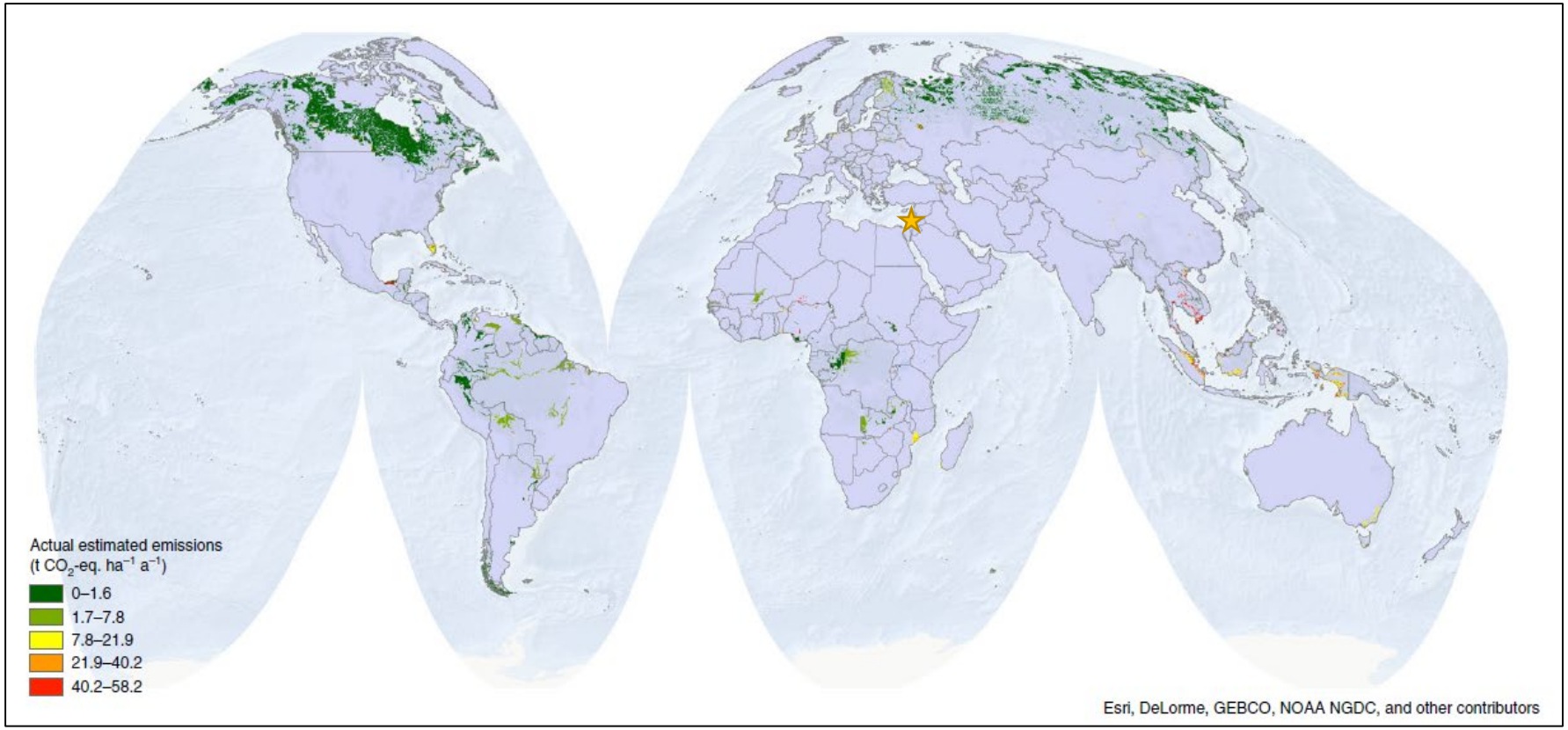
ממשק אדמות הכבול והשפעותיו ארוכות הטווח על תהליכי מינרליזציית קרקעות בסביבת האגמון

Long-Term Peat Preservation Under Cropland and Groundwater Management

Rotem Golan, Yaniv Freiberg, Roee Katzir, Meni Ben-Hur, Oren Reichmann

Funding: KKL grant

Peatlands



(Leifeld & Menichetti et al., 2018).

- **Peatlands cover 3% of terrestrial area**
- **20% of the global soil organic stock**

Global drained peat emissions account for

~0.91 Pg $CO_{2\text{-eq}}$ yr^{-1} (Tubiello et al., 2016)

Short History

- **Marsh and freshwater lakes in Hula Valley >4 Myrs**
  → Lacustrine sediments and peat accumulation
  (last of which - Millennia)
- 1951-1958; drainage project → peat exposure
  [world wide practice]
  - Land reclamation for agriculture, reduce water evaporation
  - Exposure caused spontaneous burning of the peat, land subsidence, winter floods, nutrients release down stream and soil erosion (dust)
- 1993 - Land and water protection project; Groundwater level stabilization and partial re-flooding – Hula Peatlands Project
  - Aimed at stabilizing peat soils and decrease fluxes of nutrients washed down stream
    → peat protection → mitigation of emissions → C stock preservation

Hula Valley, Ben-Dov 1926

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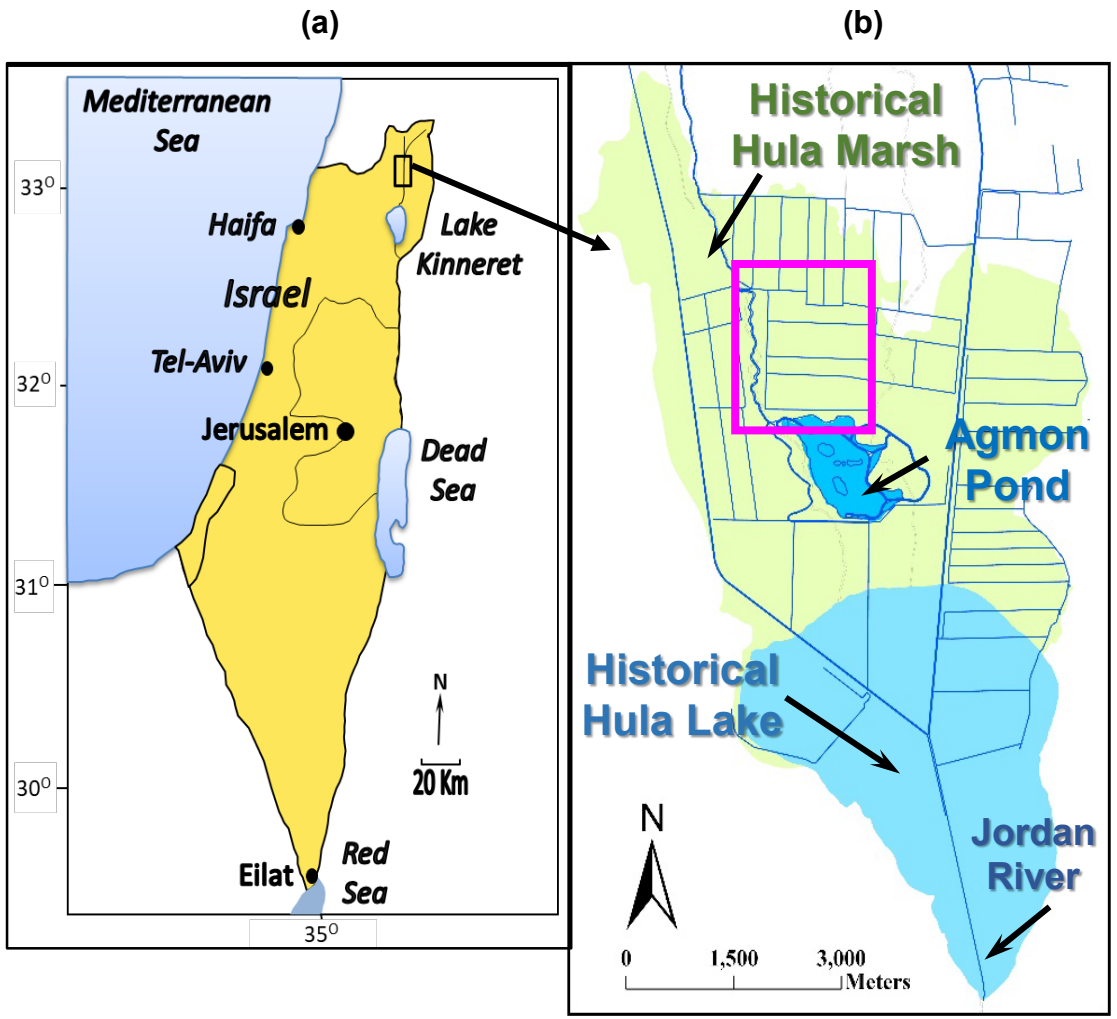
Objective

