KRISHNAGOPAL HALDER

PhD researcher in landscape-scale agroecosystem modelling, specializing in geospatial data science, machine learning, and agricultural systems modelling. I develop machine learning, deep learning, and hybrid process-based modelling workflows for crop modelling, yield forecasting, crop mapping, and climate change impact assessment, leveraging large-scale Earth observation, climate, and soil datasets. My research interests include open science, scientific software development, and advancing agricultural science and technology to address real-world challenges, particularly in underserved regions and vulnerable agricultural systems.



EDUCATION

Oct. 2026 – Present

Doctor of Agricultural Sciences (Dr. agr.)

University of Bonn — Bonn, Germany

Research conducted at the Leibniz Centre for Agricultural Landscape Research (ZALF), Germany.

Research focus: Landscape-scale agroecosystem modelling, spatial and temporal landscape dynamics, crop productivity, and resilience.

Research question: *How can spatial and temporal landscape information be represented and integrated into agroecosystem models to improve the understanding and prediction of crop productivity and resilience across scales?*

Supervisor: Prof. Dr. Frank Ewert

Jul. 2024 – Dec. 2024

M.Tech. in Disaster Mitigation and Management

Indian Institute of Technology Roorkee — Roorkee, Uttarakhand, India

Discontinued (dropout)

Nov. 2022 – Jul. 2024

M.Sc. in Remote Sensing and GIS

Vidyasagar University — Midnapore, West Bengal, India

CGPA: **9.04/10.00**

Jun. 2019 – Aug. 2022

B.Sc. in Geography

Bankura Christian College — Bankura, West Bengal, India

CGPA: **9.33/10.00**

Jun. 2017 – Mar. 2019

HSC (12th Grade)

Bankura Zilla School — Bankura, West Bengal, India

Percentage: **95.80%**. Subjects: Bengali, English, Geography, Computer Application, Philosophy, Mathematics.

Apr. 2016 – Feb. 2017

SSC (10th Grade)

Bankura Christian Collegiate School — Bankura, West Bengal, India

Percentage: **90.43%**. Subjects: Bengali, English, Mathematics, Physical Science, Life Science, History, Geography.

PROFESSIONAL EXPERIENCE

Jan. 2025 – Present

Research Scientist

Leibniz Centre for Agricultural Landscape Research (ZALF) — Müncheberg, Brandenburg, Germany

- Working within the Research Platform *Simulation and Data Science*, under the Working Group *Multi-Scale Modelling and Forecasting (MSM)*, contributing to the Leibniz-Lab Systemic Sustainability (LL SYSTAIN) project.
- Developing machine learning workflows for multi-scale crop yield forecasting and scenario analysis integrating climate, soil, and biodiversity indicators.
- Applying geospatial data science techniques to process and harmonize large Earth observation and agricultural datasets (Sentinel, MODIS, soil grids).
- Collaborating with interdisciplinary teams to co-design sustainability indicators linking agricultural productivity and ecological resilience.

CONTACT INFO

- PhD Researcher
- Leibniz Centre for Agricultural Landscape Research (ZALF)
- Müncheberg, Brandenburg, Germany
- Krishnagopal[dot]Halder[at]zalf[dot]de
- Google Scholar
- krishnagopal-halder
- geonextgis
- Medium

TECHNICAL SKILLS

Languages: Python, SQL, JavaScript and R

Technologies: Google Earth Engine, PyTorch, TensorFlow, Scikit-learn, Git and GitHub

Methodologies: Machine Learning, Deep Learning, Geospatial Analysis, Image Processing and Statistical Analysis

Software: ArcGIS Pro, QGIS, Photoshop and Adobe Illustrator

Last updated on 2026-11-22.

Feb. 2023 | Feb. 2024

Remote Intern

Institute of Crop Science and Resource Conservation (INRES) — University of Bonn, Germany

- Developed and validated ML/DL-based models (XGBoost, CNNs) for regional and continental-scale crop yield prediction using satellite-derived vegetation indices and climate data.
- Performed phenological and climate feature extraction using Google Earth Engine (GEE), Python (NumPy, Pandas, Scikit-learn), and TensorFlow for time-series analysis.
- Processed multi-terabyte Earth observation datasets via cloud computing platforms to derive agricultural insights and optimize model input features.
- Authored comprehensive technical reports and visualized key results using Python (Matplotlib, Plotly), contributing to publications on data-driven agricultural sustainability.

RESEARCH PROJECTS

Jul. 2026 — Present

SUSTAINCrop: Knowledge Exchange for Assessing Environmental Impacts of Crop Production in Bio-Based Industrial Systems

Link

Funded by the European Union under Horizon Europe

Coordination and Support Action with ZALF, Germany, as a consortium partner.

Apr. 2026 — Present

AgMIP: Agricultural Model Intercomparison and Improvement Project

Website

Leibniz Centre for Agricultural Landscape Research (ZALF), Germany

Jan. 2025 — Present

LL SYSTAIN: Leibniz-Lab Systemic Sustainability

Website

Funded by the Leibniz Association

Biodiversity, Climate, Agriculture and Food within Planetary Boundaries.

Feb. 2024 — Mar. 2026

SynPAI: Synergising Process-Based and Machine Learning Models for Accurate and Explainable Crop Yield Prediction along with Environmental Impact Assessment

Website

Funded by the Biotechnology and Biological Sciences Research Council (BBSRC)

Jan. 2024 — Present

AgML: Machine learning for agricultural modelling

Website

</> OPEN-SOURCE PROJECTS

TorchCrop

GitHub
Docs

A PyTorch-native library for hybrid crop modeling.

