

KARTHIK RAMASWAMY, Ph.D.

Agricultural Economist | Hydro-Economic Modeling | Water–Energy–Food Systems

Madison, WI, USA

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[Google Scholar Profile](#)

Research Summary

Peer-Reviewed Journal Articles: 2

Manuscripts Under Review: 1

Working Papers/Manuscripts in Preparation: 4

Technical Reports: 3

Conference Presentations: 10+

Awarded Project Funding Participation: \$125,000

Federal Research Programs: USGS 104(b), DOE Bioenergy Research Center

Research Interests

- Hydro-economic modeling of groundwater resources
- Groundwater sustainability and aquifer management
- Irrigation technology adoption and water conservation
- Bioenergy crop systems and land-use transitions
- Climate adaptation in agricultural systems
- Optimization modeling for water and land resource management
- Food–Energy–Water system integration

Research Profile and National Relevance

My research develops hydro-economic modeling frameworks to evaluate groundwater sustainability, irrigation technology adoption, and agricultural land-use transitions under water scarcity, with a primary focus on the U.S. High Plains Aquifer. By integrating economic optimization models, groundwater dynamics, MODFLOW-based simulation, and geospatial analysis, I examine long-term agricultural water management strategies and the trade-offs associated with irrigation technologies, crop transitions, and resource constraints. This work provides policy-relevant insights for improving water conservation, sustaining agricultural productivity, and supporting renewable bioenergy systems in water-stressed agricultural regions. Through interdisciplinary research, including contributions to the U.S. Department of Energy Great Lakes Bioenergy Research Center (GLBRC), my work supports sustainable agricultural transitions, groundwater conservation, and long-term resource management in the United States.

Education

Ph.D. in Agricultural Economics 2019

Oklahoma State University, Stillwater, Oklahoma

Dissertation: *Economics of Alternative Groundwater Management Strategies in Oklahoma*

Advisors: Jeffrey Vitale and Arthur L. Stoecker

M.S. in Agricultural Economics 2016

Oklahoma State University, Stillwater, Oklahoma

Thesis: *Economics of Irrigated Crop Choices Using Center Pivot Systems in the Oklahoma Panhandle*

Advisor: Arthur L. Stoecker

B.E. in Agricultural and Irrigation Engineering 2011

College of Engineering Guindy–Anna University, Chennai, India

Thesis: *Cost-effective Approaches to Weed Management in Irrigation Tanks in Southern India*

Professional Experience

Researcher I

Sep 2026–Present

Center for Sustainability and the Global Environment (SAGE)

Nelson Institute for Environmental Studies, University of Wisconsin–Madison

- Conduct hydro-economic and geospatial research on irrigation system transitions, groundwater sustainability, and bioenergy crop systems across U.S. agricultural regions.
- Develop and apply optimization and decision-support models integrating agricultural production, groundwater availability, irrigation technology, and economic outcomes.
- Analyze field-scale and national-scale irrigation efficiency, irrigation system upgrade opportunities, and water–energy–carbon trade-offs using geospatial and agricultural datasets.
- Contribute to integrated systems modeling research within the U.S. Department of Energy Great Lakes Bioenergy Research Center (GLBRC), including research on bioenergy production opportunities on water-stressed and formerly irrigated agricultural lands.

Research Associate

2023–Sep 2026

Center for Sustainability and the Global Environment (SAGE)

Nelson Institute for Environmental Studies, University of Wisconsin–Madison

- Led geospatial analysis (ArcGIS/ArcPy) and hydro-economic optimization modeling using national-scale agricultural datasets to assess long-term water and land-use transitions.
- Developed modeling frameworks integrating agricultural production decisions, groundwater dynamics, irrigation technology upgrades, and renewable energy feedstocks.
- Analyzed irrigation system upgrade potential across U.S. agricultural regions and contributed to interdisciplinary sustainability research through GLBRC and related federally funded initiatives.