Assessing the effect of management strategy (groundwater level control, agricultural practices) on the fate of organic carbon in drained and exposed peatlands

Study site – Hula Valley



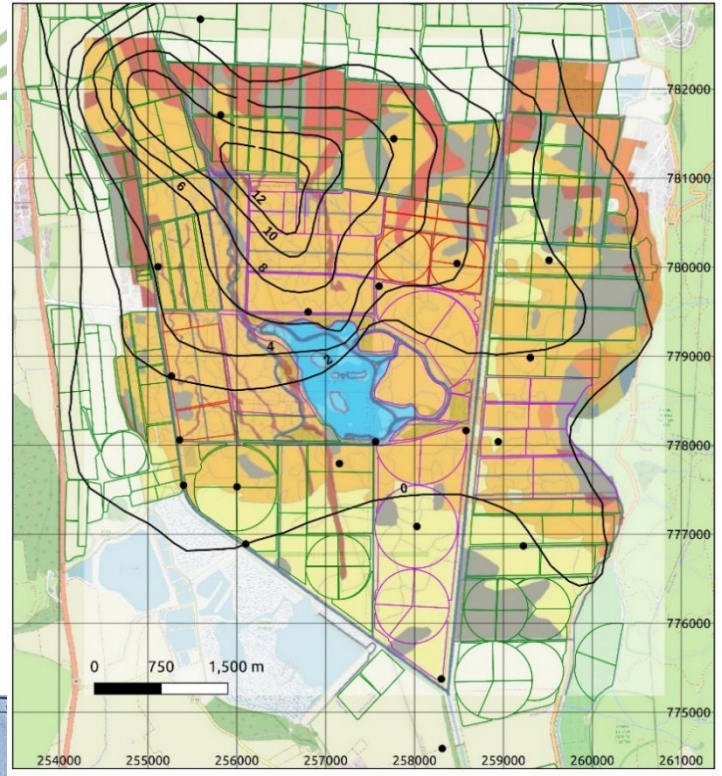
- Ground water level regulation
- Regulated by drainage channels
- Year-long center pivot or linear irrigation systems

- <u>Conflict</u> - drainage for agricultural practice
  - High water content; prevent cultivation and root stress
  - Low water content; soil erosion, deterioration

Soil preservation =
Mitigation of carbon loss

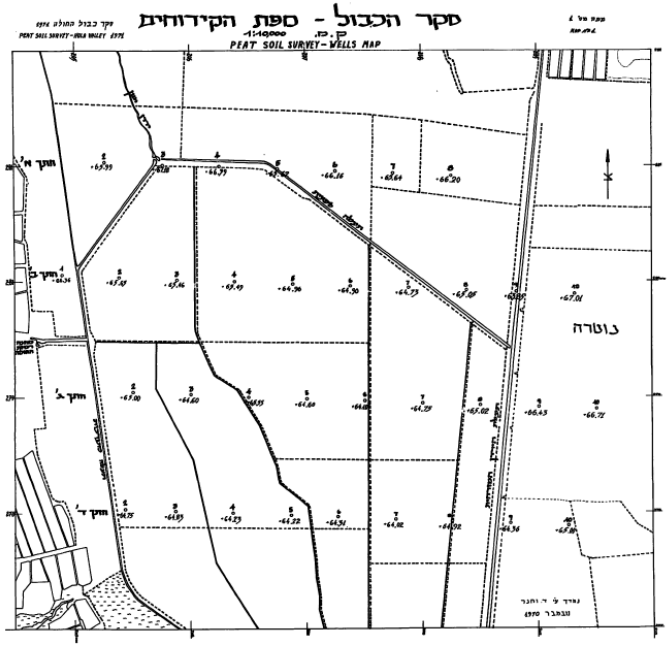
Historical peat maps

(Modified after: Bein 1967, Marish 1986 and Litaor et al. 2011)

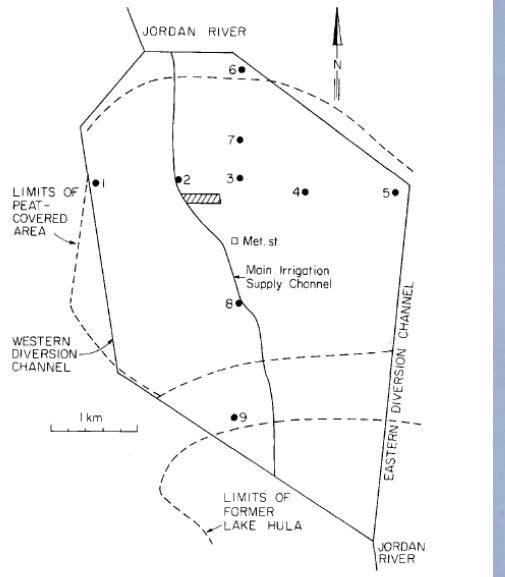


Historical peat coverage was estimated based on multiple studies, conducted between 1960-1990

