**Sujithkumar Surendran Nair**

Senior Technical Professional

Environmental Sciences Division & Climate Change Science Institute

Oak Ridge National Laboratory

PO Box 2008, MS 6301

1 Bethel Valley Rd, Oak Ridge, TN 37831

Phone: (865) 576-5307; Cell: (330) 641-4629

E-mail: surendrannas@ornl.gov

**Research interests**

* Climate change impact, vulnerability and adaptation in food, energy and water sectors
* Biophysical and socioeconomic drivers and teleconnections within and/or across coupled human ecosystems
* Understanding complexity and intervention opportunities in water-energy-carbon nexus using economy wide models
* Watershed modeling of transport and fate of heavy metals
* Use of urban typologies to investigate complex dynamics in urban systems
* Extreme weather events in socioecological systems
* Incorporating human behavioral dynamics into earth systems models
* Economic prioritization of national renewable energy landscape
* Social damage cost of critical infrastructure failure using economic system models

**Education**

2010 Ph.D. (Environmental Sciences, Focus- Environmental Economics), The Ohio State University, USA

1996 M.Sc. (Agricultural Economics), Tamil Nadu Agricultural University, India

1994 B.Sc. (Agricultural Sciences), Kerala Agricultural University, India

**Research and professional experience**

June 2016-Present: Senior Technical Professional, Oak Ridge National Laboratory, USA

2012- June 2016: Postdoctoral Research Associate, Oak Ridge National Laboratory, USA

* Climate change impact analysis of regional agroecosystems for prioritizing adaptation choices
* Developed and implemented socioecological typologies for quantification and attribution of biophysical and socioeconomic drivers in spatial variation of regional agricultural production
* Fine-resolution modeling of water footprint of urban-energy systems in river network to understand the direct and indirect water-energy linkages over urban landscapes
* Developed a method to delineate urban typologies to decipher the complex linkages in water-energy-carbon nexus in urban areas
* Detection and attribution of economic losses from extreme weather events using landscape typologies
* Applied bioenergy crop growth model to analyze the global biomass potential for bioenergy feedstock

 2010-2011: Postdoctoral Researcher, University of Tennessee, USA

* Hydro-economic modeling for water resource management in southeastern US
* Conservation prioritization in Lick Creek and Oostanaula watersheds, TN
* Economic analysis of water quality trading decisions using hydro-economic modeling

2004-2010: Graduate Research Associate, The Ohio State University, USA

* Calibration, validation and uncertainty analysis of Soil Water Analysis Tool (SWAT) in Upper Big Walnut Creek Watershed (UBWC), OH
* Recreational value of water quality in UBWC, OH
* Hydro-economic modeling for non-point source pollution management in UBWC, OH
* Climate change impact indices based on model results of world forest ecosystems

1998-2004: Agriculture Economist, Agricultural Research Service, India

* Linking crop, landscape and economic models for understanding technically feasible, economically viable and environmentally sound regional agricultural planning
* Partial equilibrium modeling for impact and trade-off analysis of future land use change on regional agricultural development
* Analysis of economic feasibility, agronomic suitability, and environmental sustainability of biomass for ethanol production in India

**Publications (Google Scholar citations: 297, H Index: 8)**

CR DeRolph, RA McManamay, AM Morton, **S SurendranNair** City energysheds and renewable energy in the United States. Nature Sustainability

Ryan A. McManamay, **Sujithkumar Surendran Nair**, Christopher R. DeRolph, Benjamin L. Ruddell, April M. Morton, Robert N. Stewart, Matthew J. Troia, Liem Tran, Hyun Kim, Budhendra L. Bhaduri 2017 US city impacts on hydrology and biodiversity, PNAS 114 (36) 9581-9586

**Surendran Nair, S**., Preston, B.L., King, A.W., Rui, M. 2016. Using landscape typologies to model socio-ecological systems: Application to agriculture of the United States Gulf Coast. Environmental Modeling and Software, 79: 85-95.

Zhou, X.V., Clark, C.D., **Nair, S.S.**, Hawkins, S.A., Lambert, D.M. 2015. Environmental and economic analysis of using SWAT to simulate the effects of switchgrass production on water quality in an impaired watershed. Agricultural Water Management, 160:1-13.

Preston, B.L., King, A.W., Ernst, K.M., Absar, S.M., **Nair, S.S.**, Parish, E.S. 2015.

Scale and the representation of human agency in the modeling of agroecosystems.

Current Opinion in Environmental Sustainability, 14: 239-249.

Yang et al. 2015 (50 authors). A roadmap for research on crassulacean acid metabolism (CAM) to enhance sustainable food and bioenergy production in a hotter, drier world. New Phytologist, 207: 491-504.

Kang, S., **Nair, S.S.**, Kline, K.L., Nichols, J.A., Wang, D., Post, W.M., Brandt, C.C., Wullschleger, S.D., Singh, N. and Wei, Y. 2014. Global simulation of bioenergy crop productivity: analytical framework and case study for switchgrass. GCB Bioenergy, 6: 14-25.

