

## Frank Anyoka Adekilae

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### RESEARCH PROFILE

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Soil hydrologist and remote sensing researcher specializing in rootzone soil moisture modeling, surface–rootzone hydrologic connectivity, and large-scale environmental monitoring. Develops scalable, physics-based, and computational frameworks that integrate surface observations, satellite remote sensing, and hydroclimatic datasets to improve drought assessment, agricultural water management, and climate resilience across the United States.

### EDUCATION AND TRAINING

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#### Doctor of Philosophy in Plant, Environmental, and Soil Sciences

*Concentration: Soil Physics and Remote Sensing*

Louisiana State University, Baton Rouge, Louisiana, USA

August 2024 – Present (Expected completion: May 2030)

GPA: 4.17/4.30 | Major Professor: Dr. Vinit Sehgal

#### International Master of Science in Soils and Global Change

*Specialization: Physical Land Resources and Global Change*

Ghent University, Belgium, and Aarhus University, Denmark (Erasmus Mundus Consortium Program)

July 2024 | Academic standing: Distinction

*Thesis: Driving Variables for Soil Hydraulic Properties*

Advisors: Prof. Bo V. Iversen and Prof. Peter Finke

#### Bachelor of Science in Natural Resources Management

*Specialization: Silviculture and Forest Management*

Kwame Nkrumah University of Science and Technology, Kumasi, Ghana

September 2021 | First Class Honours

Advisor: Prof. Emmanuel Acheampong

### AWARDS, SCHOLARSHIPS, AND COMPETITIVE FUNDING

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- Kirkham Conference Travel Grant, February 2025 — \$2,500. Competitive international travel grant supporting participation in the 2025 Kirkham Conference in Fukushima, Japan.
- Erasmus Mundus Joint Master Scholarship, March 2022–July 2024 — €49,000. Fully funded scholarship supporting tuition, insurance, international travel, installation costs, and monthly subsistence for the International Master of Science in Soils and Global Change.
- Second-Best Graduating Student, Department of Silviculture and Forest Management, KNUST, 2021.

- Mastercard Foundation Scholars Program Scholarship, August 2017–October 2021. Fully funded four-year undergraduate scholarship supporting tuition, accommodation, academic resources, leadership development, and living expenses at KNUST.

## PEER-REVIEWED PUBLICATIONS AND MANUSCRIPTS UNDER REVIEW

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### Peer-Reviewed Publications

- **Adekilae, F. A., & Sehgal, V.** (2026). Pseudo-diffusivity characteristic curves for surface–rootzone soil hydrologic connectivity. *Vadose Zone Journal*, 25(2), e70084.

### Manuscripts Under Review

- **Adekilae, F. A., & Sehgal, V.** (2026). Pedotransfer functions in the era of machine learning: Data limitations, spatial scale, transferability, and future directions. Manuscript under review at *Vadose Zone Journal*. Manuscript ID: VZJ-2026-06-0069-R.
- Sehgal, V., **Adekilae, F. A., & Fisher, J. B.** (2026). Regime-adaptive framework for daily evapotranspiration using diurnal surface–air temperature contrast. Manuscript under review at *Water Resources Research*.

## RESEARCH EXPERIENCE

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### Graduate Research Assistant

School of Plant, Environmental, and Soil Sciences, Louisiana State University  
Baton Rouge, Louisiana | August 2024–Present

- Conduct research in soil hydrology, remote sensing, and surface–rootzone hydrologic connectivity.
- Develop physics-based frameworks for estimating rootzone soil moisture dynamics from surface observations using pseudo-diffusivity and state-based filtering.
- Analyze large-scale soil moisture, land-surface temperature, meteorological, and hydroclimatic datasets using R, statistical modeling, and geospatial methods.
- Contribute to the development and field deployment of the Louisiana Climate and Digital Agriculture Network, a statewide environmental monitoring network.
- Install and maintain soil, vegetation, and meteorological sensors and support data-quality control and near-real-time data-processing workflows.
- Publish research findings and present results at national and international scientific conferences.

### Research and Teaching Assistant

Department of Silviculture and Forest Management, KNUST  
Kumasi, Ghana | October 2021–August 2022

- Supported experimental design, field research, environmental data collection, and preparation of research protocols and technical reports.
- Mentored undergraduate students in research design, data collection, analysis, and thesis preparation.

- Prepared instructional materials, conducted tutorials, assessed coursework, and provided academic feedback.
- Collaborated with faculty members to support teaching delivery and student research activities.

### **Field Assistant, EU-Funded ReDIAL Project**

Kwame Nkrumah University of Science and Technology, Ghana | February 2022–August 2022

- Led farmer training on sustainable fertilization and conservation agriculture practices.
- Coordinated soil sampling and supported field data collection and analysis.
- Contributed to climate-smart agriculture and sustainable land-management activities with farming communities.

### **Assistant Laboratory Technician**

Soil Laboratory, Faculty of Renewable Natural Resources, KNUST | December 2021–July 2022

- Conducted laboratory analyses of soil pH, bulk density, water content, and organic carbon.
- Supervised practical soil laboratory training for more than 200 undergraduate students.
- Maintained laboratory equipment and supported laboratory data quality control.

### **Field and Technical Assistant Intern**

Ghana Forestry Commission, Navrongo, Ghana | June 7–August 31, 2019

- Supported sustainable land and water management activities.
- Conducted forest inventory and mensuration measurements.
- Supported tree-planting and nursery-management operations.