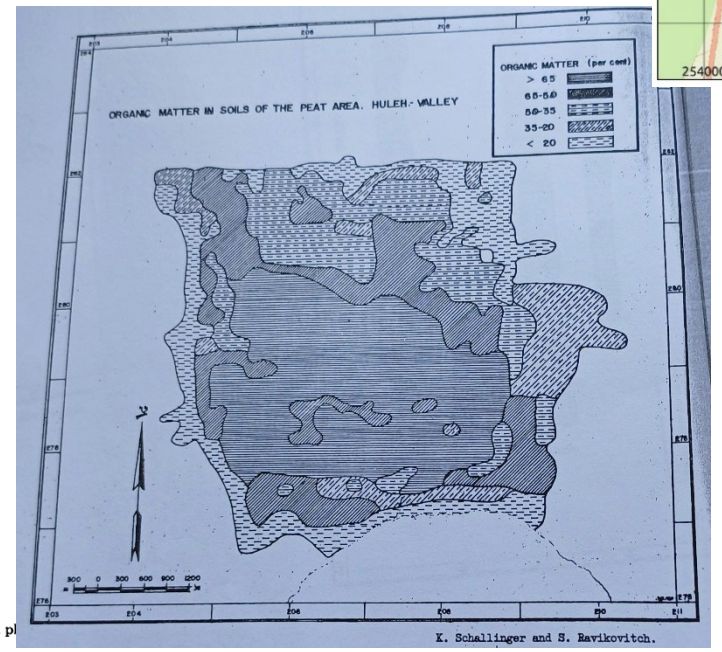
→ Sampling scheme



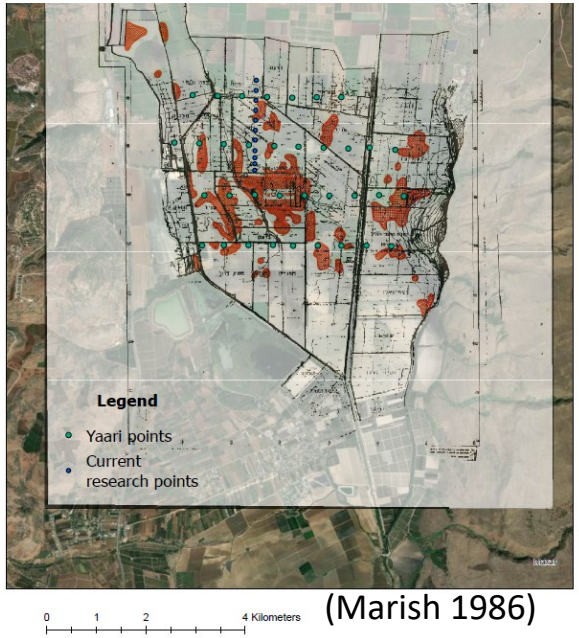
(Yaari Cohen et al. 1971)



(Dasberg and Neuman 1977)

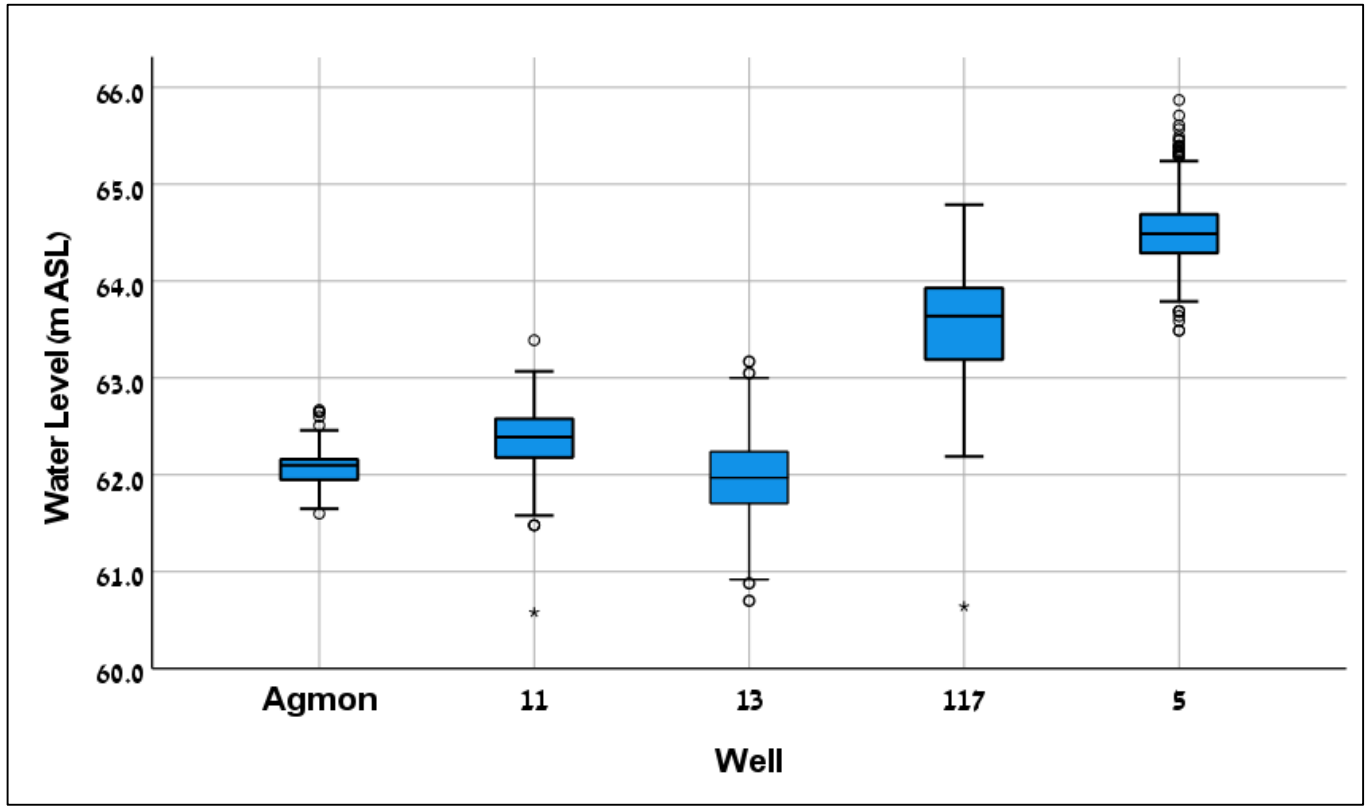


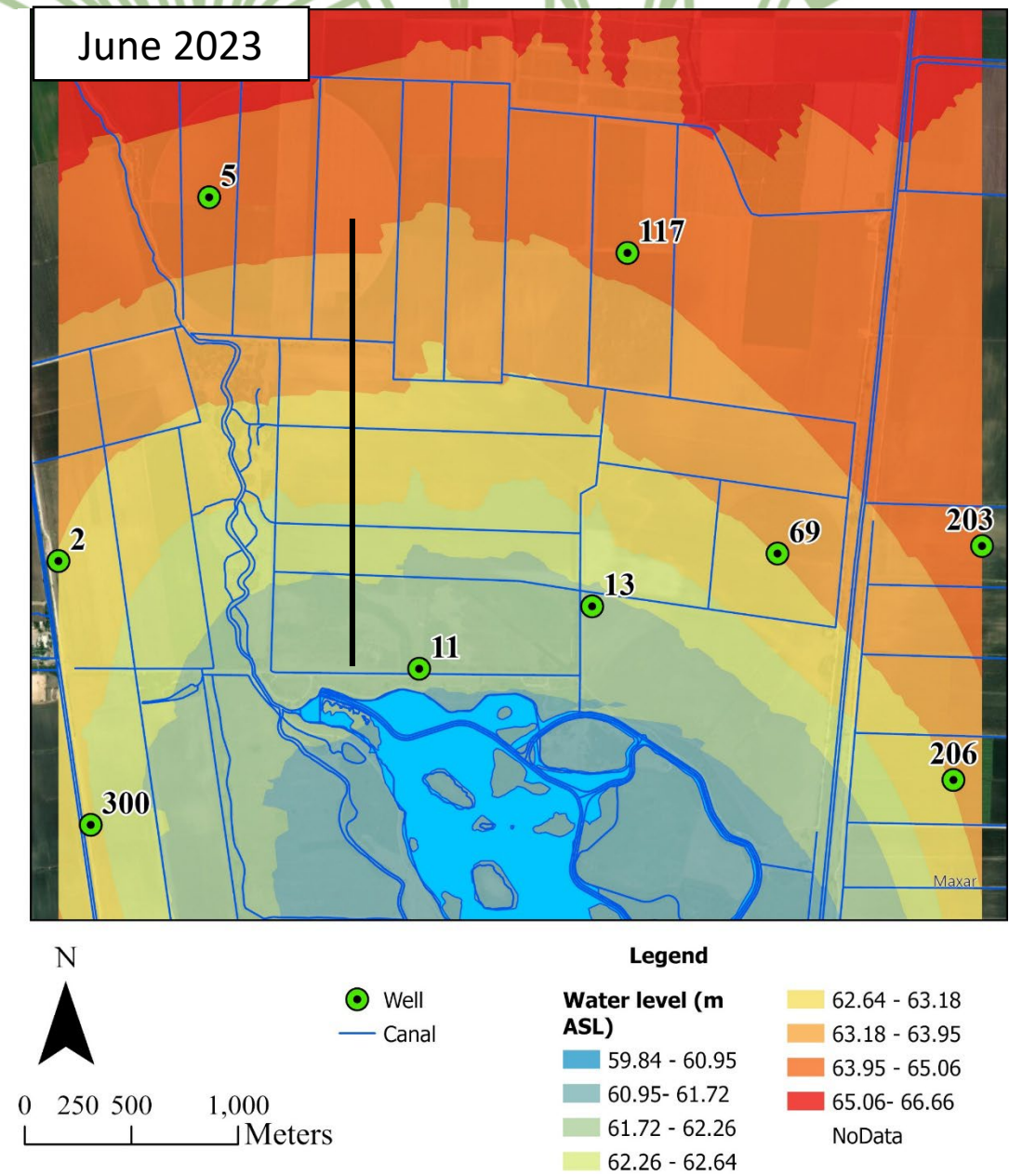
(Shcallinger and Ravikovitch)