Langholtz, M., Webb, E., Preston, B.L., Turhollow, A., Breuer, N., Eaton, L., King, A.W., Sokhansanj, **S., Surendran Nair, S.**, Downing, M. 2014. Climate risk management for the U.S. cellulosic biofuels supply chain. Climate Risk Management, 3: 96-115.

**Surendran Nair, S.**, Kang, S., Zhang, X., Miguez, F., Izaurralde, R.C., Post, W.M., Wullschleger, S.D. 2012. Bioenergy crop models: description, data requirements, and potential applications. GCB Bioenergy, 4: 620-633.

Zegada-Lizarazu, W., Wullschleger, S.D., **Surendran Nair, S.**, Monti, A. 2012. Crop physiology of switchgrass. In: Switchgrass: a valuable biomass crop for energy, ed. Andrea Monti, Springer-Verlag.

**Surendran Nair, S.**, King, K.W., Witter, J.D., Sohngen, B.L., Fausey, N.R. 2011. Importance of crop yield calibration in watershed modeling for water quality applications. Journal of the American Water Resources Association, 47: 1285-1297.

Vasisht. A.K., **Sujithkumar. S.**, Aggarwal, P.K., Kalra, N., Pathak, H. 2007. An Integrated Evaluation of Trade-offs between Environmental Risk Factors and Food Production Using Interactive Multiple Goal Linear Programming – A case study of Haryana. Indian Journal of Agricultural Economics, 62: 511-523.

Aggarwal, P.K., Joshi, H.C., **Sujithkumar, S.**, Gupta, N., Sushilkumar, S. 2007. Fuel ethanol production from Indian agriculture: Opportunities and constraints. Outlook on Agriculture, 36: 167-174.

**Sujithkumar, S.**, Vasisht, A.K., Hoanh, C.T., Aggarwal, P.K., Kalra, N. 2001. Linking socio-economic to the biophysical evaluation: The MGLP model. In: Land use analysis for sustainable food security: with an illustration for the state of Haryana, India, ed. P.K. Aggarwal et al. Chapter 7, 105-116. Joint publication by IARI, IRRI and Wageningen University.

**Sujithkumar, S.**, Vasisht, A.K., Hoanh, C.T., Pathak, H., Aggarwal, P.K., Kalra, N., Bandyopadhyay, S.K. 2001. Exploring limits of agricultural production, resource requirements and environmental impact. In: Land use analysis for sustainable food security: with an illustration for the state of Haryana, India, ed. P.K. Aggarwal et al. Chapter 8, 117-126. Joint publication by IARI, IRRI and Wageningen University.

Aggarwal, P.K., **Sujithkumar**, S., Vasisht, A.K., Hoanh, C.T., Van Keulen, H., Kalra, N., Pathak, H., Roetter, R.P. 2001. Balancing food demands and supply. In: Land use analysis for sustainable food security: with an illustration for the state of Haryana, India, ed. P.K. Aggarwal et al. Chapter 9, 137-152. Joint publication by IARI, IRRI and Wageningen University.

Aggarwal, P.K., Bandyopadhyay, S.K., Pathak, H., Kalra, N., Chander, S., **Sujithkumar, S.** 2000. Analysis of yield trends of the rice-wheat system in north-western India. Outlook on Agriculture, 29: 259-268.

**Technical Report**

Daniel, G., Patlolla, D.R,, **Surendran Nair,S**., King, A.W., 2017. A Recursive MPI-Based

Approach to Hierarchical Modal Association Clustering. ORNL Technical Report

**Copyright**

Applied for copyrights for improved Hierarchical Mode based cluster algorithm for HPC application (Daniel, G., Patlolla, D.R,, **Surendran Nair,S**., King, A.W., 2017( Under Process).

**Conference presentations (Lead Author Only)**

**Surendran Nair, S.**, Preston, B.L., King, A.W., Rui, M. 2015. Socio-ecological Typologies for Understanding Adaptive Capacity of a Region to Natural Disasters. Oral Presentation. 2015 AGU Fall Meeting.

**Surendran Nair, S.**, Preston, B.L., King, A.W., Rui, M. 2013. Climate Change Vulnerability of Agro-Ecosystems: Do socio-economic factors matter? Poster Presentation. 2013 AGU Fall Meeting.

**Surendran Nair, S.**, King, K.W., Witter, J.D. 2011. Application of Soil Water Assessment Tool (SWAT) for water quality simulations: Importance of crop yield calibration. Oral Presentation. 2011 Tennessee Water Resources Symposium.

**Surendran Nair, S**., Armstrong. H., Wright, W., Hawkins, S. 2011. Watershed modeling using an intensive, short term data collection technique: SWAT application to Lick Creek Watershed in Greene County, TN. Oral Presentation. 2011 Tennessee Water Resources Symposium.

