

PROMOTION RECOMMENDATION
The University of Michigan
School for Environment and Sustainability

Meha Jain, assistant professor of environment and sustainability, School for Environment and Sustainability, is recommended for promotion to associate professor of environment and sustainability, with tenure, School for Environment and Sustainability.

Academic Degrees:

Ph.D.	2014	Columbia University, Ecology, Evolution, and Environmental Biology
A.B.	2007	Princeton University, Ecology and Evolutionary Biology

Professional Record:

2016-present	Assistant Professor, School for Environment and Sustainability, University of Michigan
2014-2016	Post-doctoral Fellow, Department of Earth System Science, Stanford University

Summary of Evaluation:

Teaching: Professor Jain has established a strong record of formal teaching since joining the University of Michigan and SEAS. She has developed two lecture courses and one graduate seminar, and she has also developed two Coursera MasterTrack courses in the online Sustainability and Development program offered by SEAS. Professor Jain's main course is Natural Resource Statistics; this is a large (about 90 students), four-credit-hour course that is required for most master's students at SEAS. She has completed a remarkable overhaul of the course, transforming it from a persistent problem for the school to a reliably successful course. Moreover, her course design has invigorated the school's quantitative curriculum; a large number of students taking this course now continue into other more advanced quantitative courses. For this and her other courses, Professor Jain regularly receives course evaluation scores in the 4.6-4.9 range for the question focusing on the quality of the teaching ('overall the instructor is an excellent teacher').

In addition to her formal teaching, Professor Jain is an energetic mentor of post-doctoral fellows, master's students, and undergraduate students. She has an excellent record of placing post-doctoral fellows in faculty positions and master's students in Ph.D. programs. She has mentored eleven UROP students, all of whom are underrepresented in their field of study.

Research: Professor Jain is an interdisciplinary sustainability scholar who relies on theories and methods from the fields of geography, agronomy, ecology, and economics. She studies the outcomes of farmers' agricultural practices in smallholder systems in low-income countries, with a focus on their adaptation to environmental change and the adoption of interventions to increase productivity. A hallmark of her research is the combination of multiple empirical methods to produce novel datasets at large spatial-temporal scales. Professor Jain and her team of collaborators and students have used these data products to identify smallholder practices, quantify crop yields, and assess the impact of environmental change and agricultural interventions. The overarching goal of her research program is to develop sustainable agricultural practices in the context of global change.

Professor Jain's scholarship is impressive in its abundance and quality. As of May 2022, Professor Jain's peer-reviewed publications include 44 refereed articles, ten manuscripts in review, two book chapters, and a book review. Her publications appear in high-impact science journals and environmental journals, and in a range of disciplinary journals. She has averaged 4.75 publications per year since obtaining her Ph.D. in 2014 (1.37 publications per year as first author), and 5.1 publications per year since starting at SEAS in

2016 (1.16 publications per year as first author). Professor Jain's publications have received 1763 citations on the Web of Sciences and 2966 citations on Google Scholar. Her H-index is 20 in the Web of Sciences and 26 in Google Scholar. Professor Jain has an exemplary record of grant funding in support of her scholarship.

A second perspective is the highly interdisciplinary nature of Professor Jain's work, spanning both natural and social systems. Her publications are distributed across remote sensing, agricultural, and social sciences, with the common goal of improving and promoting sustainable agricultural practices in smallholder systems. Such an objective requires an interdisciplinary approach that addresses complex interactions between the environmental, agronomic, and social components of crop production systems. The extent of her contributions across multiple fields is impressive and commendable.

Professor Jain's publications demonstrate that she is an outstanding collaborator, as evidenced by her multiple co-authored publications, while still maintaining independent productivity (i.e., sole authored reviews, and numerous publications with her post-doctoral fellows and students). This clearly shows her ability to be an intellectual leader, as well as a person who works well as a member of an interdisciplinary research team. Professor Jain is a productive, independent researcher who is making a large academic impact.

