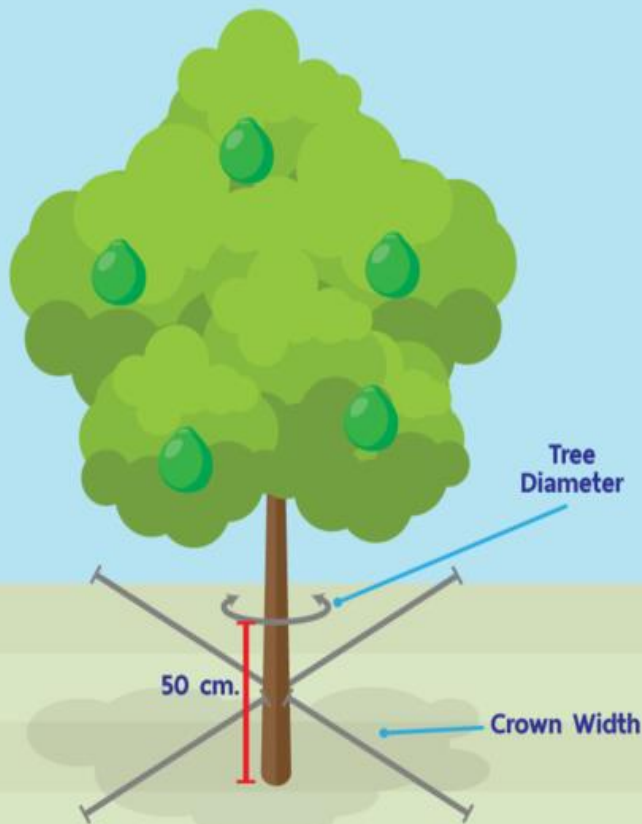
[B] Medium Part

[C] Lower Part

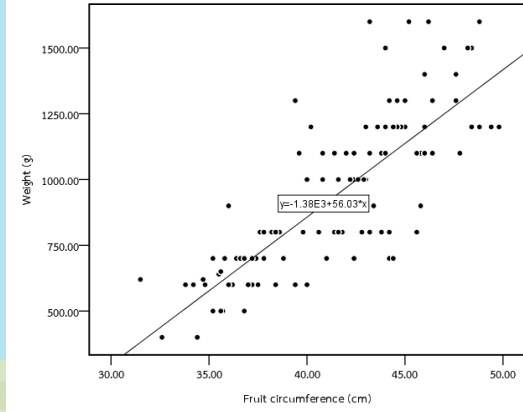
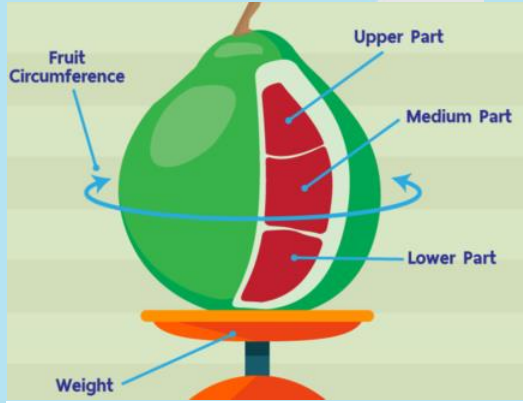
❖ Pomelo size and sweetness