(Marish 1986)

Groundwater Monitoring



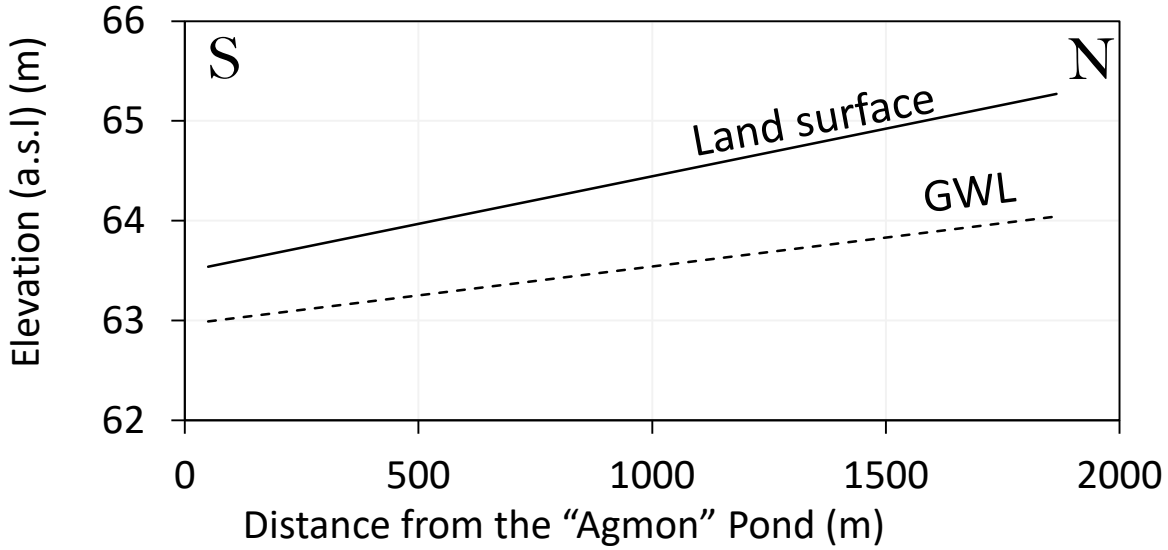


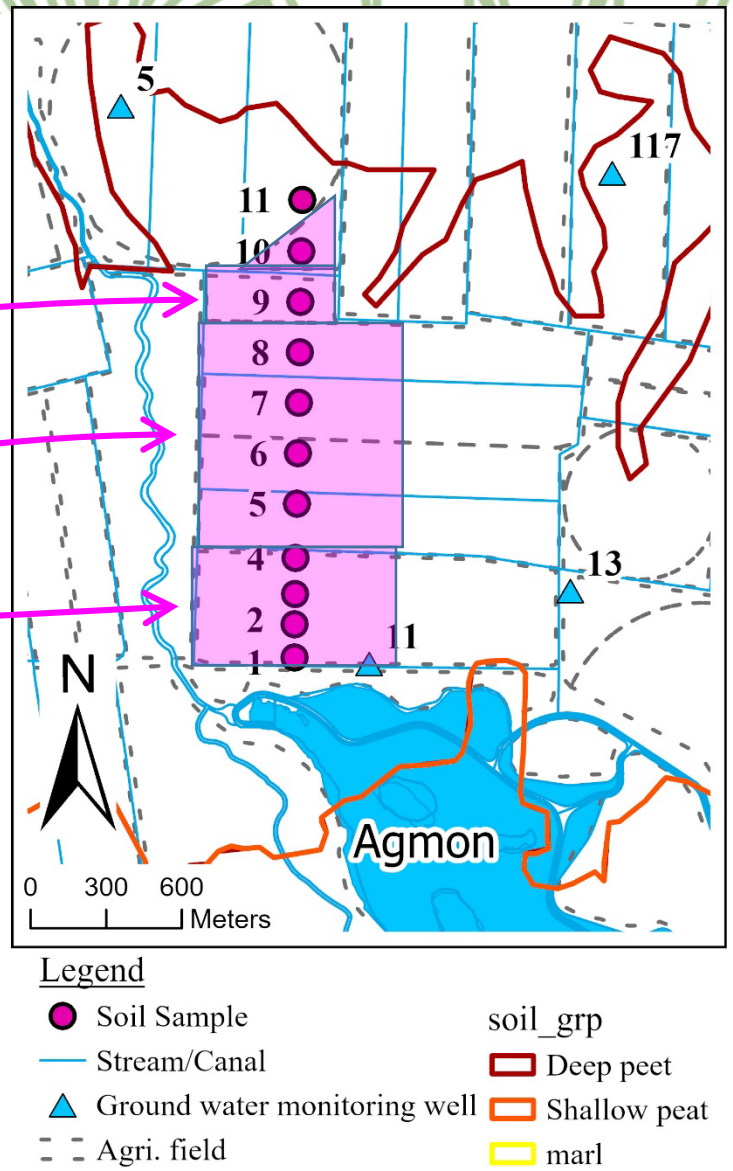
Soil sampling scheme →

(KKL & Migal monitoring data- monthly, 2002-2024)

Sampling scheme

- Spatial variation in GWL
- Variation in land use
  - Cultivated
  - Cultivated and irrigated
  - Uncultivated