Professor Jain has an outstanding record of external funding. Her extramural support totals \$1.86M as the PI, mostly funded by NASA, and \$500K as a co-PI, mostly funded by USDA (these numbers reflect Professor Jain's share of the grant funds, not the total funds). Professor Jain has been very energetic in the pursuit of funding. In addition to those funded, she has submitted five proposals as the PI and 14 others as a co-PI; these were submitted to a diverse set of organizations, including NASA, NSF, and several foundations. This is an excellent record of funding for an assistant professor and shows Professor Jain's potential for continuing her successful career in research.

Professor Jain has received several awards and fellowships. She received an early career award in 2016 from NASA's New Investigator Program in Earth Science. Prior to joining the SEAS faculty, she won an NSF Sustainability Postdoctoral Fellowship in 2014; an NSF Coupled Human and Natural Systems Fellowship in 2013; and an NSF Graduate Research Fellowship in 2009. Professor Jain's publications have received widespread attention in the general media and by journal editors, including two that were selected as among the top papers in Global Environmental Change over the last 10 years for advancing the frontiers of adaptation research.

Recent and Significant Publications:

- Jain, M., R. Fishman, P. Mondal, G.L. Galford, N. Bhattarai, S. Naeem, U. Lall, B. Singh, R.S. DeFries (2021). Groundwater depletion will reduce cropping intensity in India. *Science Advances*. 7 (9): eabd2849.
- Jain, M., B. Singh, P. Rao, A.K. Srivastava, S. Poonia, J. Blesh, G. Azzari, A.J. McDonald, D.B. Lobell (2019). "The impacts of agricultural interventions can be doubled by using satellite data." *Nature Sustainability*. 2, 931-934.
- Jain, M., B. Singh, A. Srivastava, R.K. Malik, A. McDonald, D.B. Lobell (2017). Using satellite data to identify the causes of and potential solutions for yield gaps in India's wheat belt. *Environmental Research Letters*. 12: 094011.
- Jain, M., D. Solomon, H. Capnerhurst, A. Arnold, A. Elliott, A. Kinzer, C. Knauss, M. Peters, B. Rolf, A. Weil, C. Weinstein (2020). How much can sustainable intensification increase yields across South Asia? A systematic review of the evidence. *Environmental Research Letters*. 15: 083004
- Jain, M. (2020). The Benefits and Pitfalls of Using Satellite Data for Causal Inference. *Review of Environmental Economics and Policy*. 14(1). 157-169.

Service: Professor Jain has an active program of service and engagement. She has contributed meaningfully to SEAS as well as to campus-level educational programming, most prominently the Sustainability and Development Initiative, the Sustainable Food Systems Initiative, and the Transformative Food Systems Fellowship Program. Professor Jain serves as SEAS' Liaison for Inclusive Teaching and has served on the SEAS Ph.D. Selection Committee. She reviews abstracts and papers for professional organizations and journals. Professor Jain's engagement leverages her field-based research to forge relationships with international development organizations. In collaboration with these organizations, she conducts impact evaluations of interventions intended to improve agricultural production outcomes in smallholder systems.

Professor Jain's engagement with international development organizations leverages her field-based research on agricultural production in smallholder systems. She has forged three collaborative relationships – with the International Maize and Wheat Improvement Center, the German Agency for International Cooperation, and Precision Development – to conduct impact evaluations of various interventions intended to improve production outcomes. In addition, Professor Jain has trained researchers at several development organizations on software for satellite imaging. Her work with development organizations is a commendable mode of faculty engagement, translating research into real-world impact.

External Reviewers

Reviewer A: "I have been following her work [Professor Jain's work] and publications since she started publishing her excellent scientific contributions, mainly addressing food security in smallholder farmers in India. I have always been impressed with the quality of her work, which has made her a highly respected colleague in the field of remote sensing among scientists from around the world. ...Her work on remote sensing was the first to show the benefit of using new micro-satellite data to map smallholder agriculture or to evaluate the implications of groundwater depletion on agricultural production in India and how farmers may adapt, or to increase yield and equity in smallholder systems."

