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Applying geo-electric methods to investigate soil salinity in rice production systems in the Vietnam Mekong Delta

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Introduction

- Rice production in Mekong River Delta in Vietnam is threatened by salinity due to sea level rise that may result in seawater intrusion into groundwater, potentially allowing capillary rise of salt into the top soil
- Geo-electric methods are rapid and work-saving, but it has not often applied in agriculture

➡ **Investigate the suitability of two geo-electric methods to access soil salinity in rice production systems in the Mekong River Delta**

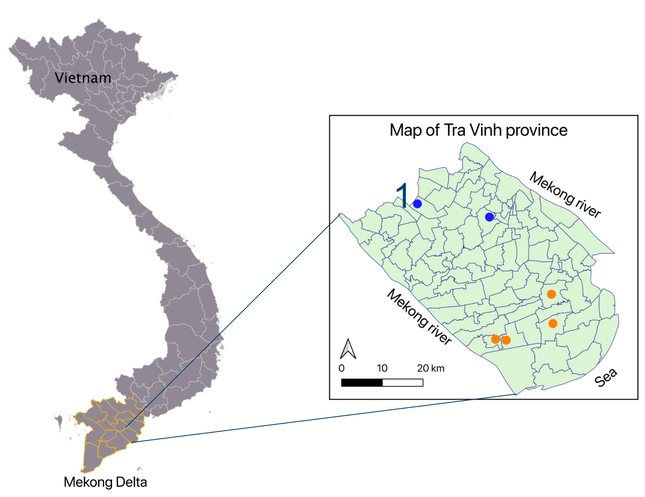


Figure 1. Map of Vietnam. Case study is in Tra Vinh province in the Mekong Delta. Blue points represent triple crops, orange points are double rice crops per year.

Conclusions

- ARES II with 4m electrode spacing reliably detects water tables below rice fields
- EM38 top soil conductivity measurements do not correlate with ARES II top soil values
- A combination of EM38 and ARES II can be applied to evaluate salinity problems in rice fields in the Mekong Delta

Results

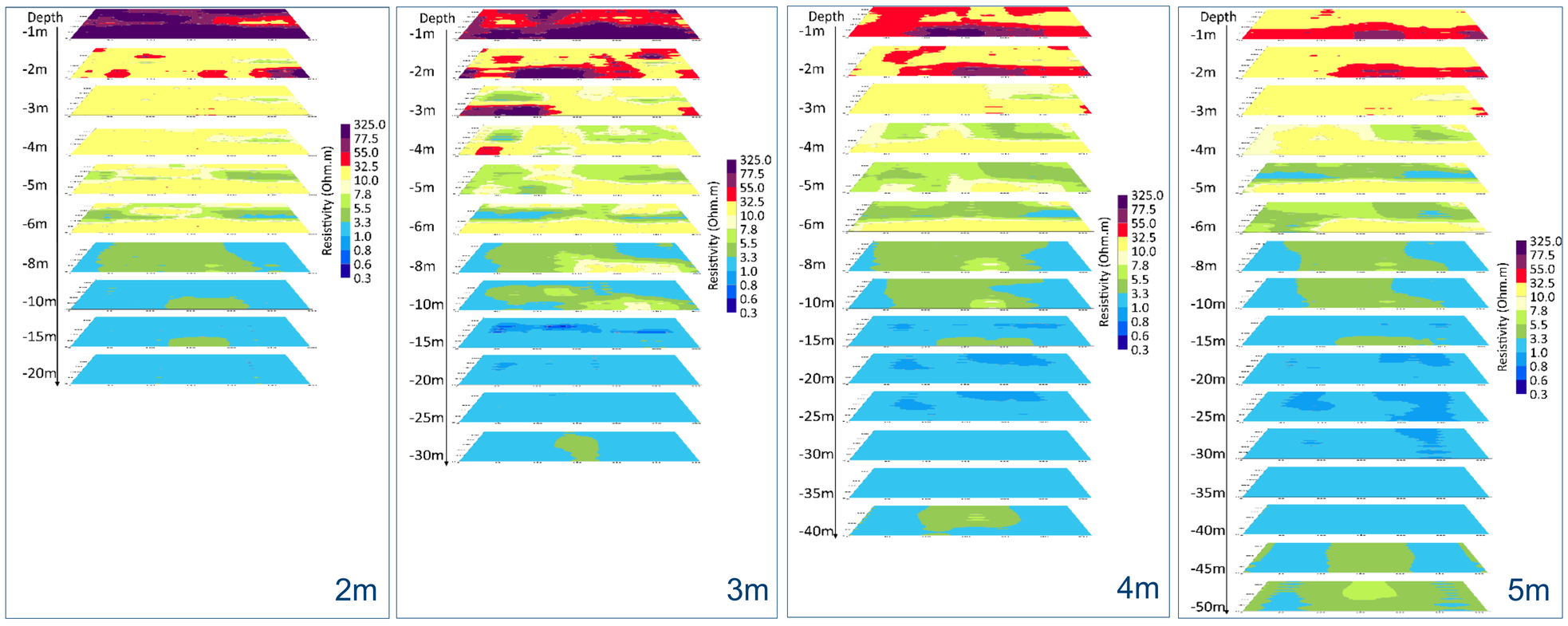


Figure 2. Electrical resistivity measured with ARES II at 2m, 3m, 4m, and 5m electrode spacing at site No.1 in Figure 1.

