

## CURRICULUM VITAE

### NAME AND ADDRESS:

Narayanan, Rangesan  
(775) 815 8595 (mobile)  
(775) 852-5852 (home)  
rangesannarayanan@gmail.com



### EDUCATION:

Ph.D. Economics, Utah State University 1976  
M.E. Electrical Engineering, Utah State University, 1973  
B.E. Electrical Engineering, University of Madras, India, 1971

### EMPLOYMENT:

|                |   |
|----------------|---|
| 2011 – Present | Senior Fellow<br>National Center for Food and Agricultural Policy<br>Washington D.C.  |
| 2010 – 2011    | Professor<br>Department of Resource Economics<br>University of Nevada, Reno   |
| 1999 – 2010    | Associate Dean<br>College of Agriculture, Biotechnology and Natural Resources<br>and the Nevada Agricultural Experiment Station<br>University of Nevada, Reno |
| 1990 – 1999    | Professor and Department Chair<br>Department of Applied Economics and Statistics<br>University of Nevada, Reno  |
| 1989 – 1990    | Associate Professor and Department Chairman<br>Department of Agricultural Economics<br>University of Nevada, Reno   |
| 1985 – 1989    | Associate Professor<br>Department of Agricultural Economics<br>University of Nevada, Reno   |
| 1980 – 1984    | Research Associate Professor<br>Economics Department and Utah Water Research Laboratory<br>Utah State University, Logan                                       |
| 1977 – 1980    | Research Assistant Professor<br>Economics Department and Utah Water Research Laboratory<br>Utah State University, Logan                                       |

## **MAJOR ACCOMPLISHMENTS AS ADMINISTRATOR:**

- Based on industry and other stakeholder input, initiated several research and outreach projects that were supported by the Nevada Arid Rangeland Initiative and Hatch funds.
- Helped develop the Cooperative Ecosystem Studies Unit (CESU) for the Great Basin in 2001 and have provided leadership for CESU for the past decade. CESU—a consortium of 14 universities and 8 federal agencies for research, education, and technical assistance—has had funding of \$75million over the last 10 years.
- Assisted with the establishment of the Great Basin Plant Material Center in Fallon.
- Supported the development of native grass seed production and field trials in Nevada.
- Provided research support to the Nevada Dairy Industry in 2001 through two projects.
- Worked with Nevada’s congressional delegation to obtain funding for the Nevada Food and Agricultural Policy Institute (FAPRI) to support policy research on the economics of Western Livestock Industry.
- Organized many excellent conferences on Great Basin issues including the Elko Summit (2003), Research and Management Collaboration Conference (2006), Wildfire Forum (2007), NGO Conference of the Great Basin Environmental Program (2008), and the American Desert Symposium (2009).
- Instrumental in planning, hosting and overseeing the 2007 Great Basin “Wildlife Forum” that included top scientists of the Great Basin. A publication summarizing the outcome and recommendations of this important forum was published and distributed widely.
- With Dr. Stan Johnson, initiated the Great Basin Environment Program (GBEP) and established an on-going collaboration between NGOs, universities, and federal and state agencies in the five states of the Great Basin.
- Administratively helped develop the initial field research for the Nevada wine-grape industry.
- Worked with Nevada legislators to develop Plant Science and Horticulture Degree Programs which were approved by the NSHE Board of Regents.
- Established international research and academic collaboration with Universities and research institutions in Romania, Turkmenistan, Austria and Turkey.

## **INTERNATIONAL/NATIONAL RESEARCH AND SERVICE:**

- Invited to Romania to teach a course a course in the economics of locally produced and distributed food as part of a Master’s Program in Food Identity sponsored by Erasmus Mundus program administered in Angers, France, in 2012 and 2014 and 2016.
- Served as trainer for the Cochran Fellowship Program through the National Center for Food and Agricultural Policy under contract from USDA, for Fellows from Nigeria, Thailand and Pakistan in 2015 and 2016.
- As consultant to Food and Agricultural Organization of the United Nations, went to Almaty and Astana in Kazakhstan in 2013 to strengthen agricultural extension programs and gave lectures at the Forum organized at the Kazakh National University.
- At the invitation of the Kazakh National University at Almaty went to Kazakhstan again in 2013 and taught a course in water resource economics.
- Went to Turkmenistan two times by invitation to deliver lectures on the economics and management of agricultural and natural resources to the Institute of Deserts, Flora and Fauna under the Ministry of Nature Protection in 2012 as part of the Foreign Agricultural Service grant from USDA.