Research Fellow

2020–2021

Jordan College of Agricultural Sciences and Technology

California State University–Fresno

- Developed a spatial equilibrium model (SEM) in GAMS to evaluate the impacts of Chinese retaliatory tariffs on the U.S. tree nut industry and inform agricultural trade policy analysis.
- Constructed a multi-product price-endogenous linear programming model (PELPM) to forecast mill assessment revenue for the California Department of Pesticide Regulation.
- Conducted economic impact analysis of certification requirements under 40 CFR Part 171 (Certification of Pesticide Applicators) for pesticide applicators in California.
- Performed cost–benefit analysis for the proposed Temperance Flat Reservoir (RM 274) to evaluate its potential contribution to water supply and resource management in California.
- Developed grant proposals on groundwater sustainability and economic strategies under California’s Sustainable Groundwater Management Act (SGMA).

Technical Paraprofessional

2019

Department of Agricultural Economics, Oklahoma State University, Stillwater, Oklahoma

- Instructed graduate students in GIS-based spatial analysis techniques and supported development of economic models for pest management in grain sorghum systems across the Southern High Plains.
- Managed grading and attendance records for 200 students in AGE 3423: Farm and Agribusiness Management.
- Assisted in preparing peer-reviewed manuscripts on GIS applications, agricultural computing, and irrigation management.
- Supported grant proposal preparation for groundwater management research in the Oklahoma High Plains.

Graduate Research Associate

2017–2019

Department of Agricultural Economics

Oklahoma State University, Stillwater, Oklahoma

- Conducted hydro-economic and spatial analysis to evaluate subsurface drip irrigation adoption under groundwater constraints in the Southern High Plains.
- Simulated groundwater flow and migration dynamics using MODFLOW to assess impacts of conservation irrigation districts.
- Used GIS-based spatial analysis to examine crop allocation strategies in priority groundwater management zones in the Oklahoma High Plains.
- Calibrated and validated EPIC crop growth simulations for irrigated wheat using long-term field trial data.

Graduate Research Assistant

2013–2016

Department of Agricultural Economics

Oklahoma State University, Stillwater, Oklahoma

- Simulated long-term yield responses of irrigated corn and grain sorghum under groundwater-limited irrigation scenarios using the EPIC crop model.
- Quantified groundwater pumping costs across alternative well capacities and interference conditions using the Cooper–Jacob drawdown equation.
- Constructed crop enterprise budgets for alternative irrigation technologies, well-capacity levels, and interconnected well systems.
- Developed a mixed-integer programming (MIP) optimization model to determine optimal multi-period irrigation system investment strategies.

Publications and Research Outputs

Peer-Reviewed Journal Articles

1. **Ramaswamy, K.**, Uludere-Aragon, N., Lark, T. J. 2026. Opportunities for Bioenergy Crops to Support Transitions from Irrigated Agriculture and Conserve the U.S. High Plains Aquifer. *Agricultural Water Management*. 334, 110675. <https://doi.org/10.1016/j.agwat.2026.110675>
2. Asci, S., **Ramaswamy, K.** 2021. “Issues Facing the Californian Fruit Sector.” *Choices*, 36(2). <https://www.jstor.org/stable/27098589>

Manuscripts Under Review

1. **Ramaswamy, K.**, Stoecker, A. L., Warren, J., Jones, R., Taghvaeian, S., Vitale, J. Potential Replacement of Center Pivot Systems with Subsurface Drip Irrigation. *Agricultural Water Management*. Under review.