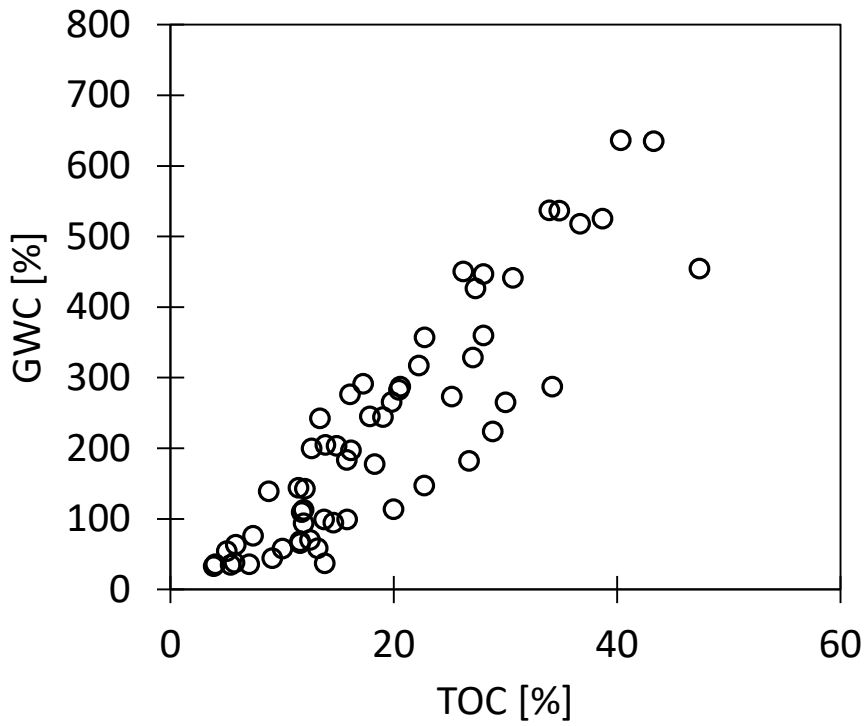
From the books to the field

Methods

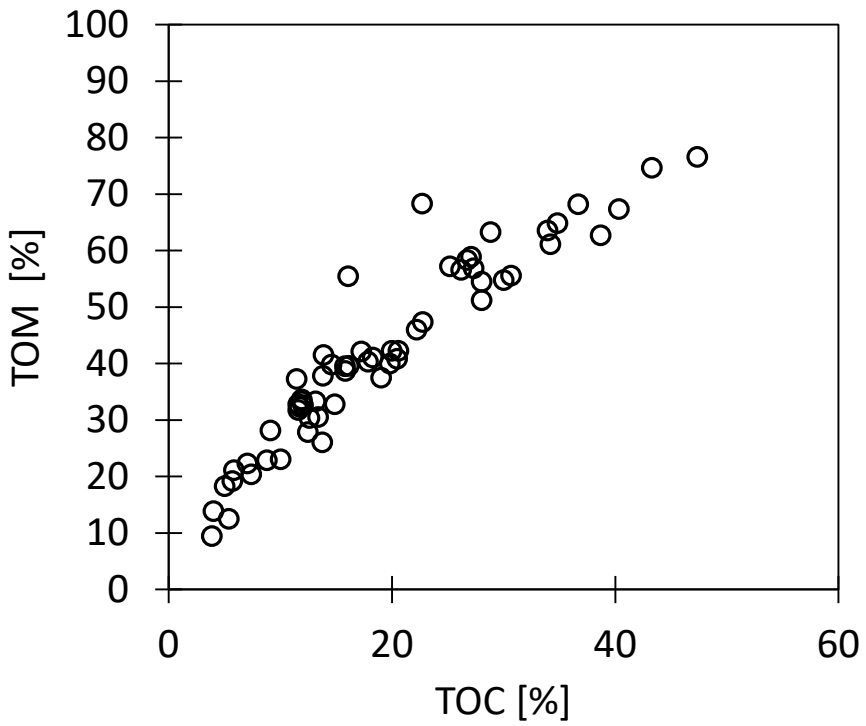
- Sampling - manual augers:
  - 0-1.20 m - dutch auger
  - 1.2-3 m- gouge auger
- Soil texture & color – on site
- Gravimetric water content (GWC)
- TOC, IC , TN, Hydrogen – CN analyzers (Soli TOC® & LECO)
- TOM – Loss on ignition at 550°C, 16 hrs
- Total P – full digestion with H_2SO_4, followed by colorimetric reading (Gallery™ Discrete Analyzer)

Organic Matter – Organic Carbon – Water Content

Gravimetric Water Content (GWC)



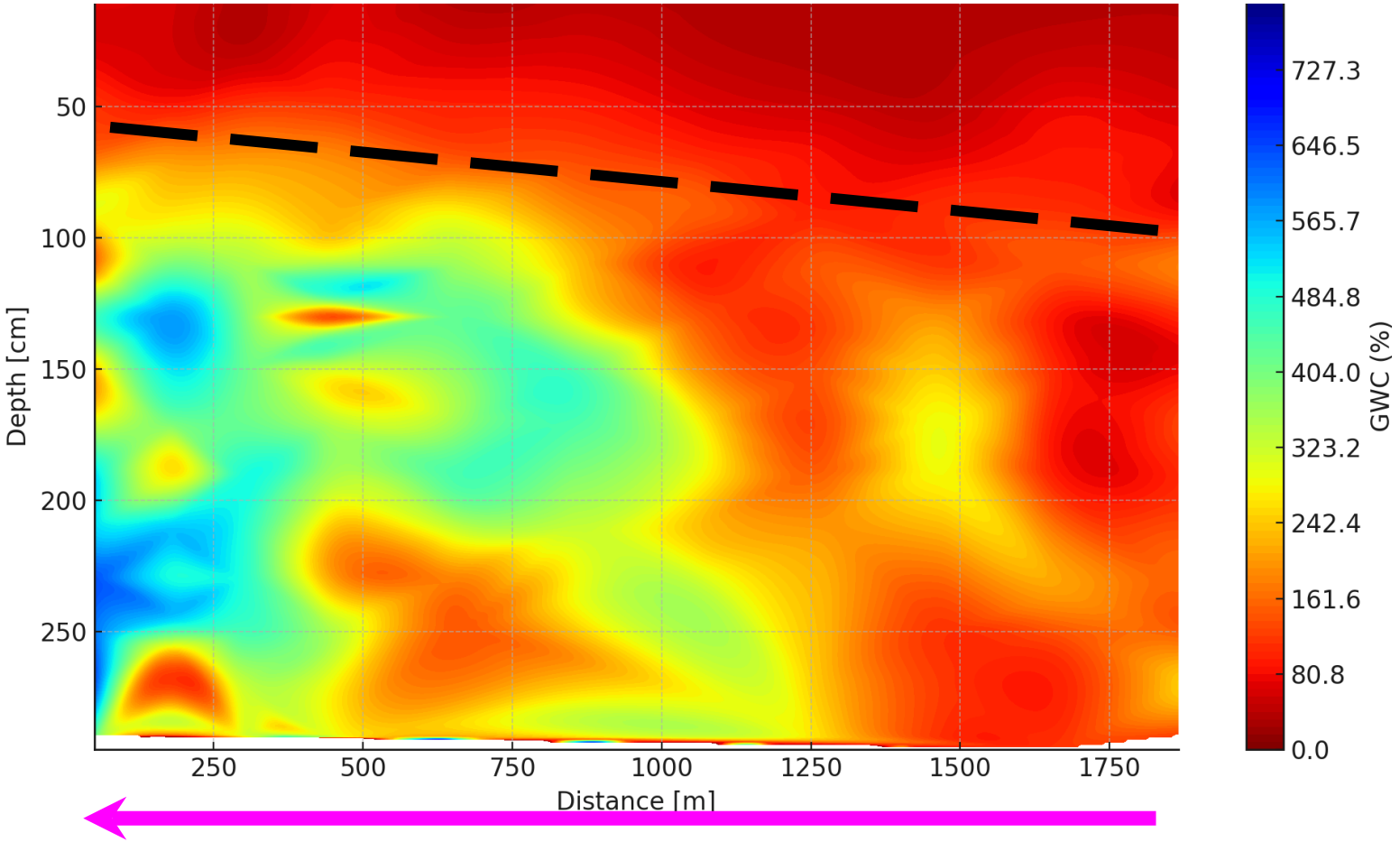
Total Organic Matter (TOM)