### **Remote Conservation Extern**

National Geographic Society and The Nature Conservancy | March 7–May 2, 2022

- Conducted primary and secondary research on marine conservation challenges and community impacts.
- Engaged community leaders, conservation practitioners, and local stakeholders to identify conservation priorities and knowledge gaps.
- Conducted a landscape and gap analysis and developed a community-focused conservation proposal.
- Communicated conservation challenges and proposed solutions through written and visual storytelling.

## **SCIENTIFIC PEER REVIEW AND PROFESSIONAL SERVICE**

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### **Reviewer, IEEE International Geoscience and Remote Sensing Symposium 2025**

IEEE Geoscience and Remote Sensing Society

- Reviewed two scientific submissions in remote sensing and geospatial analysis.
- Provided technical assessments of scientific quality, methods, and relevance.

### **Co-Organizer and Instructor, AGU Fall Meeting Scientific Workshop**

*Large-Scale Geospatial Data Analysis and Visualization in R*

New Orleans, Louisiana | December 16, 2025

- Co-organized and delivered a full-day advanced scientific-computing workshop.
- Developed instructional modules on raster processing, multidimensional time series, NetCDF/HDF5 data, and parallel computing.
- Led hands-on exercises on scalable processing of large satellite and geospatial datasets.

## **PROFESSIONAL MEMBERSHIPS**

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- American Geophysical Union (AGU), Student Member | 2025–Present
- American Society of Agronomy (ASA), Graduate Student Member | 2024–Present
- Crop Science Society of America (CSSA), Graduate Student Member | 2024–Present
- Soil Science Society of America (SSSA), Graduate Student Member | 2024–Present

## **TECHNICAL EXPERTISE**

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- Programming, Statistical Analysis, and Scientific Computing: R, Python, MATLAB, SPSS, and Microsoft Excel; statistical modeling, time-series analysis, nonlinear optimization, inverse modeling, mutual information analysis, model calibration, validation, parallel computing, and scientific visualization.
- Hydrologic and Soil Modeling: HYDRUS-1D, RETC, AquaCrop, and SoilView; soil hydraulic characterization, soil-water retention analysis, hydraulic conductivity, rootzone soil moisture modeling, pseudo-diffusivity modeling, state-based filtering, and surface–rootzone hydrologic connectivity.
- Geospatial Analysis and Remote Sensing: ArcGIS Pro, QGIS, ERDAS Imagine, and Google Earth Engine; raster processing, satellite time-series analysis, NASA SMAP soil moisture integration, and large-scale geospatial data processing.
- Environmental and Hydroclimatic Data Processing: USCRN, SCAN, NASA SMAP, SoilGrids250m, and CGIAR aridity datasets; large-scale soil moisture, thermal, meteorological, climate, and drought data; NetCDF/HDF5 processing and data quality control.
- Field and Laboratory Methods: Environmental sensor installation and monitoring, soil sampling, soil hydraulic characterization, HYPROP, WP4C, KSAT, particle-size analysis, bulk density, and soil water content measurements.
- Scientific Communication: Peer-reviewed scientific writing, technical reporting, conference presentations, scientific peer review, workshop instruction, and undergraduate research mentoring.

## **LEADERSHIP AND COMMUNITY ENGAGEMENT**

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### **Graduate Student Treasurer**

School of Plant, Environmental, and Soil Sciences, Louisiana State University | October 2025–Present

- Manage graduate student association finances, budget allocations, and financial records.
- Support funding and planning for academic and professional development activities.

### **Team Leader, Campaign Against Child Marriage**

Natugnia, Ghana | September 2018–Present

- Lead annual community education and awareness initiatives addressing child marriage and its social and educational impacts.
- Mentor youth on academic achievement and personal development and coordinate community stakeholders and volunteers.
- Lead fundraising activities supporting annual outreach, student recognition, and educational initiatives.

### **Community COVID-19 Sensitization Team Leader**

Natugnia, Ghana | April–December 2020

- Led community COVID-19 awareness and public-health education activities using the local language.
- Coordinated community-focused communication of COVID-19 safety practices.

### **Science and Mathematics Volunteer Teacher**

Saabisi Junior High School, Ghana | May–July 2018

- Taught foundational science and mathematics to junior high school students.
- Developed instructional materials and supported students' academic development.

## **SELECTED CONFERENCE PRESENTATIONS**

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- **Adekilae, F. A., & Sehgal, V. (2025).** Modeling rootzone moisture dynamics from surface observations using pseudo-diffusivity. Poster presented at the American Geophysical Union Fall Meeting, New Orleans, Louisiana, December 15–19, 2025.
- **Adekilae, F. A., & Sehgal, V. (2025).** Influence of soil and climate on surface–rootzone hydrologic connectivity. Short oral presentation and poster presented at CANVAS 2025, Salt Lake City, Utah, November 9–12, 2025.
- **Adekilae, F. A., & Sehgal, V. (2025).** Enhancing Rootzone Soil Moisture Dynamics Estimation with a State-Based Low-Pass Filter. Flash oral presentation and poster at the Kirkham Conference, Fukushima, Japan, August 19–22, 2025.
- **Adekilae, F. A., & Sehgal, V. (2025).** Modeling Rootzone Moisture Dynamics from Surface Observations Using Pseudo-Diffusivity. Oral presentation at the National Soil Moisture Workshop 2025, Colorado State University, Fort Collins, Colorado, USA, June 3–5, 2025.