Working Papers

1. Lark, T. J., **Ramaswamy, K.**, Uludere-Aragon, N., Basso, B., Robertson, P. 2026. Biomass production opportunities on intermittent, former, and water-stressed irrigated lands of the United States. Manuscript in preparation for *GCB Bioenergy*.
2. **Ramaswamy, K.**, Lark, T. J., Uludere-Aragon, N., Xie, Y. 2026. Field-scale irrigation efficiency estimates reveal water–energy–carbon trade-offs across the United States. Manuscript in preparation; intended for submission to *Nature Water*.
3. **Ramaswamy, K.**, Lark, T. J., Uludere-Aragon, N., Xie, Y. Reinforcement Learning for Sustainable Irrigation System Upgrades in U.S. Agriculture. Manuscript in preparation; intended for submission to *Environmental Modelling & Software*.
2. **Ramaswamy, K.**, Stoecker, A. Groundwater Conservation Leakage and the Scale of Collective Pumping Management: A Coupled Hydro-Economic and Flow Modeling Study of the Ogallala Aquifer. Manuscript in preparation; intended for submission to *Water Resources Research*.

Technical Reports

1. **Ramaswamy, K.**, Stoecker, A.L. 2019. Economics of Groundwater Interaction and Competing Crops. USGS 104(b) project report submitted to the *Oklahoma Water Resources Center*.

2. Warren, J. G., Stoecker, A. L., Gatlin, J., **Ramaswamy, K.**, Jones, R. D., Campiche, J., Paul, A., Lane, B. 2016. Optimizing the Economic Value of Water from the Ogallala Aquifer Used for Irrigation. *USGS 104(b) project report, Oklahoma Water Resources Center.*
3. Stoecker, A. L., **Ramaswamy, K.**, Warren, J. G., Jones, R. D., Campiche, J., Paul, A., Lane, B. 2015. Comparison of Grain Sorghum and Corn Productivity under Limited Irrigation with Subsurface Drip. *USGS 104(b) project report, Oklahoma Water Resources Center.*

Scholarly Dissemination

Extension Publications

1. Warren, J. G., Stoecker, A. L., Jones, R. D., Lane, B., **Ramaswamy, K.**, Beedy, T. 2016. Crop Insurance Limitation to Adoption of Irrigated Grain Sorghum. *Oklahoma Cooperative Extension Service fact sheet*, Stillwater, Oklahoma.
2. Warren, J. G., Stoecker, A. L., Jones, R. D., **Ramaswamy, K.**, Beedy, T. 2017. Economic Viability of Grain Sorghum and Corn as a Function of Irrigation Capacity. *Oklahoma Cooperative Extension Service fact sheet*, Stillwater, Oklahoma.

Conference Papers

1. **Ramaswamy, K.**, Lark, T. J., Uludere-Aragon, N. 2024. Economic Strategies to Synergistically Produce Bioenergy and Optimize Aquifer Life in the U.S. High Plains. Selected paper, *Agricultural & Applied Economics Association (AAEA) Annual Meeting*, New Orleans, Louisiana. July 28–30.
2. Asci, S., **Ramaswamy, K.**, Konduru, S. 2020. Modern Trade Wars: Chinese Retaliatory Tariffs vs. California's Tree Nuts Industry. Selected paper, *Agricultural & Applied Economics Association (AAEA) Annual Meeting*, virtual, Kansas City, Missouri, August 10–11.
3. **Ramaswamy, K.**, Stoecker, A. L., Jones, R. D., Warren, J. G., Taghvaeian, S. 2018. Economics of Groundwater Interaction and Competing Producers. Selected paper, *Agricultural & Applied Economics Association (AAEA) Annual Meeting*, Washington, District of Columbia, August 5–7.
4. **Ramaswamy, K.**, Stoecker, A. L., Jones, R. D., Warren, J. G., Taghvaeian, S. 2017. Choice of Irrigated Corn or Grain Sorghum and Center Pivot or Subsurface Drip Systems in the High Plains of Oklahoma. Selected paper, *Agricultural & Applied Economics Association (AAEA) Annual Meeting*, Chicago, Illinois, July 30–August 1.
3. Warren, J. G., Stoecker, A. L., Jones, R. D., **Ramaswamy, K.**, Beedy, T. 2014. Economic Viability of Grain Sorghum and Corn as a Function of Irrigation Capacity. Selected paper, *29th Annual Central Plains Irrigation Conference*, Burlington, Colorado, February 21–22.