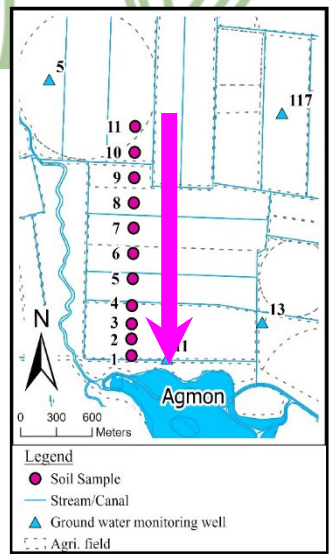


- Higher TOC supports higher water content
- Positive correlation between TOC and TOM

>> Groundwater regulation

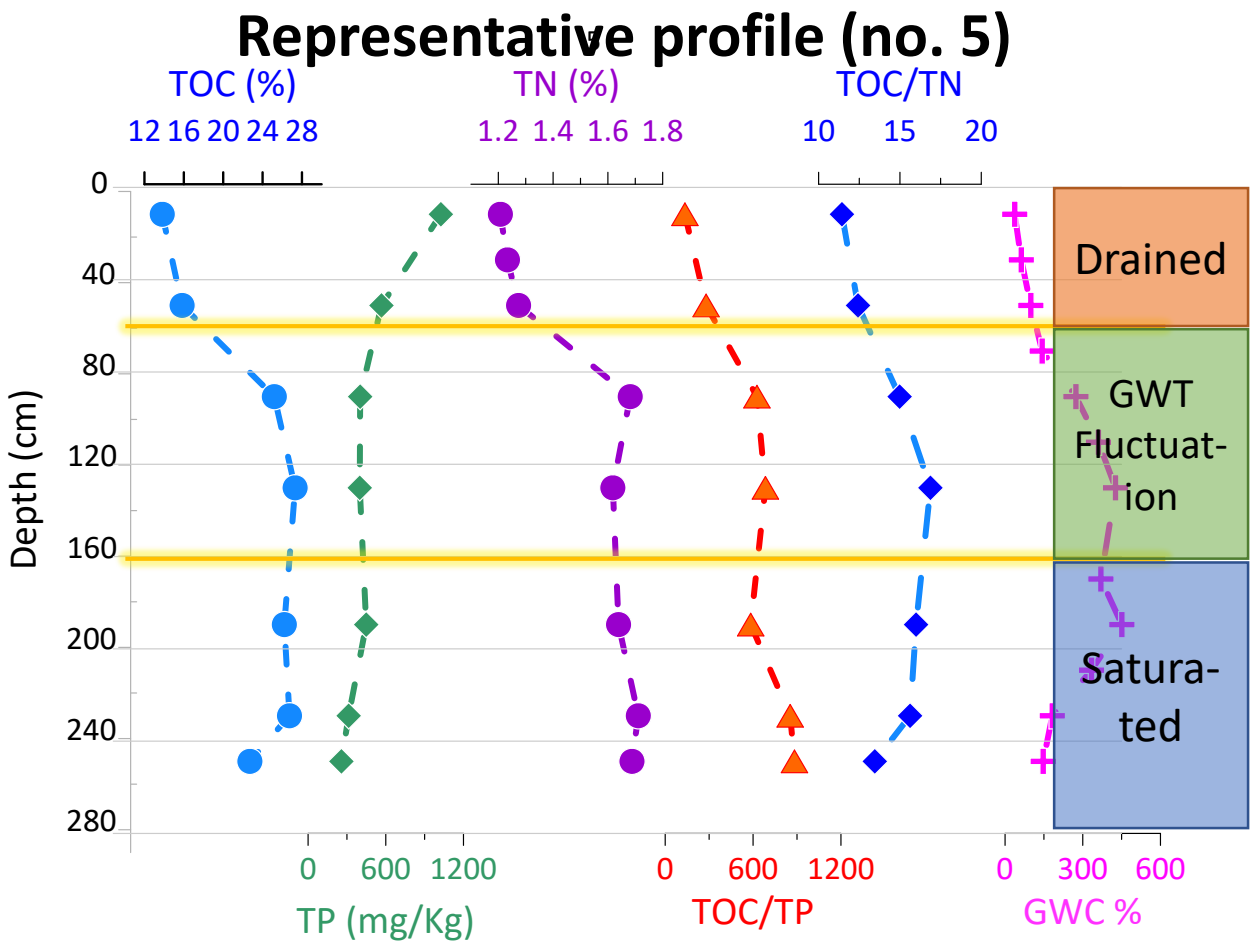
Gravimetric Water Content (GWC)

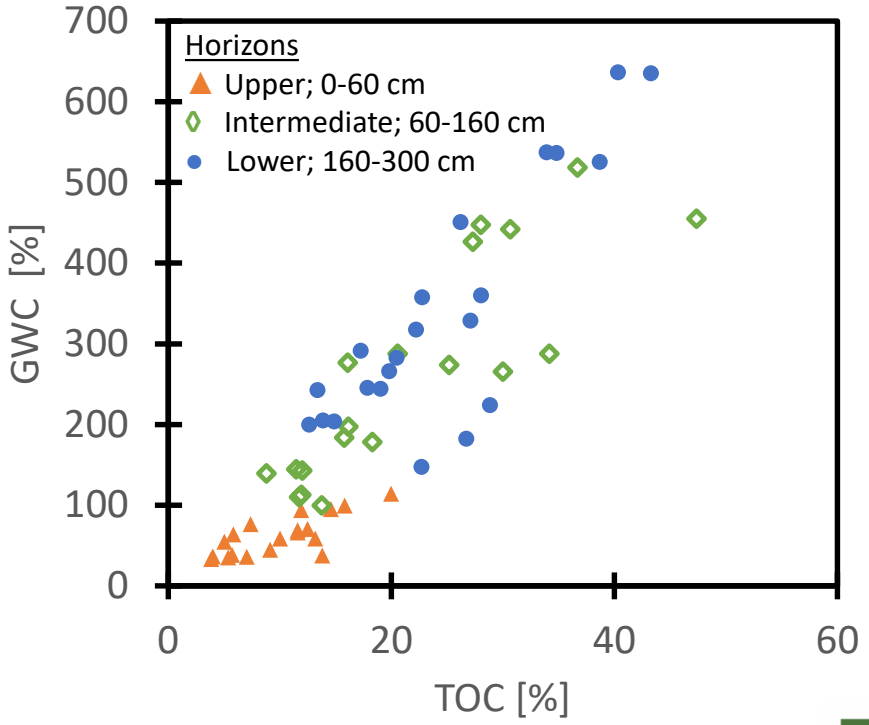


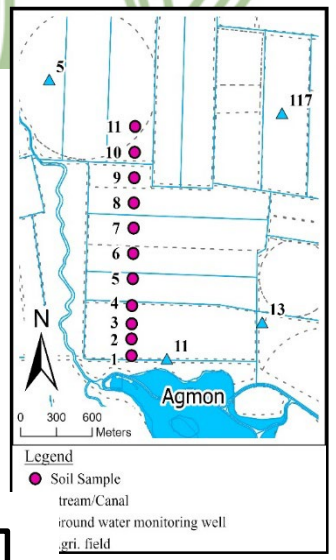


- Surface GWC is low
- Deeper GWC decrease towards the North

Depth profiles - Trends







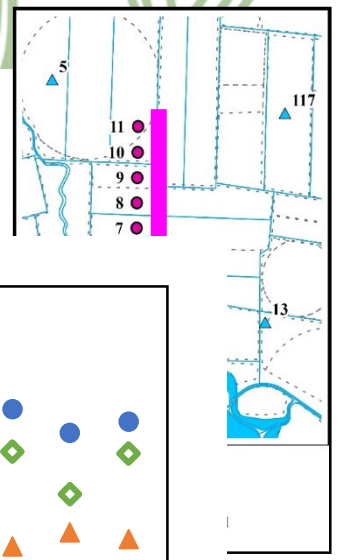
Natural depositional variation ← → Decomposition processes