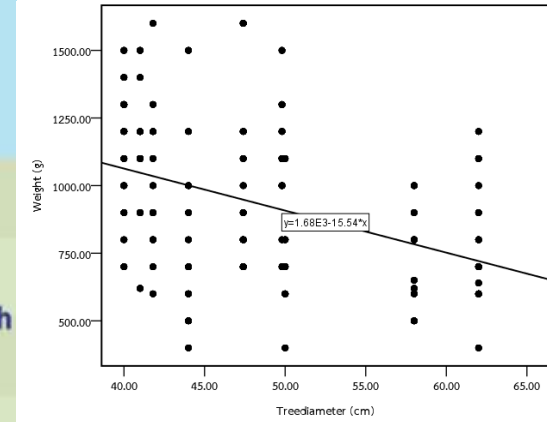
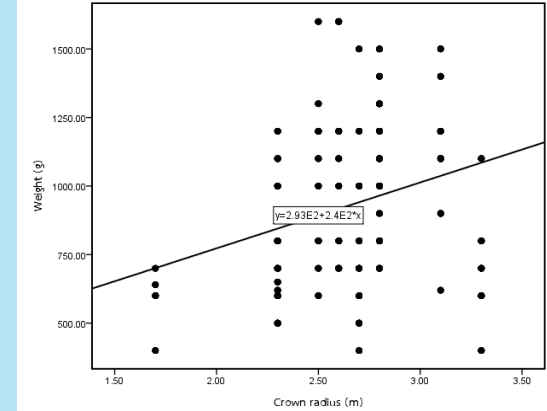
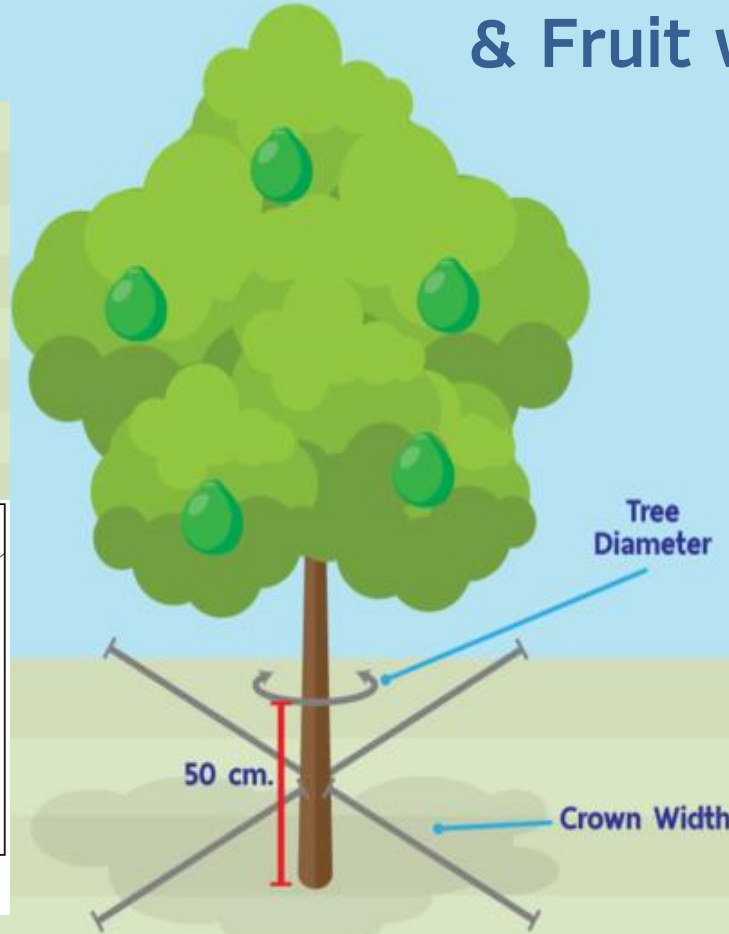
❖ Crown radius, tree diameter and sweetness