Selected Conference Presentations

1. **Ramaswamy, K.**, Stoecker, A. L. 2016. Optimal Long-Term Choice of Crop and Irrigation System with Limited Groundwater Supply. Paper presentation, *American Society of Civil Engineers (ASCE) World Environmental & Water Resources Congress*, West Palm Beach, Florida, May 22–26.
2. **Ramaswamy, K.**, Stoecker, A. L. 2018. Economics of Cooperative Irrigation District in Oklahoma Panhandle. Paper presentation, *Oklahoma Governor's Water Conference and Research Symposium*, Midwest City, Oklahoma, December 5–6.
3. **Ramaswamy, K.**, Stoecker, A. L., Warren, J. G., Taghvaeian, S., Jones, R. D. 2017. Profitability between Subsurface Drip and Center Pivot Irrigation Systems in Oklahoma Panhandle. Paper presentation, *Oklahoma State University Student Water Conference*, Stillwater, Oklahoma, March 23–24.
4. **Ramaswamy, K.**, Stoecker, A. L. 2016. Economic Contrast of Independent and Competitive Water Extraction with Limited Water Supply. Paper presentation, *27th Annual OSU Research Symposium*, Stillwater, Oklahoma, February 15–16.
5. **Ramaswamy, K.**, Stoecker, A. L., Warren, J. G., Jones, R. D., Taghvaeian, S., Campiche, J., Paul, A., Lane, B. 2015. Economic Modeling to Maximize the Remaining Value of Ogallala Groundwater with Irrigated Corn VS Grain Sorghum and Center Pivot VS Subsurface Drip Systems. Paper presentation,

Oklahoma Governor's Water Conference and Research Symposium, Norman, Oklahoma, December 1–2.

4. **Ramaswamy, K.**, Stoecker, A. L. 2014. Groundwater Level Depletion and Comparison of Corn and Grain Sorghum Production in Texas County, Oklahoma. Paper presentation, *Oklahoma State University Student Water Conference*, Stillwater, Oklahoma, April 10–11.