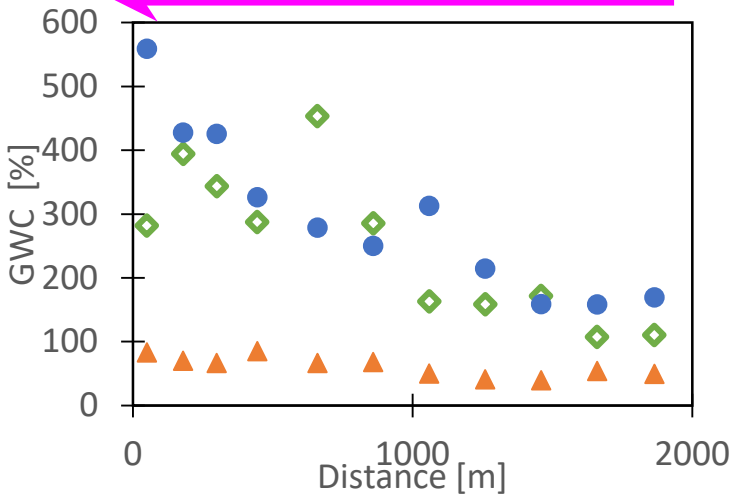
THE HEBREW UNIVERSITY OF JERUSALEM

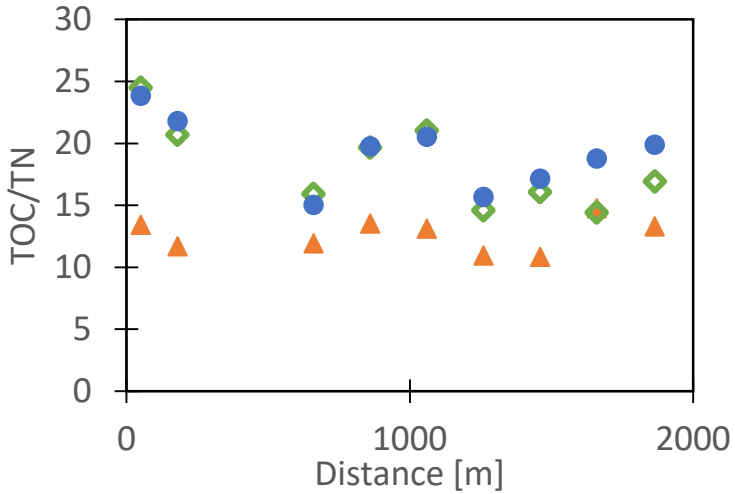
Agricultural Research Organization - Volcani Institute

