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# Joshua O. Minai

## BIO

Joshua Minai is a doctoral student in the Ecological Sciences and Engineering Interdisciplinary Graduate Program at Purdue University under the supervision of Dr. Darrell G. Schulze. He received a B.S. in Environmental Science from Kenyatta University, Nairobi, Kenya and an M.S. in Soil Science from Purdue University. He grew up in Siaya in rural western Kenya where he helped his parents in subsistence farming. Prior to graduate school, he was involved in forming the African Youth Initiative on Climate Change to promote African youth involvement in climate change mitigation and adaptation. He coordinated the *African Youth Climate Justice Caravan: Road to Durban* (We Have Faith-Act Now campaign) that brought together 160 youth from Africa, Europe, and the United States to participate in climate change advocacy in 6 African countries in preparation for the United Nations Climate Change Conference in Durban, South Africa in 2011.

# Utilization of Legacy Soil Data for Digital Soil Mapping and Data Delivery for the Busia area, Kenya.

## October 25, 2019

## 1:30 pm Lilly 2-425

## ABSTRACT

Most legacy soil data and soils information lies idle in libraries and archives, especially in developing countries like Kenya. We demonstrated the usefulness of a stepwise approach to bring legacy soils data 'back to life' using the 1980 *Reconnaissance Soil Map of the Busia Area (quarter degree sheet No. 101)* for western Kenya as an example. Three studies combined agronomic information, published soil survey reports, field observations, and laboratory analyses using a digital soil mapping platform. In the first study, the agronomic information in the survey report was interpreted to generate 10 land quality maps. The maps show the ability of the land to support specific agronomic functions. We also generated 18 crop suitability maps that were not previously available. In the second study, a dataset of 76 profile points mined from the survey report was used to predict the spatial distribution of soil organic carbon (SOC) and texture. The three predictions models were: (i) ordinary kriging, (ii) stepwise multiple linear regression, and (iii) the Soil Land Inference Model (SoLIM). Ordinary kriging had the narrowest 95% C.I. range while stepwise multiple linear regression had the widest range. From a pedological standpoint, SoLIM conformed better to soil forming factors than ordinary kriging and had lower confidence interval ranges compared to stepwise multiple linear regression. Predicted soil property maps were at a resolution of 30 m, more suitable for smallholder farmers. In the third study, rules generated from the map legend and map unit descriptions were used to generate a soil class map. Information about soil distribution and parent material from the map unit descriptions were combined with six terrain attributes to generate a disaggregated soil class map with an overall accuracy of 58% and a Kappa coefficient of 0.54. Motivated by the wealth of soil agronomic information generated by this study, we tested the feasibility of delivering this information in rural western Kenya using the cell phone-based Soil Explorer (https://soilexplorer.net/) app. This study demonstrates that legacy soil data can play a critical role in providing sustainable solutions to address some of the most pressing agronomic challenges currently facing Kenya and most African countries.