Selected Poster Presentations

1. **Ramaswamy, K.**, Uludere-Aragon, N., Lark, T. J. 2026. From Optimization to Adoption: A Decision-Support Tool for Groundwater-Constrained Bioenergy Crop Transitions. Poster presentation, *U.S. Department of Energy Great Lakes Bioenergy Research Center Annual Science Meeting*, Lake Geneva, Wisconsin, May 11–13.
2. **Ramaswamy, K.**, Lark, T. J., Uludere-Aragon, N., Xie, Y. 2025. Advances in Decision-Making in Modern Agriculture: Targeted Irrigation System Upgrades in the U.S. Poster presentation, *American Geophysical Union (AGU) Annual Meeting*, New Orleans, Louisiana, December 15–19.
3. **Ramaswamy, K.**, Uludere-Aragon, N., Lark, T. J. 2025. Bioenergy as a Bridge: Smart Irrigation Transitions to Conserve the U.S. High Plains Aquifer, *U.S. Department of Energy Great Lakes Bioenergy Research Center Sustainable Bioenergy Cropping Systems Meeting*, Hickory Corners, Michigan, October 22–23.
4. **Ramaswamy, K.**, Lark, T. J., Uludere-Aragon, N. 2025. Mitigating Groundwater Decline with Bioenergy Crops: Strategic Transitions in the U.S. High Plains. Poster presentation, *U.S. Department of Energy Great Lakes Bioenergy Research Center Annual Science Meeting*, Milwaukee, Wisconsin, May 16–18.
5. **Ramaswamy, K.**, Lark, T. J., Uludere-Aragon, N. 2024. Economic Opportunities for Producing Bioenergy Feedstocks and Optimizing Aquifer Life in the U.S. High Plains. Poster presentation, *U.S. Water@UW-Madison Annual Spring Symposium*, Madison, Wisconsin, May 6.
6. **Ramaswamy, K.**, Lark, T. J., Uludere-Aragon, N. 2024. Economic Opportunities for Producing Bioenergy Feedstocks and Optimizing Aquifer Life in the US High Plains. Poster presentation, *U.S. Department of Energy Great Lakes Bioenergy Research Center Annual Science Meeting*, Lake Geneva, Wisconsin, May 13–15.
7. **Ramaswamy, K.**, Lark, T. J. 2024. Economic Opportunities of Bioenergy Feedstock Production in the U.S. High Plains, *U.S. Department of Energy Great Lakes Bioenergy Research Center Sustainable Bioenergy Cropping Systems Meeting*, Hickory Corners, Michigan, February 6–8.
8. **Ramaswamy, K.**, Vitale, J., Warren, J., Taghvaeian, S. 2020. Groundwater Management Policy Strategies for Effective Conservation of the Ogallala Aquifer. Poster presentation, *Agricultural & Applied Economics Association Annual Meeting*, virtual, Kansas City, Missouri, August 10–11.
9. **Ramaswamy, K.**, Vitale, J. 2019. Potential Enacting of Cooperative Irrigation District in the High Plains of Oklahoma. Poster presentation, *Oklahoma Governor's Water Conference and Research Symposium*, Midwest City, Oklahoma, December 4–5.
10. Hoback, W. W., Boyer, T., **Ramaswamy, K.** 2018. Non-Major Student Perception of Accuracy of Content About the Loss of Pollinators Varies by Delivery Mode, *North American Colleges and Teachers of Agriculture Conference*, Ames, Iowa, June 12–15.
11. **Ramaswamy, K.**, Stoecker, A. L. 2018. Economics of a Potential Groundwater Management Area in Oklahoma Panhandle. Poster presentation, *Oklahoma Clean Lakes and Watersheds Conference*, Stillwater, Oklahoma, April 4–5.
12. **Ramaswamy, K.**, Stoecker, A. L., Warren, J. G., Taghvaeian, S., Jones, R. D. 2017. Irrigation System Choice in Oklahoma Panhandle: Center Pivot versus Subsurface Drip. Poster presentation, *Oklahoma Governor's Water Conference and Research Symposium*, Norman, Oklahoma, October 31–November 1.
13. **Ramaswamy, K.**, Stoecker, A. L., Warren, J. G., Taghvaeian, S., Jones, R. D. 2016. Irrigated Crop Choices Using Center Pivot: A Long-Term Profit Maximization. Poster presentation, *Oklahoma Governor's Water Conference and Research Symposium*, Norman, Oklahoma, October 11–12.

14. **Ramaswamy, K.**, Stoecker, A. L., Warren, J. G., Jones, R. D., Campiche, J. 2014. Water Use Profitability: Corn vs Grain Sorghum for Panhandle Irrigation. Poster presentation, *Oklahoma Governor's Water Conference and Research Symposium*, Oklahoma City, Oklahoma, October 22–23.

Professional Recognition and Scientific Service

Invited talk

Characterizing Land Availability for Bioenergy Across the United States, GLBRC Sustainability Retreat, U.S. Department of Energy Great Lakes Bioenergy Research Center, Kellogg Biological Station, Michigan State University, 2024.

Scientific Review and Evaluation

- Poster Judge, Great Lakes Bioenergy Research Center (GLBRC) Annual Science Meeting, 2024, 2025, and 2026.
- Selected Poster Judge, UW–Madison Postdoctoral Research Symposium, University of Wisconsin–Madison, 2026

Abstract Reviewer

Agricultural & Applied Economics Association (AAEA) Annual Meeting

- International Development: Trade, Markets, and Policy – 2021
- Resource and Environmental Analysis Policy – 2020
- Production Economics – 2018

Academic Committee Service

Graduate Student Committee Member, Natural Resources and Environmental Economics Faculty Search, Department of Agricultural Economics, Oklahoma State University, Stillwater, Oklahoma, 2019.