- Invited to Turkmenistan in 2010 to work on a faculty exchange program under a grant from the Foreign Ag Service, USDA.
- Went to Tbilisi in 2010 and worked on the economics of National Health Care Plan to reduce the adverse economic impacts of brucellosis in cattle and sheep in the Republic of Georgia under a grant from the Foreign Ag Service, USDA.
- Gave lectures to student groups and faculty at Turkmenistan Agricultural University and on market economics and supply chain analysis under the USDA FAS grant program in 2009.
- Invited by the Institute for Desert, Flora and Fauna, Ministry of Nature Protection, Turkmenistan, to assist with economic evaluation of environmental problems associated with Irrigation Return Flows in 2007. An experiment station project to initiate collaboration with the Institute is continuing, 2007-2011.
- Visited Selcuk University in Konya, Turkey to explore possible collaboration and developing an agreement with the University of Nevada, Reno in 2007.
- Developed an Agreement between the University of Natural Resources (BOKU) in Vienna, Austria and the University of Nevada, Reno for student and faculty exchanges in 2006. Three students have participated in the exchange programs at UNR.
- Developed a Memorandum of Understanding with UNR, College of Agriculture, Biotechnology and Natural Resources and the University of Agriculture and Veterinary Medicine at Cluj, Romania. Visited Romania in 2001 twice and once in 2003 for initiating collaboration on teaching and research. As a result, several faculty and students from Romania have participated in the college's programs. A joint Master's Degree Program has been developed between the two universities.
- Invited to the International Institute for Applied Systems Analysis, Laxenburg, Austria in 1982 for consultation on the project Salinity Management of the Use of Low Quality Water. A paper on the economics of cost allocation was presented by invitation to the Resource Group at this institute.
- Went to Rabat, Morocco in 1985, sponsored by the U.S. Agency for International Development at the request of the Institute of Agronomy. Activities involved evaluation of Moroccan irrigation systems and developing proposal for operation of reservoirs. Served as an examiner for a Ph.D. dissertation at the Institute.
- Visited the following institutions as part of faculty development to study agricultural industry and policies, water and related land resources and rural economic development in Spring 2000:
  - National University of Singapore – Center for Business Research and Development, February 7-13, 2000
  - University Putra Malaysia – Agricultural University in Malaysia visiting faculty, February 13-25, 2000
  - Geophysical Research Institute, Hyderabad, India, February 26-March 18, 2000
  - Ministry of Agriculture and Veterinair Institut Agronomique Hassan II, Rabat, Morocco, April 1-May 1, 2000
  - Agricultural Ministry and Nile River Delta, Egypt May 2-8, 2000
- **ADMINISTRATIVE APPOINTMENTS TO COMMITTEES AND BOARDS:**
  - Coordinator and PI for the Great Basin Cooperative Ecosystem Studies Unit, a consortium of 14 universities and 8 federal agencies - appointed by University of Nevada, Reno
  - Advisory Board for the Great Basin Plant Materials Center – appointed by NRCS USDA
  - Member of the Nevada Conservation Commission – appointed by Governor of State of Nevada
  - Member of the Executive Committee for Great Basin Research and Management Partnership established for collaboration between Great Basin universities and federal agencies – appointed by University of Nevada, Reno
  - Member of the Great Basin Environmental Program Commission, a multi-state partnership between universities, federal agencies, state agencies and NGOs – appointed by Governor of State of Nevada
  - Member of the Nevada Partners for Conservation and Development (coalition of universities, state and federal agencies) – appointed by University of Nevada, Reno