- Wider spacing increases measurement depth
- Water table detected at 8m
- Consistent results in deeper layers 4 and 5 m spacings
- Inconsistent results in top soil layers

- 4m electrode spacing provides a useful profile

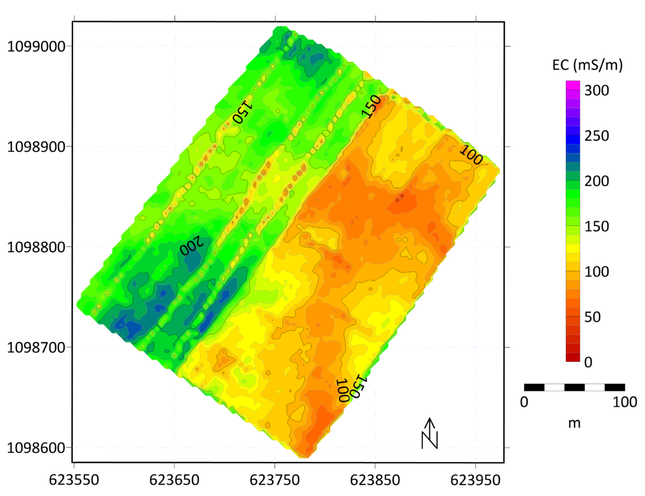


Figure 3. Top soil EC map of site No.1 in Figure 1 measured with EM 38 for 1m depth.

- EM 38 measurements reflect surface water fluxes
- High values indicate micro relief depressions

- No capillary rise of saline water tables detected

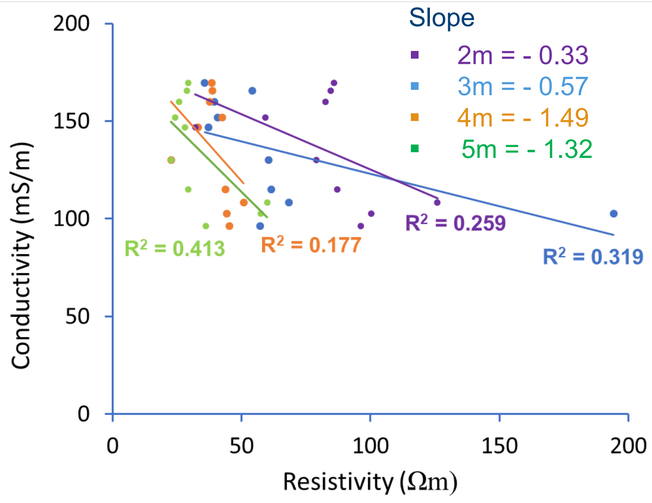


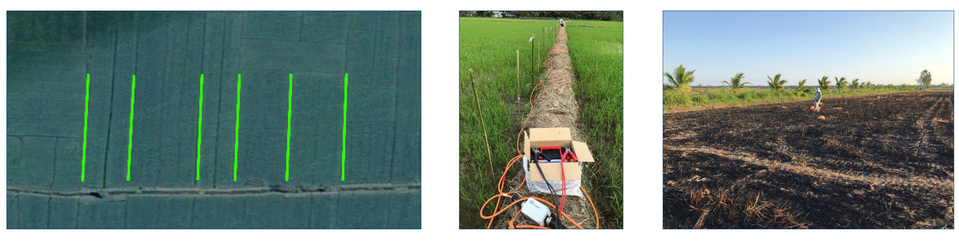
Figure 4. Top soil resistivity (ARESII) at different electrode spacings vs. top soil EC (EM38) for 1m depth at site No. 1 (Figure 1).

- Top soil resistivity (ARESII) is weakly correlated with top soil conductivity (EM38)
- 4 and 5 m spacings under estimate top soil EC

- ARESII resolution for top soil is too low

Materials and Methods

ARESII (electrical resistivity) and EM38 (electromagnetic conductivity) were employed for soil salinity exploration at rice system. ARESII explores resistivity of sub-soil layers down to 50m with different spatial resolutions. EM38 characterizes effects of irrigation management on top soil properties. Measurements were done by following parallel bunds.



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