Research Presentation to Policy Advisory Bodies

- Presented research findings from the USGS 104(b) project, Economics of Groundwater Interaction and Competing Crops, to the U.S. Geological Survey Water Research Advisory Board, Oklahoma City, Oklahoma, 2018.
- Presented research proposal for the USGS 104(b) project, Economics of Groundwater Interaction and Competing Crops, to the U.S. Geological Survey Water Research Advisory Board, Stillwater, Oklahoma, 2016.

Professional Affiliations

- Agricultural & Applied Economics Association (AAEA)
- American Geophysical Union (AGU)
- Great Lakes Bioenergy Research Center (GLBRC)

Guest Lectures

- Integer and Mixed-Integer Programming for Agricultural Optimization Models, PhD course AGEC 6103, *Department of Agricultural Economics, Oklahoma State University*, Stillwater, Oklahoma, 2018.
- Economic Analysis of Groundwater Depletion and Crop Choice in the Ogallala Aquifer, PhD course AGEC 6103, *Department of Agricultural Economics, Oklahoma State University*, Stillwater, Oklahoma, 2014.

Grants and Funding

Awarded Project Funding Participation: \$125,000

Funded

Closing the Loop on Sustainable Plasticulture
Co-Investigator (PI: C. Hillyer)

2021–2022

Colorado State University
\$115,000

Economics of Groundwater Interaction between Producers and Competing Crops 2018–2019
Co-Investigator (PI: J. Vitale)
U.S. Geological Survey (USGS) 104(b) Program – Oklahoma Competitive Research Grants Program
\$5,000

Optimal Location for Cooperative Irrigation Districts in the High Plains of Oklahoma 2017–2018
Co-Investigator (PI: A. L. Stoecker)
U.S. Geological Survey (USGS) 104(b) Program – Oklahoma Competitive Research Grants Program
\$5,000

Submitted Proposals:

California Pesticide Demand Forecast: Big Data Analysis Using Pesticide Use Reporting Data 2020–2021
Co-Investigator (PI: S. Asci)
Agricultural Research Institute Competitive Grant – California State University, Fresno
\$105,870

Optimal Irrigation District Size with Sustainable Yield under the Sustainable Groundwater Management Act (SGMA) 2021–2023
Co-Principal Investigator (PI: C. Qualle)
U.S. Geological Survey (USGS) – University of California Agriculture and Natural Resources
\$25,000

Honors and Awards

Endowed International Agricultural Economics Fellowship	2015
<i>Oklahoma State University, Stillwater, Oklahoma</i>	
Leonard F. Miller Distinguished Graduate Fellowship in International Rural Development	2014–2015
<i>Oklahoma State University, Stillwater, Oklahoma</i>	
Spielman Scholarship (Graduate Fellowship)	2014
<i>Oklahoma State University, Stillwater, Oklahoma</i>	

Outreach and Research Engagement

Research Dissemination

- Communicated research findings on “How Crop Arrangement Strategies Can Extend the Life of the Ogallala Aquifer,” Oklahoma Water Resources Center newsletter, July 2019.
- Communicated research findings on “Emerging Irrigation Technologies Lead to Water Conservation Strategies,” Oklahoma Water Resources Center newsletter, April 2019.

Field Research Experience

Coordinated field surveys with approximately 300 farmers in southern India on irrigation tank weed management practices in collaboration with the International Water Management Institute (IWMI), May 2010.

Technical and Programming Skills

Programming and Modeling: Python • GAMS • MATLAB • R • SAS • STATA • SQL

Optimization and Economic Modeling: Risk Solver • MODFLOW • EPIC • IMPLAN • SEMITAR

Geospatial Analysis: ArcGIS Pro • ArcPy • Google Earth Engine

Scientific Computing: Mathematica • Maple

Survey and Data Collection: Qualtrics • Google Forms

Data Analysis and Productivity: Excel (including VBA) • Microsoft Office Suite • LaTeX