- Administrative Advisor for WERA202, “Climatic Data Application in Irrigation Scheduling and Water Conservation” – appointed by Western Association of Agricultural Experiment Station Directors (WAAESD)
- Administrative Advisor for WERA1005, “Western Rural Development” – appointed by WAAESD
- Administrative Advisor for WERA1014, “Intensive Pasture Management for Sustainable Livestock Production in the Western US” – appointed by WAAESD
- Member of the Board of Western Rural Development Center and member of the executive committee of the Board – appointed by WAAESD
- Chair, Native American Scholarship Committee – appointed by Dean of the College of Agriculture, Biotechnology and Natural Resources, University of Nevada, Reno
- Reviewer for American Journal of Agricultural Economics, Journal of Agricultural and Resource Economics, Western Journal of Agricultural Economics, Water Resources Research, Applied Agricultural Research Journal, Water Resources Bulletin, American Society of Civil Engineers (ASCE), Irrigation and Drainage Division.
- Reviewer for U.S. Geological Survey Competitive Grant Programs and University Council on Water Resources, Small Business Innovation Grants Program of the U.S. Department of Commerce.
- Member of the Technical Committee for the Western Regional Project W-178 on Water Conservation and Management, 1992-1997.
- Member, Western Regional Research Technical Committee W-190, 1997-2000
- Chair, Western Regional Research W-190 Technical Committee, 2000-2001
- Vice Chair, Western Regional Research W-190 Technical Committee, 1999-2000
- Secretary, W-190 Technical Committee on water management and conservation issues in the western United States, 1998.

## **TEACHING EXPERIENCE:**

Production Economics (Graduate at M.S.level) at UNR

Economics of Land and Water Use (Graduate/upper division) at UNR

Water Resource Economics and Policy (upper division/graduate) at UNR

Advanced Natural Resources (Graduate) at UNR

Operations Research (Graduate, M.S. and Ph.D. level) at Utah State University (USU)

Econometrics (Graduate, Ph.D. level)

Advanced Statistics (Graduate) at UNR

Mathematical Economics (upper division/Graduate) at UNR

Micro and Macroeconomic Theory (upper division) at USU

## **RESEARCH PROJECTS:**

Thawley, D.G. and Narayanan, R. Great Basin Cooperative Ecosystem Studies Unit (GBCESU), funded by USGS, NPS, NRCS, ARS, FWS, BOR, FS and BLM – 2001 to 2011 (\$80K)

Narayanan, R. Environmental Impacts of Conservation – CEAP, project funded by Agricultural Research Service of USDA - 2007 to 2011 (\$200K)

Narayanan, R. and Johnson, S.R. Turkmenistan Exchange Program – Foreign Agricultural Service, USDA - 2008 to 2011 (\$160K)

Narayanan, R. and Johnson, S.R. Great Basin Environmental Program – National Institute of Food and Agriculture, USDA - 2009 to 2011 (\$200K)