Reviewer B: "Dr. Jain is unequivocally an extremely productive, collaborative, and motivated researcher. Her record makes evident that she has established herself as an authoritative scientist in the use of remotely sensed data, coupled with socioeconomic census and survey data, to gain insight into agricultural resource use and production outcomes in face of changing environmental conditions. ...While there is no need to reiterate the quantitative metrics that describe Dr. Jain's productivity, by any measure, Dr. Jain is exceeding expectations for a scholar of her rank and experience."

Reviewer C: "I am delighted to provide comments as part of your evaluation of Meha Jain for promotion to Associate Professor with tenure at the University of Michigan. I do so with much enthusiasm and no reservations whatsoever. Her profile is stronger than almost any other candidate I have evaluated in the past five years. ...Frequently we face the question of whether there is sufficient quality or quantity or both. Personally, I value high quality above quantity, though I of course understand the tradeoffs here. Fortunately, in Professor Jain's case, she has numerous high-quality publications and has more than enough on quantity... Professor Jain has creative and well-executed ideas and is innovative in ways that few other sustainability scholars are right now. I am just highly impressed."

Reviewer D: "Dr. Jain's research examines topics at the interface of remote sensing, land use and land cover change, and agriculture. The key focus of her work is how remote sensing and geospatial technology can be used to map, monitor, and improve the management and sustainability of agricultural lands, with a particular focus on land use and sustainable agriculture in India. Dr. Jain is clearly productive, and the quality and impact of her work is very high. ...In summary, my evaluation is that Dr. Jain's case for tenure and promotion is extremely strong."

Dr. Jain leads a successful research group, her work is important and widely respected in the community, and her papers are having a significant impact in her field. She is clearly a rising star, and the University of Michigan is very lucky to have her.”

Reviewer E: “I was particularly impressed by the range of methods employed by Dr. Jain. Her scholarship includes efforts to map smallholder agriculture where she made significant contributions to map crop area, yield, sowing date, field boundaries, evapotranspiration and tillage practices using high-resolution and moderate-resolution data. These have made significant contributions to the field. She leverages this novel data to examine the impacts of environmental change on smallholders and their pathways for adaptation. She goes beyond the top-down view to get in the field through household surveys and also relies on census data to deepen her understanding. Dr. Jain admirably uses her science to then develop solutions demonstrating the applied nature of her work and her commitment to conduct research that can be used by the communities she studies. In this work, she partners with stakeholders to develop sustainable strategies to close yield gaps. ...In summary, Dr. Meha Jain is a remarkable scholar who is at the very top of her peer group.”

Reviewer F: “[Professor Jain] has made an important contribution to studying the challenges of climate and environmental change faced by smallholder farmers, including the impact of groundwater depletion. Her research combines a technical knowledge of satellite data with a strong domain-based understanding of smallholder farming systems. Her research is oriented to finding solutions to societal problems. ...Meha is on an excellent research trajectory and all the signs are positive that she will continue to make a significant contribution to the field of land use science. I have no reservations in recommending Dr. Meha Jain for promotion to Associate Professor with tenure.”

Reviewer G: “A growing number of scientists are leveraging remote sensing measurement to answer pressing questions about the environment and human well-being. Dr. Jain was at the forefront of this movement. Her ability to collaborate across disciplines has allowed her to leverage her expertise in measurement to address a range of important questions. ...Increasingly, new researchers aspire to marry methodological rigor in remote sensing with applied problems, and Dr. Jain’s leadership role in this emerging community will serve her well through her career. For someone so early in her career, her impact on the profession is remarkable.”

Summary of Recommendation: Professor Jain has an excellent record of scholarship and research productivity. She has a strong record of grant funding in support of her research program, and she has used this funding, in part, to train a set of post-doctoral fellows in her field. Professor Jain has established an outstanding record of teaching and mentoring of graduate students. Professor Jain provides valuable service both externally and at the university, and her engagement with international development organizations serves to translate her research into tangible societal impact. I enthusiastically recommend Meha Jain for promotion to associate professor of environment and sustainability, with tenure, School for Environment and Sustainability.



Jonathan T. Overpeck
Samuel A. Graham Dean
School for Environment and Sustainability

May 2023