**Surendran Nair, S**., King, K.W., Witter, J.D., Sohngen , B., Fausey, N. 2011. Importance of crop yield in calibrating watershed water quality simulation tools. Oral Presentation. 2011 Tennessee Water Resources Symposium.

**Surendran Nair, S**., Sohngen, B.L., King, K.W., Fausey, N.R., Witter, J.D. 2010. Integrated Watershed Economic Model for Non-Point Source Pollution Management in the Upper Big Walnut Watershed.Oral Presentation. 2010 Agricultural and Applied Economic Association Meeting.

**Surendran Nair, S**., Sohngen, B.L., King, K.W., Fausey, N.R., Witter, J.D. 2007. Optimal Management of Non-point Source Pollution from Agriculture: An Application of Dynamic Programming. Oral Presentation. 2007 Soil and Water Conservation Society Conference.

**Invited talks**

**Surendran Nair, S.** Socio-ecological typologies for modeling regional crop production.

Multiple Breadbasket Failure Initiative Meeting November 5th – 6th, 2014, Boston University.

**Grants / Research proposals**

* 2016 Laboratory Directed Research & Development Full Proposal for Seed Funds, Oak Ridge National Laboratory, **Co-PI**. *Modeling Road Vulnerability to Snow Using Rate of Snowmelt and Slope Data LDRD Full Proposal for Seed Funds* (PI: Olufemi A. Omitaomu $185,000). ***Funded***
* 2016 Laboratory Directed Research & Development, Oak Ridge National Laboratory, **Co-PI**. *Urban Typologies: Towards an ORNL Urban Information System* (PI: Anthony W. King, $1,492,000). ***Funded***
* 2016 The Office of Energy Efficiency and Renewable Energy (EERE), DOE, **Co-PI**. *Hydropower Sustainability Research to Enable Low Impact Development* (PI: Shelaine L. Hetrick $2,275,000). ***Funded***
* 2015 Laboratory Directed Research & Development, Oak Ridge National Laboratory, **Co-PI**. *Land Fine-resolution Modeling of Urban-Energy Systems’ Water Footprint in River Network* (PI: Ryan A. McManamay, $600,000). ***Funded***
* 2014 Laboratory Directed Research & Development, Oak Ridge National Laboratory, **Co-PI**. *Development of the Energy Sustainability Analysis and Visualization Environment* (E-SAVE) (PI: Benjamin L. Preston, $808,700). ***Pre-proposal accepted***
* 2014 Laboratory Directed Research & Development, Oak Ridge National Laboratory, **Co-PI**. *An Integrated, High-Resolution Sustainability Analysis to Determine the Optimal Balance of Ecological Services and Bioenergy Products* (PI: Matthew H. Langholtz,

$808,700). ***Pre-proposal not accepted***

* 2011 Agriculture and Food Research Initiative/U.S. Department of Agriculture, **Co-PI**.

*Land Use and Environmental Impacts of Alternative Bioenergy Policies* (PI: Chad M. Hellwinckel, $500,000). ***Pre-proposal accepted***

* 2010 Tennessee Department of Environment and Conservation, **Co-PI**. *SWAT modeling on-farm conservation practices to reduce watershed nutrients loads*, Watersheds Initiative in Tennessee (PI: Shawn A. Hawkins, $40,504). ***Funded***
* 2007 Sustainable Agricultural Research and Education, U.S. Department of Agriculture, **PI**. *Land management strategies for watershed restoration: An integration of spatial modeling with dynamic programming* ($9000). ***Funded***

**Research proposals in circulation with collaborators**

* 2016 Laboratory Directed Research & Development Full Proposal for Seed Funds fund research proposal, Oak Ridge National Laboratory, **Co-PI**. *Economic Loss Analysis of Disruption in Electricity Grid* *(EGrid-LEAD)* (PI: Olufemi A. Omitaomu, $170,000)

* 2016 Laboratory Directed Research & Development Full Proposal for Seed Funds fund research proposal, Oak Ridge National Laboratory, **Co-PI**. *Endogenizing farm-level adaptations in crop simulation models* (PI: Benjamin L. Preston, $150,000)

**Analytical capabilities**

**Applied Statistical Modeling**

* Continuous, discrete, cross sectional and panel data analysis
* Spatial and time series data analysis
* Multivariate and high dimensional statistics

**Crop Growth / Agro-ecosystem Modeling**

* EPIC, DSSAT, SWAT and STELLA

**Social and Economic System Modeling**

* Modeling technical, allocative and economic efficiency in different sectors
* Total factor productivity and technical change in different sectors
* Partial equilibrium modeling and trade-off analysis
* Dynamic programming
* Ecosystem service accounting
* Designing and conducting survey (market and non-market methods)

**Computer and software skills**

* SAS, STATA
* Matlab, R
* Arc GIS, Arc View, Arc Objects
* MS ACCESS