Big Data analytics to transform agriculture: experience and progress

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Introduction

Major soil/agronomy related decisions are based on blanket recommendation. This undermines the performance of agriculture costing the country huge amount of money. It is this essential to develop site- and context specific fertilizer recommendation. The objective of this work is to build soils/agronomy database following the FAIR principle and apply geospatial analysis and Big Data analytics to facilitate targeted fertilizer application and support Ethiopian agricultural transformation.

Method/Approaches

- Crete awareness about data access and data sharing principles and benefits.
- Establish 'coalition of the willing' and taskforce to facilitate soils/agronomy data access and sharing.
- Collate available data and create soils/agronomy database.
- Conduct meta-data analysis to assess crop response to fertilizer application and produce yield response probability map.
- Conduct data mining and machine learning techniques to develop site-and context specific fertilizer recommendation.
- Create recommendation domain to enhance targeting and scaling

Results/Achievements

- Developed soils/agronomy database and extracted corresponding co-variates (Figure 1).
- Developed data access and sharing guideline that can enable data exchange among the coalition members.
- Conduct meta-data analysis to produce crop response to fertilizer application.
- Built capacity of national staff in data exploration and data mining techniques.
- Produce preliminary 'crop yield response probability' map for different fertilizer application rates using data mining techniques (Fig. 3a).
- Developed framework to create SoilScape – homogeneous landscape units where similar recommendations can be made (Figure 3b).

Key challenges and lessons

- Data access and sharing save time, avoid duplication of effort and encourage innovation.
- Bringing soils/agronomy and natural resources data together can facilitate making informed decisions and transforming agriculture.
- Large and standardized dataset can improve machine learning and model performance.
- We can produce pixel-based crop response probability mapping using Big Data approaches.

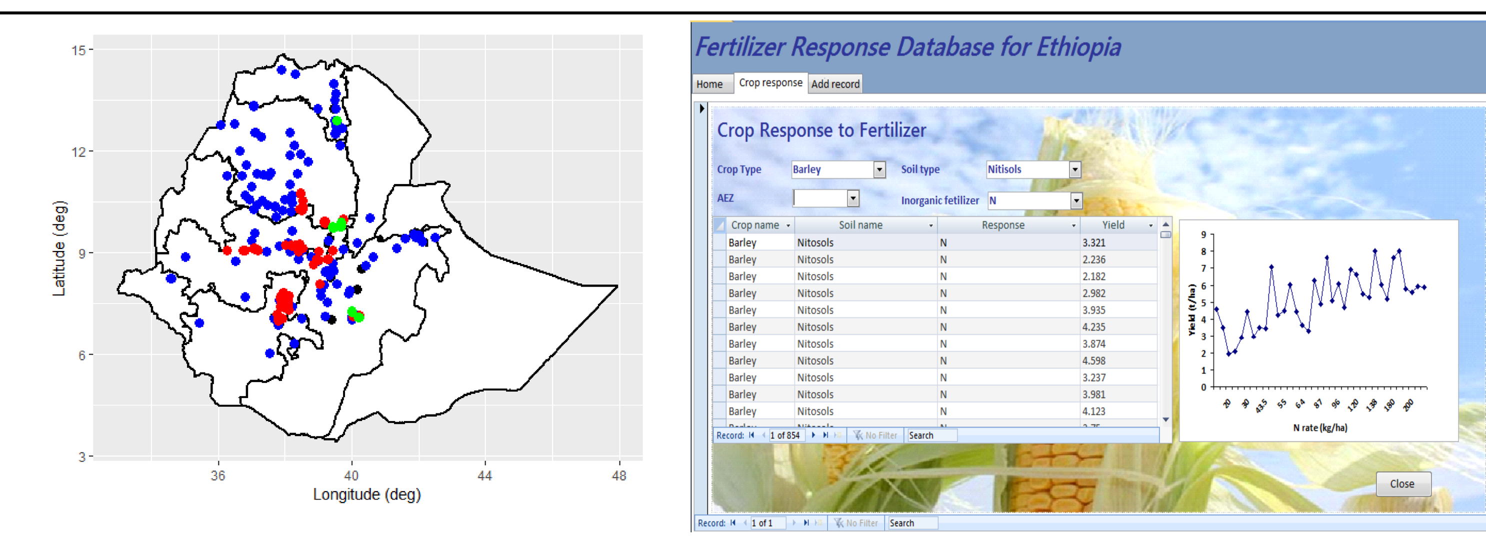

Figure 1. Soils/agronomy database collated from literature and COW members.