- Harris, T. R., Johnson, S. R. and Narayanan. R. Food and Agricultural Policy Institute – NIFA, USDA – 2009 to 2011 (\$200K)
- Thain, D. R. , Narayanan R. and Harris T. R. Cost Benefit Analysis of Animal Health Program in Republic of Georgia, FAS, USDA – 2009 to 2011 (\$140K)
- Breazeale, D.E., Narayanan, R., and Munk, G.G. (2003). Alfalfa Seed Pollination and Bee Population Management. USDA/ARS/Northern Plains Area, Bee Biology and Systematics Lab, Utah State University, Logan UT. \$7,243.
- Breazeale, D.E., Narayanan, R. and Munk, G.G. (2003). Alfalfa Seed Pollination and Bee Population Management. Nevada Alfalfa Seed Research and Promotion Board. \$6,461.
- Beattie, C.W., Bruce, L.B., Glimp, H., Narayanan, R., Thain, D.S. Nevada Beef Cattle: Market Assisted Selection – Nevada Rangeland Initiative funded 2003-2006, \$177,079.
- R. Narayanan, L. Singletary, G.C. Fernandez and B. Stinson, “Effectiveness of Perennial Pepper Weed Control Measures in a Landscape Setting.” Nevada Agricultural Experiment Station. 2002-2007, \$15,000/year.
- R. Narayanan and W.O. Champney, “Development of Alternative Grazing Fee Structures.” Nevada Public Lands Committee. 2000, \$21,000.
- R. Narayanan and T.R. MacDiarmid, “Feasibility of Alternative Water Charging Structures for the Newlands Project.” Department of the Interior. 1997, \$96,000.
- R. Narayanan, “Hydrologic, Economics and Institutional Aspects for a Local and Voluntary Water Bank. Walker River Basin Water Users Association.” 1996, \$50,000.
- R. Narayanan, T.R., Harris, M. Reid, and D. Shaw. : Study of the Potential for Water Banking Within the Walker River Basin, Phase I”. U.S. Bureau of Reclamation, 1997-1998 \$245,000
- R. Narayanan, T.R. Harris, M. Reid, and D. Shaw. “Study of the Potential for Water Banking Within the Walker River Basin, Phase I.” U.S. Bureau of Reclamation, 1996-1997 \$140,000.
- Narayanan, R., W.O. Champney, T.R. MacDiarmid, and T.R. Harris. “Study of Leasing Private Grazing in Nevada”. Nevada State Legislature Senate Bill 18. 1995-1997. \$26,370
- Harris, Thomas R., Rangesan Narayanan, Robert R. Fletcher, Mary E. Reid, and Thomas R. MacDiarmid. “Development of an Input-Output Model for the Newlands Project Area”. Truckee Carson Coordination Office. 1996-1997. \$130,695
- Harris, T.R., R. Narayanan, J. Englin and D.K. Lambert. “Water Policy Analysis Using Computable General Equilibrium Models.” U.S. Geological Survey. 1994-1996. \$40,000
- Narayanan, R., T.R. Harris, W.O. Champney, and T.R. MacDiarmid. “Private Grazing Lease Survey.” Nevada State Legislature. 1995-1996. \$26,000
- Harris, T.R. and R. Narayanan. “Development of Information and Training for Economic and Demographic Assessment in White Pine County, Nevada.” Intertech Services Corporation. 1995. \$10,000
- Harris, T.R. and R. Narayanan. “Development of Information and Training for Economic and Demographic Assessment in Esmeralda County, Nevada.” Intertech Services Corporation. 1995. \$10,000

Harris, T.R., R. Narayanan, G. Atkinson, T.E. Oleson, Jr., S.W. Stoddard and S. Lewis. "Development of Information and Training for Fiscal Impact Analysis in Douglas County, Nevada." Douglas County Commissioners. 1994-1995. \$25,000

Harris, T.R. and R. Narayanan. "Development of Information and Training for Economic and Demographic Assessment in Lincoln County, Nevada." Lincoln County Commissioners. 1994. Intertech Services Corporation. 1995. \$10,000

Narayanan, R., T.R. Harris, and K. Raffiee. "Development of Survey Information and Training for Establishing Economic Linkages in the Truckee River Basin." U.S. Department of the Interior, U.S. Bureau of Reclamation, 1993-1995. \$89,000

Englin, J., T.R. Harris, and R. Narayanan. "Stillwater Wildlife Economic Impact Study." Meyer Resources, Inc. 1992-1993. \$10,000

Harris, T.R. and R. Narayanan. "An Evaluation of Efficiency of Rural Water Systems: An Application of Data Envelope Analysis." U.S. Geological Survey, Office of Water Policy. 1991-1993. \$51,000

Harris, T.R., D. Lambert, and R. Narayanan. "Socioeconomic Studies." U.S. Department of Energy. 1991-1992. \$65,000

Harris, T.R. and R. Narayanan. "Preliminary Feasibility and Infrastructure Needs for Alternative Transportation Routes for Nuclear Wastes to the Yucca Mountain Site." Department of Energy. 1991. \$15,000

Economic Development and Rural Economic Structural Changes - funded by First Interstate Bank Institute for Economic Development and International Trade, 1989-1990 - co-principal investigator.