CropFusionNet

GitHub

An interpretable deep learning framework for probabilistic crop yield forecasting.

PUBLICATIONS

2026

CropFusionNet: an interpretable deep learning framework for uncertainty-aware crop yield forecasting across Germany

Read
</> Code

Srivastava, A. K., Halder, K., et al.

Artificial Intelligence in Agriculture (IF: 16.1; Q1)

2026

AgriPINN: A process-informed neural network for interpretable and scalable crop biomass prediction under water stress

Read

Shi, Y., Srivastava, A. K., Behrend, D., Gaiser, T., Thuy, N. H., Zhang, X., Sobeih, T., Ewert, F., Halder, K., Han, L.

Smart Agricultural Technology (IF: 7.1; Q1)

2025 **A machine learning framework for modeling and upscaling mangrove carbon productivity (ML-MCP)** Read
Alsafadi, K., Srivastava, A. K., Halder, K., et al.
Agricultural and Forest Meteorology (IF: 6.6; Q1)

2025 **Enhancing landslide susceptibility mapping in the Himalayas: geospatial and machine learning with explainable AI** Read
Utthasini, M., Ilampooranan, I., Singh, S. K., Kanga, S., Kumar, P., Halder, K., et al.
Gondwana Research (IF: 8.9; Q1)

2025 **A robust and scalable crop mapping framework using advanced machine learning and optical and SAR imageries** Read
Halder, K., Srivastava, A. K., et al.
Smart Agricultural Technology (IF: 7.1; Q1)

2025 **Propagation patterns of different degree meteorological droughts across the Yangtze River Basin: a three-dimensional drought feature identification approach with Copula modeling** Read
Xing, L., Zhao, R., Sun, H., Tan, Z., Fang, Q., Li, M., Halder, K., et al.
Journal of Hydrology (IF: 7.3; Q1)

2025 **High-Resolution Maize Yield Mapping across Africa using Earth Observation and Machine Learning, Deep Learning, and Foundation Model** Read
Halder, K., Ewert, F., et al.
Science of Remote Sensing (IF: 7.1; Q1)

2025 **Improving landslide susceptibility prediction through ensemble Recursive Feature Elimination and meta-learning framework** Read
Halder, K., Srivastava, A. K., et al.
Scientific Reports (IF: 4.9; Q1)

2025 **Highlighting the role of traditional paddy for sustainable agriculture and livelihood: issues, policy intervention and the pathways** Read
Patra, S., Saha, A., Pal, S. C., Islam, A. R. M. T., Halder, K., et al.
Discover Sustainability (IF: 5.2; Q1)

2025 **Dynamic Modelling of Mixed Crop-Livestock Systems: A Case Study of Climate Change Impacts in sub-Saharan Africa** Read
Srivastava, A. K., Rahimi, J., Alsafadi, K., Vianna, M., Enders, A., Zheng, W., Demircan, A., Dieng, M. D. B., Salack, S., Faye, B., Singh, M., Halder, K., et al.
Scientific Reports (IF: 4.9; Q1)

2024 **SAR-driven flood inventory and multi-factor ensemble susceptibility modelling using Machine Learning Frameworks** Read
Halder, K., Ghosh, A., et al.
Geomatics, Natural Hazards and Risk (IF: 4.9; Q1)

2024 **Application of bagging and boosting ensemble machine learning techniques for groundwater potential mapping in a drought-prone agriculture region of eastern India** Read
Halder, K., Srivastava, A. K., et al.
Environmental Sciences Europe (IF: 7.1; Q1)

PRESENTATIONS

May 2026 **Assessing Agricultural Production within Planetary Boundaries using an Integrated Monitoring and Hybrid Modelling Approach**
Oral presentation • EGU General Assembly 2026 Vienna, Austria

Oct. 2025

Mapping Land Surface Phenology for Sustainable Food Systems: A Multiscale, Open-Source Approach Using Multi Source Remote Sensing

Oral presentation • Sustainable Agriculture for Food Security and Global Health, GBPUA&T — Pantnagar, India

Apr. 2025

Advancing Crop Yield Predictions: The Potential of Diffusion Models in Machine Learning for Agriculture

Poster • EGU General Assembly 2025 — Vienna, Austria

Apr. 2025

Transforming Low-Resolution CORINE Data into High-Resolution Landscape Maps with Semi-Supervised Deep Learning

Poster • EGU General Assembly 2025 — Vienna, Austria

Feb. 2024

Indo-German Workshop on Resilient Food Systems: AI, Remote Sensing, and Crop Models in Harmony (R-FARM)

Oral presentation — University of Bonn, Germany

Sep. 2023

International Seminar on Recent Advancement in Geographical Studies - A Multidimensional Outlook

Oral presentation • Department of Geography, Rampurhat College — Birbhum, West Bengal, India

WORKSHOPS & TRAINING

Sep. 2025

Hy4Cast — Hybrid modelling leveraging Artificial Intelligence for fine-scale crop yield forecasts

Workshop Moderator at Tropentag 2025 — University of Bonn, Germany

Feb. 2022

Training Course on Aquifer Mapping and Management

Workshop Attendee, Central Ground Water Board — Salt Lake, Kolkata, India

AWARDS & ACHIEVEMENTS

Mar. 2024

All India Rank (AIR) 36 in the Geomatics Engineering paper of GATE 2024

Indian Institute of Science, Bangalore — Bangalore, India

Graduate Aptitude Test in Engineering (GATE) 2024.

Jun. 2019

Top 0.01 percentile statewide in the Higher Secondary Certificate (HSC) examination

West Bengal, India

Ranked among the top 0.01 percentile of 777,000 candidates with a test score of 479/500.