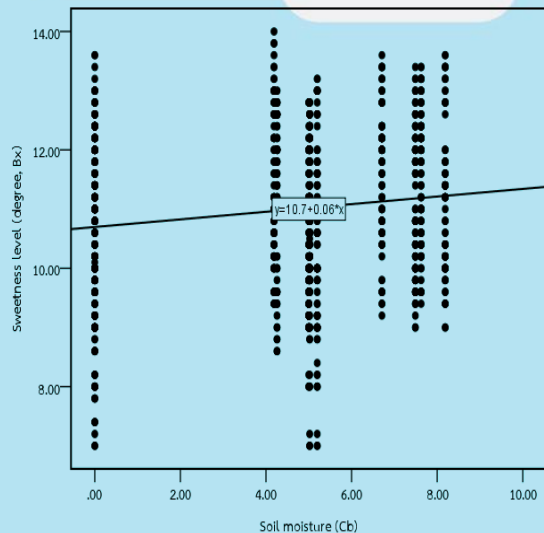
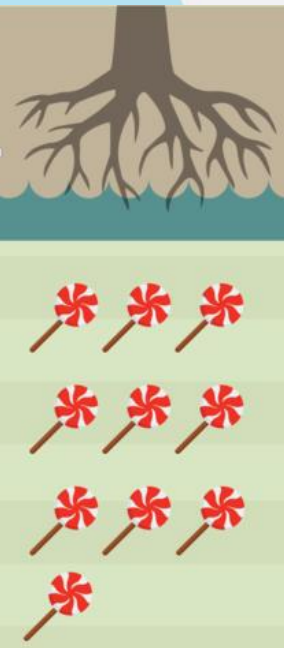
Fruit Weight & size



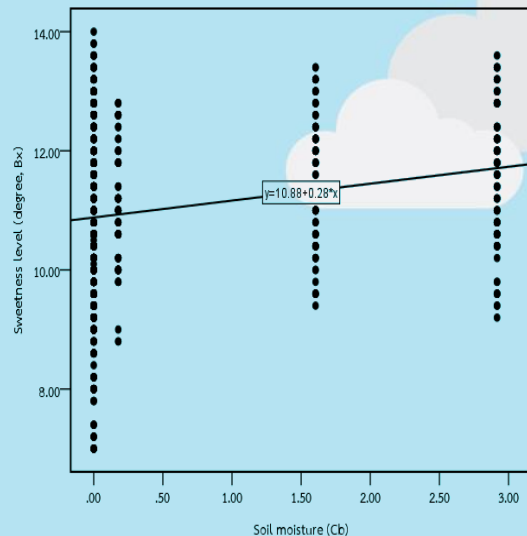
Crown radius, tree diameter & Fruit weight



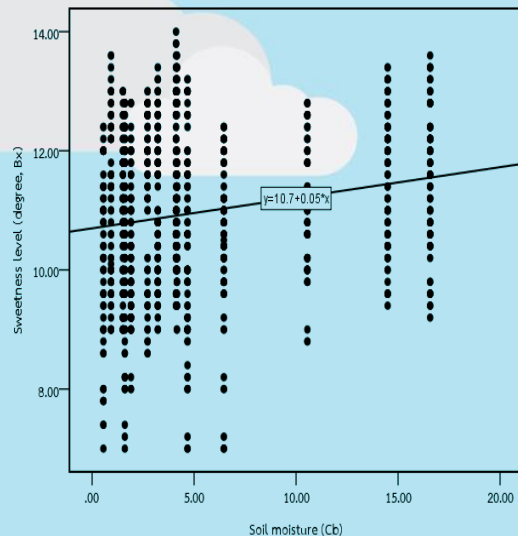
- ❖ Soil moisture at 15, 30, 45 cm and sweetness
- ❖ Soil becomes drier, Pomelo becomes sweeter



Soil depth 15 cm



Soil depth 30 cm



Soil depth 45 cm



เรียบเรียงโดย รศ.ดร. นิลลิกา เจริญสุธาวิทย์
รศ.ดร. กฤษณะเดช เจริญสุธาวิทย์ มหาวิทยาลัยวลัยลักษณ์

ส้มโอทับทิมสยาม

"แดง หวาน อร่อย"

Conclusion

- Water is important.
- Too much is not good for farmers.
- Precision Farming using automatic weather station, soil station & Ecocam help farmers irrigate their Pomelo orchard, reduce the cost, improve Pomelo quality, gain better incomes.

Acknowledgements

- We thank the Talent Mobility Project
- Wirat Suksaeng, Pomelo Orchard farmer
- Center of Excellence for Ecoinformatics, Walailak University