Analysis of OCAP and TCID during Drought - funded by Truckee Carson Irrigation District, 1989 - principal investigator.

Special Nevada Report: Withdrawal of Public Lands for Military Purposes - funded by Department of Defense under subcontract from Desert Research Institute, 1989-1991 - co-principal investigator.

Economic Development and Diversification Strategies for Nevada Counties Using Portfolio Analysis - funded by First Interstate Bank of Nevada, 1989-90 - principal investigator.

Threshold Envelope Analysis for Rural Commercial Sector Development - funded by the Western Rural Development Center, 1988-89 - principal investigator.

Economic Evaluation of Potential Benefits of PL-95-337 to the Fallon Indian Reservation - funded by the Fallon Tribe's Business Council, 1988 - principal investigator.

Estimation Methods and Sampling Distributions for Models of Markets in Disequilibrium - funded by Research Advisory Board, UNR, 1988-89 - principal investigator.

Evaluation of Techniques for Statistical and Economic Analysis of Angler Use Survey in Nevada - funded by Nevada Division of Wildlife, 1988-90 - principal investigator.

Evaluation of Capacity Expansion Alternatives for Municipal Water Supply - funded by United States Geological Survey, 1988-90 - principal investigator.

Economic Cost of Agricultural Water Rights in Sierra Valley and Truckee Meadows under Drought Conditions - funded by WestPac Utilities, 1988-89 - principal investigator.

Rate Structure Preferences and Consumer Demand for Local Telephone Service in Nevada - funded by Nevada Telephone Association, 1987 - principal investigator.

Use of R/S Analysis to Study Regional and Sectoral Employment Fluctuations - funded by Graduate School, University of Nevada, Reno, 1986 - principal investigator.

Planning Rural Water Systems in Nevada: An Application of Economics of Risk and Uncertainty - funded by United States Geological Survey through Water Resources Center, Desert Research Institute, 1986 - principal investigator.

Economic Evaluation of State-wide Water and Related Land Resources Allocation - funded by Agricultural Experiment Station, University of Nevada, Reno, 1985-1989 - principal investigator.

Environmental Impact Statement for Groom Mountain Range, Lincoln County, Nevada - Funded by Air Force under subcontract with Desert Research Institute, 1985 - Co-principal Investigator.

Economic Evaluation of Conservation Programs for Municipal Water Supply Systems - funded by U.S. Bureau of Reclamation, 1984-1986 - principal investigator.

Development of a Comprehensive Upper Colorado River Basin Model for Analyzing Energy Development Impacts - funded by Office of Water Resources and Technology, Department of the Interior, 1983-1984 - principal investigator.

Methodology for Balancing Consideration of Economical Energy Production and Environmental Quality at Hydroelectric Sites - funded by State of Utah, 1983-1985 - principal investigator.

Guidelines for Groundwater Withdrawal in Utah - funded by the State of Utah, 1981-1983 - principal investigator.

Criteria for Optimal Water Allocation to Instream Uses - funded by the State of Utah, 1981-1983 - project leader.

The Effects of Drought on the Allocation of Water Between Agriculture and Energy Considering Instream Uses - funded by Office of Water Resources and Technology, Department of the Interior, 1980-1982 - project leader.

Drought Management Concepts: Lessons of the 1976-1977 U.S. Drought - funded by Office of Water Resources and Technology, Department of the Interior, 1980-1982 - principal investigator.

Efficient Allocation of Water Between Agriculture and Energy Through Optimum Techniques of Water use and Conservation - funded by Office of Water Resources and Technology, Department of the Interior, 1979-1981 - project leader.

Formulation of an Impact Methodology to Facilitate Indian Self-Determination in Energy Development - funded by the Office of the Vice-President for Research, Utah State University, 1979-1980 - project leader.