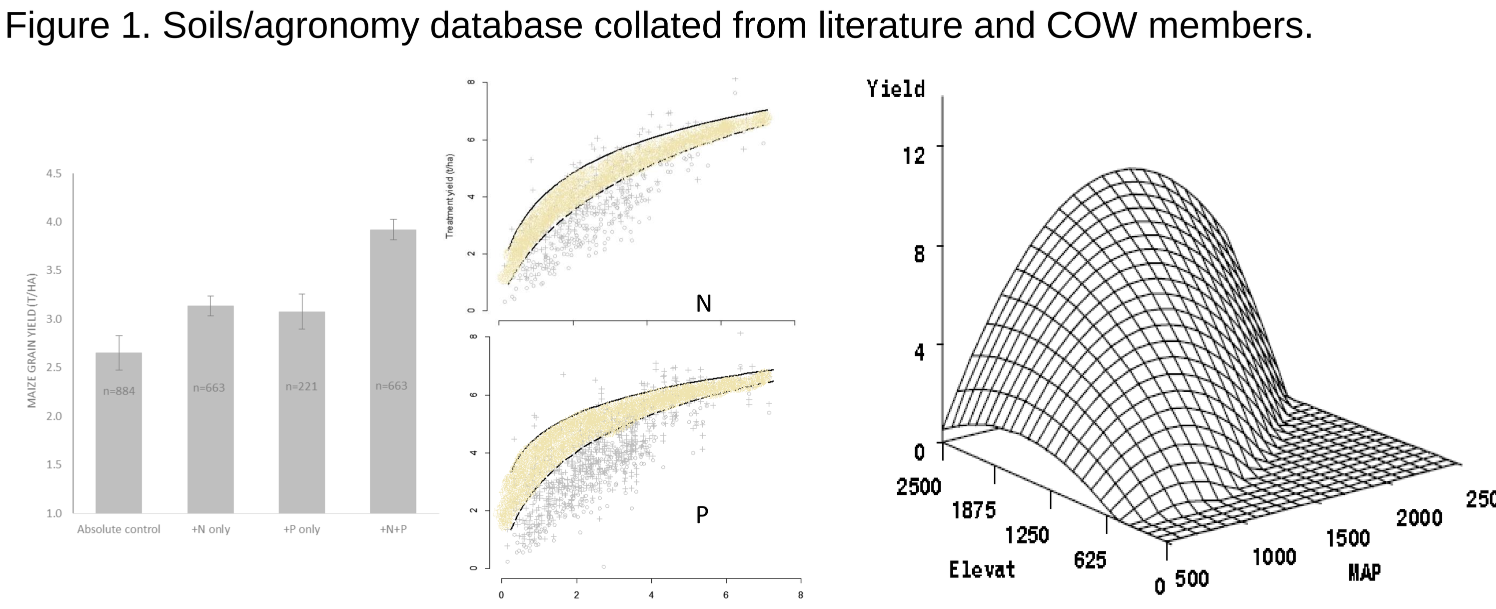

Figure. 2. Meta-data analysis revealing national level crop response to fertilizer

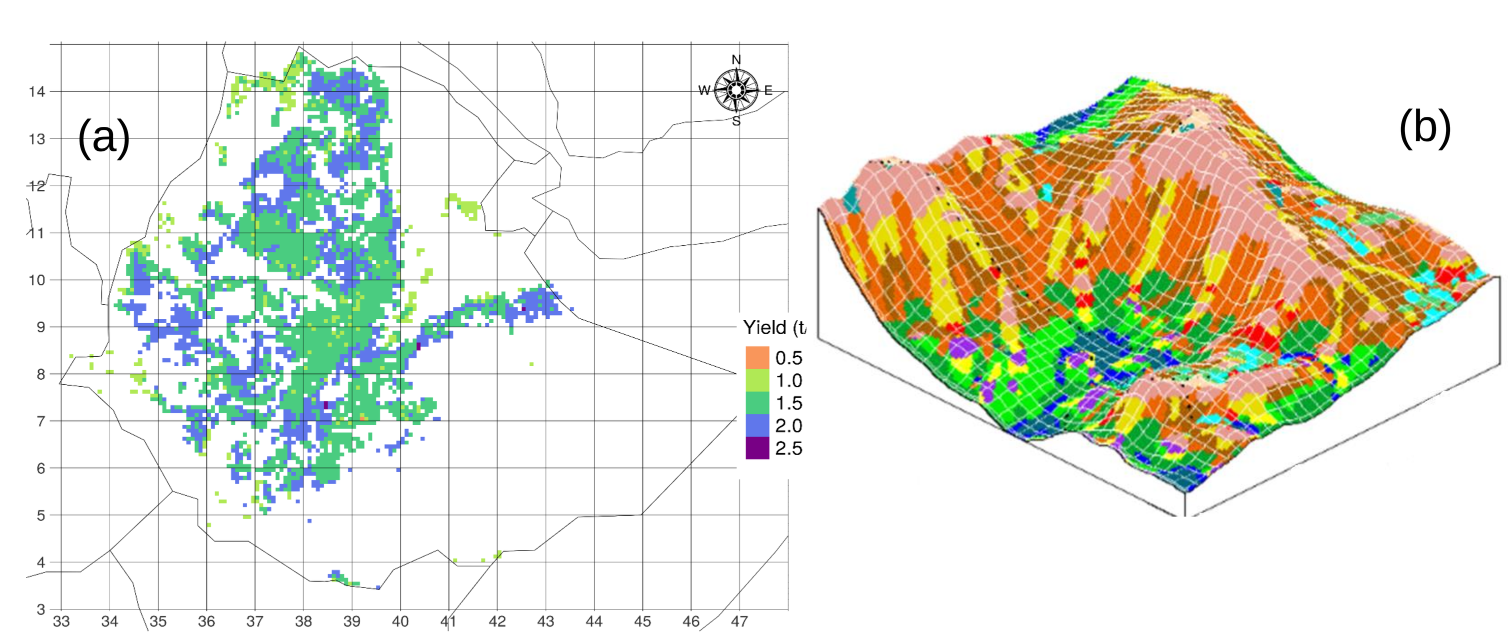

Figure.3. (a) Wheat response probability map for 60 kg of N application and (b) SoilScape.

Plan for 2019

- Continue building soil/agronomy database.
- Drive crop-response curve for various nutrients and rates and produce yield probability map.
- Finalize development of recommendation domains for targeting and scaling.
- Test and validate results.

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