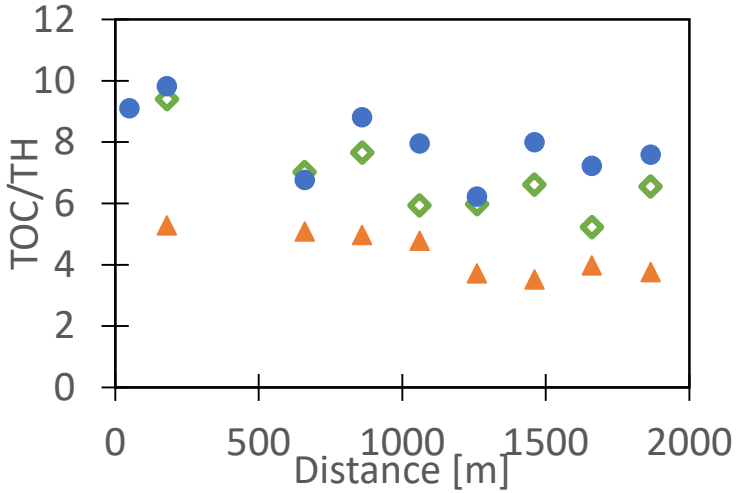
Tel-Hai University on the rise

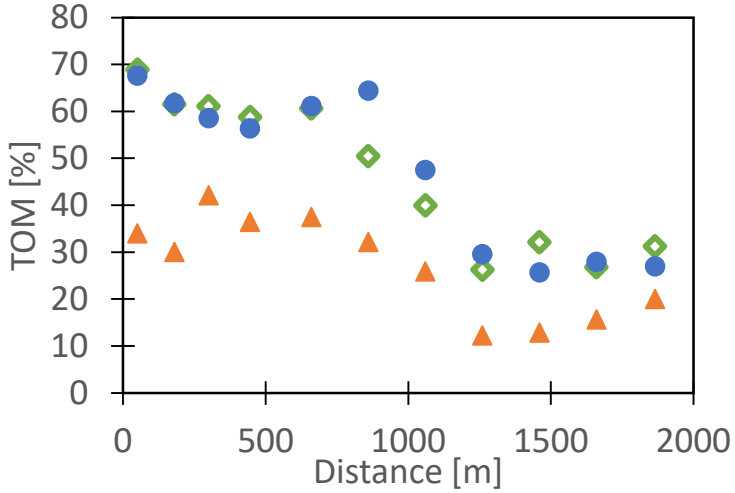
Spatial trends

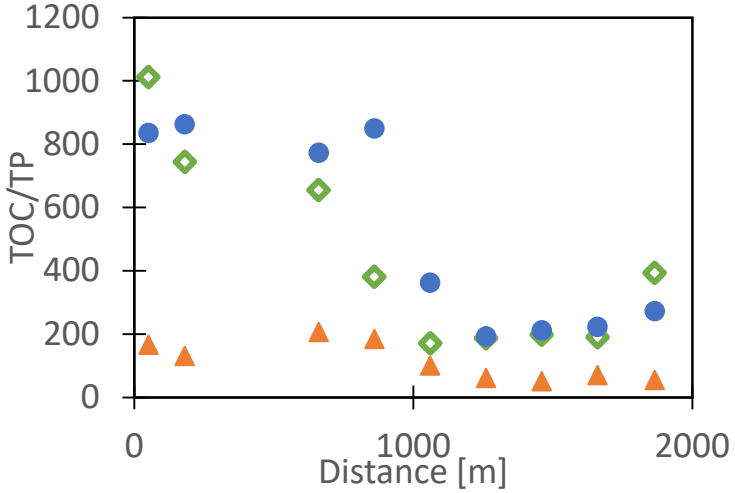






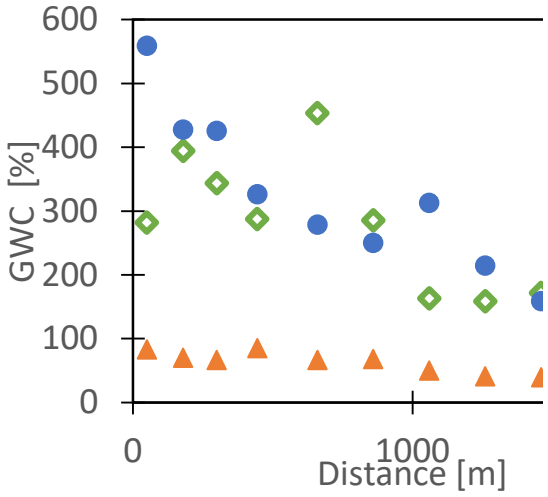


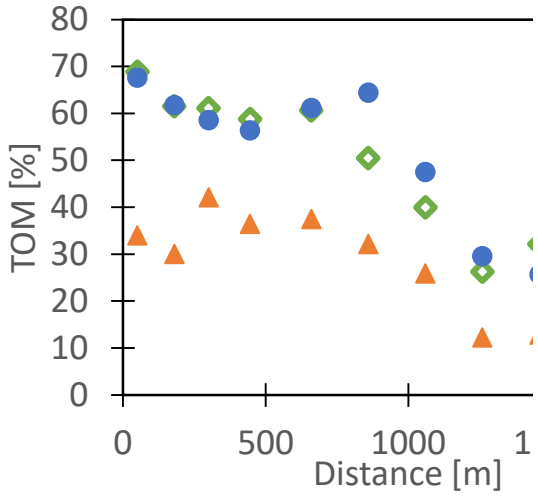


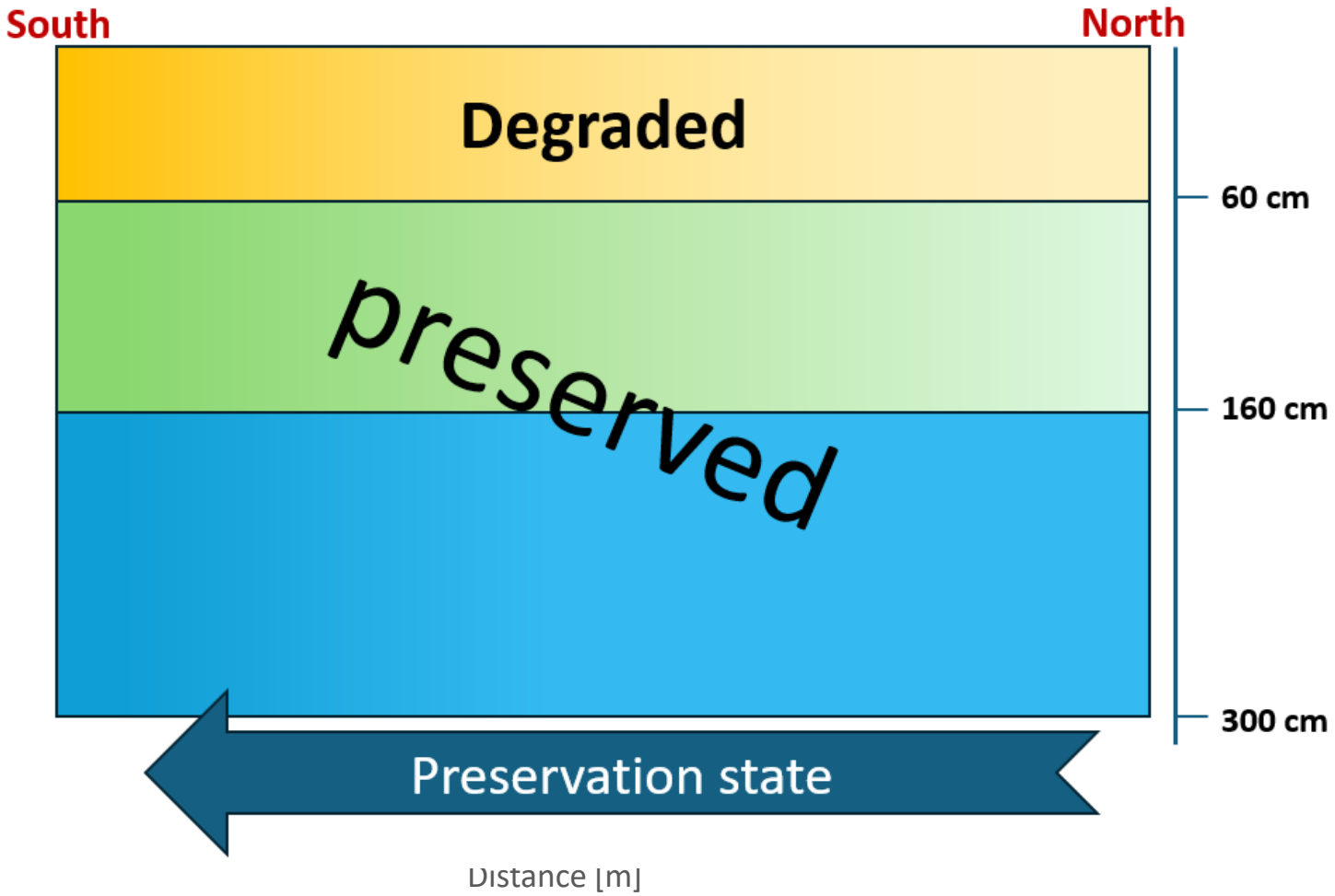


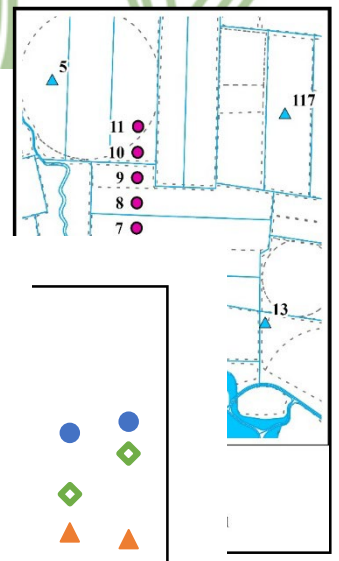
Soil Horizons: ▲ U = Upper; 0-60 cm | ◇ M = Intermediate; 60-160 cm | ● L = Lower; 160-300 cm

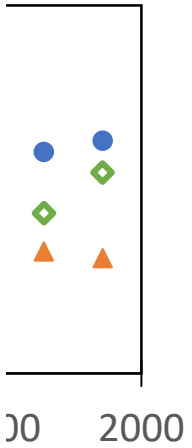
Spatial trends











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מסקנות

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- יחסי היסודות (TOC/TP, TOC/TN and TOC/TH) מעידים על דרגת פירוק גבוהה באופק העליון
- בפני השטח עדיין קיימת כמות משמעותית של פחמן אורגני (TOC<5%).
- ממשק מי התהום בעמק משמר מפלס מי תהום גבוה קרוב לאגמון, המאפשר שימור חומר אורגני קרוב יותר לפני השטח
- הפרופילים הצפוניים מעידים שהכבול בחלק זה של העמק פחות שמור
- לשימור קרקעות הכבול יתרונות מקומיים וגלובליים (הפחתת פליטות גזי חממה)

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IT WORKS!

תודתינו והערכתינו הכנות לשותפים למהלך החשיבה, הכוונה ופעילות השטח:

אפי נעים
נטלי לוינה
עמית רוזנברג
און רבינוביץ
דורון מרקל

איתן ישראלי
דויד דן (שניר)
גיל גרשוביץ (יפתח)
אלון שושני (נחלת המושבים)
אורי שולמן (יראון)
עופר ברנע