The Effect of Risk of Drought in Energy Development and Water Allocation: A Programming Model for Utah - funded by Office of Water Resources and Technology, Department of the Interior, 1979-1981 - co-principal investigator.

Criteria for Achieving an Equitable Balance between Upstream and Downstream Water Rights on Water Use Efficiency, funded by the State of Utah, 1978-1980 - project leader.

A Time-Series Analysis of Residential Water Consumption Patterns in Utah, funded by the Office of Vice-President for Research, Utah State University, 1978-1979 - project leader.

- A Cross-Cultural Comparison of the Potential of Native American Communities to Assimilate the Impacts of Large-Scale Energy Development, funded by Energy Resource Development Agency, 1977-1978 - co-principal investigator.
- Optimization of Water Resource Systems Using Interactive Integer Programming-Simulation Models, funded by Office of Water Resources and Technology, Department of the Interior, 1976-1977 - co-principal investigator.
- Alternative Energy Development Options and the Impact on Water Resources and Salinity, funded by Office of Water Resources and Technology, Department of the Interior, 1976-1979 - project leader.
- Development of an Interactive Planning Methodology for Displaying Effects and Establishing Public Preference among Multi-Objective Water Resource Plans, funded by Office of Water Resources and Technology, Department of the Interior, 1976-1979 - principal investigator.
- Capability of Integer Programming Algorithms for Water Resources Problems, funded by Office of Water Resources and Technology, Department of the Interior, 1975-1976 - research assistant.
- Environmental Management of Residuals: A Regional Application, funded by Environmental Protection Agency, 1975-1976 - co-principal investigator.
- The Impact of Energy Development on Utah Water Allocation, funded by Environmental Protection Agency, 1975-1978 - co-principal investigator.
- Evaluating Water Reuse Alternatives for Water Supply Planning, funded by Office of Water Resources and Technology, Department of the Interior, 1972-1975 - research assistant.

## **LIST OF PUBLICATIONS**

### **REFEREED JOURNAL PUBLICATIONS:**

- Johnson, S.R., Narayanan, R., Esenov, P., Zverev, N. "Value Chain Analysis for Evaluating Saline Irrigation Drainage Water Reuse for Livestock Feed Production in Turkmenistan" Scientific Papers Series in Management, Economic Engineering in Agriculture and Rural Development, Vol. 13, Issue 1, 2013.
- Weltz, M.A., Coates-Markle, L., Narayanan, R. "Wildfire and Invasive Plants in American Deserts: A Special Feature" Rangeland Ecology & Management, 64(5): 429-430. 2011.
- Johnson, S.R. and R. Narayanan. "Bio-fuels as a Major Competitor for Petroleum Based Fuels: Implications for Agriculture." Bulletin of University of Agricultural Sciences and Veterinary Medicine, Horticulture Section, Cluj-Napoca, Romania, Vol. 66(2), p. 13, 2009.
- Breazeale, D.E., G. Fernandez and R. Narayanan. "Modeling Pollination Factors that Influence Alfalfa Seed Yield in North Central Nevada." Journal of Central European Agriculture, Vol. 9, No. 1, pp. 107-116, 2008.
- Gomez-Raya, L., et.al. "The Value of DNA Paternity Identification in Beef Cattle: Examples from Nevada's Free Range Ranches." Journal of Animal Science, 86:17-24, 2008.
- L. Singletary and R. Narayanan. "Assessing Farmers' Willingness to Participate in Water Banking: A Case Study." Journal of Agricultural Education and Extension, 2004.



- Breazeale, D.E., R. Narayanan, and R. C. Torell. "An Economic Analysis of Occupational Benefits among Nevada Cattle Ranch Employees." Journal of the American Society of Farm Managers and Rural Appraisers, (66)1, pp. 1-8, Denver, CO, 2003.
- Harris, Thomas R., Chang Seung, and Rangesan Narayanan. "Targeting Economic Diversification: An Application of Target MOTAD Procedures." The Review of Regional Studies, Vol. 31, No. 2, Fall 2001.
- Bhattacharyya, Arun, Rangesan Narayanan, Thomas R. MacDiarmid, Thomas R. Harris, and William O. Champney. "Demand for Grazing on Public Lands: A Disequilibrium Approach." Land Economics, Vol. 72, No. 4, pp. 483-499, November 1996.
- Harris, Thomas R., Kalyan Chakraborty, Lijuan Xiao, and Rangesan Narayanan. "Application of Count Data Procedures to Estimate Thresholds for Rural Commercial Sectors." The Review of Regional Studies, Vol. 26, No. 1, pp. 75-88, 1996.
- Bhattacharyya, Arun, Thomas R. Harris, Rangesan Narayanan, and Kambiz Raffiee. "Technical Efficiency of Rural Water Utilities." Journal of Agricultural and Resource Economics, Vol. 20, No.2, pp. 373-391, 1995.
- Bhattacharyya, A., T.R. Harris, R. Narayanan, and K. Raffiee. "Specification and Estimation of the Effects of Ownership on the Economic Efficiency of the Water Utilities." Regional Science and Urban Economics, 25: 759-784, December 1995.
- Bhattacharyya, A., T.R. Harris, R. Narayanan, and K. Raffiee. "Allocative Efficiency of Rural Nevada Water Systems: A Hedonic Shadow Cost Function Approach." Journal of Regional Science, Vol. 35, No. 3, pp. 485-501, 1995.
- Narayanan, R., A. Bhattacharyya, and R.L. Shane. "A Note on the Inefficiency Cost of Non-Optimal Input Mix." International Review of Economics and Finance, Vol. 2(1), 1993.
- Raffiee, K., R. Narayanan, T.R. Harris, D. Lambert, and J.M. Collins. "Cost Analysis of Water Utilities: A Goodness-of-Fit Approach." Atlantic Economic Journal, Vol. 21, No. 3, September 1993.
- Harris, T.R., R. Narayanan, K. Raffiee, and Q. Qi. "A Historical Application of the Export-Base Model: Economic Impacts of an Indian Reservation." The Review of Regional Studies, Vol. 22, No. 2, Fall 1992.
- Helmi-Oskoui, B. and R. Narayanan. "Optimal Extraction of Petroleum Resources: A Empirical Approach." Resources and Energy, Vol. 14, 1992.
- Guerrant, D.G., W.W. Miller, C.N. Mahannah, and R. Narayanan. "Site Specific Erosivity Evaluation of a Sierra Nevada Forested Watershed Soil." Journal of Environmental Quality, Vol. 20, No. 2, April-June 1991.
- Su, M.D., R. Narayanan, T.C. Hughes, and A.B. Bishop. "Evaluation of Municipal Water Supply Operating Rules Using Stochastic Dominance." Water Resources Research, Vol. 27, No. 7, July 1991.
- Myer, G.L., W.W. Miller, R. Narayanan, E.H. Jensen, and Y.B. Zheng. "Water Management of Alfalfa through Individual Harvest Production Functions." Journal of Production Agriculture, Vol. 4, No. 4, October-December 1991.
- Guerrant, D.G., W.W. Miller, C.N. Mahannah, and R. Narayanan. "Infiltration Evaluation of Four Mechanical Rainfall Simulation Techniques in Sierra Nevada Watersheds." Water Resources Bulletin, Vol. 26, No. 1, February 1990.

- Leconte, R., R. Narayanan, and T.C. Hughes. "An Application of Investment Timing Analysis of Dual Water Systems." Water Resources Bulletin, Vol. 24, No. 2, April 1988.
- Leconte, R., T.C. Hughes, and R. Narayanan. "Estimating Cost Models of Dual Water Supply Systems." Journal of Water Resources Planning, American Society of Civil Engineers, Vol. 114, No. 5, September 1988.
- Franklin, D.R. and R. Narayanan. "Trends in Western United States Agriculture: Irrigation Organizations." Water Resources Bulletin, Vol. 24, No. 6, 1988.
- Keith, J.E. and R. Narayanan. "Water Policies for Energy Development." Water Resources Bulletin, Vol. 24, No. 6, 1988.
- Narayanan, R. and R.L. Shane. "Agricultural Productive and Consumptive Use Components of Rural Land Values in Texas: Comment." American Journal of Agricultural Economics, Vol. 69, No. 1, pp. 176-178, February 1987.
- Leconte, R., T.C. Hughes, and R. Narayanan. "Economic Efficiency and Investment Timing for Dual Water Systems." Water Resources Research, Vol. 23, No. 10, pp. 1807-1815, October 1987.
- Narayanan, R., H. Beladi, R.D. Hansen, and A.B. Bishop. "Feasibility of Seasonal Water Pricing Considering Metering Costs." Water Resources Bulletin, Vol. 23, No. 6, December 1987.
- Casola, W.H., R. Narayanan, C. Duffy, and A.B. Bishop. "Optimal Control Model for Groundwater Management." ASCE Journal of Water Resources Planning and Management, ASCE, Vol. 112, No. 2, 1986.
- Narayanan, R. "Evaluation of Recreational Benefits of Instream Flows." Journal of Leisure Research, 18(2):116-128, 1986.
- Narayanan, R., D.T. Larson, and T.C. Hughes. "Effectiveness of Drought Policies in Municipal Water Management." Water Resources Bulletin, Vol. 21, No. 3, June 1985.
- Beladi, H., B. Biswas, R. Narayanan, and G. Tribedi. "Energy Development and Navajo Coal Leasing Programs." Resources and Energy, Vol. 7, No. 14, 1985.
- Fakhraei, H., R. Narayanan, and T.C. Hughes. "Price Rigidity and Quantity Rationing Rules Under Stochastic Water Supply." Water Resources Research, Vol. 20, No. 6, 1984.
- Torpy, M.F., A.B. Bishop and R. Narayanan. "Identifying Environmentally Acceptable Least Cost Pollution Control Systems." Journal of Environmental Management, Vol. 15, 1982.
- Hansen, R.D. and R. Narayanan. A reply to discussion. "A Monthly Time Series Model of Municipal Water Demand." Water Resources Bulletin, Vol. 18, No. 6, 1982.
- Hansen, R.D., R. Narayanan and A.B. Bishop. "Stochastic Approach to Waste Treatment Planning." ASCE, Journal of Water Resources Planning and Management Division, Vol. 106, No. WR 1, March 1980.
- Narayanan, R. and R.D. Hansen. "A Monthly Time Series Model of Municipal Water Demand." Water Resources Bulletin, Vol. 17, No. 4, December 1980.
- Narayanan, R. and A.B. Bishop. "A Residuals Management Model for Regional Environment Quality." Journal of Environmental Systems, 8(2), 1978-1979.
- Bishop, A.B. and R. Narayanan. "Combined Management of Air, Water and Solid Wastes." Journal of Environmental Management, 9(2), September 1979.

- Bishop, A.B. and R. Narayanan. "Competition of Energy for Agricultural Water Use." ASCE, Journal of Irrigation and Drainage Division, Vol. 105 IR 3, September 1979.
- Narayanan, R. and S. Padungchai. "Effects of Energy Development in the Upper Colorado Basin on Irrigated Agriculture and Salinity." Western Journal of Agricultural Economics, Vol. 4, No. 2, December 1979.
- Bishop, A.B., R. Narayanan, W.J. Grenney, and P.E. Pugner. "Closure - Goal Programming Model for Water Quality Planning." ASCE, Journal of the Environmental Engineering Division, 104(E5), October 1978.
- Bishop, A.B., R. Narayanan, W.J. Grenney, and P.E. Pugner. "Goal Programming Model for Water Quality Planning." ASCE, Journal of Environmental Division, 103(E2), April 1977.
- Narayanan, R., B.C. Jensen, and A.B. Bishop. "An Optimization Model for Efficient Management of Urban Water Resources." AWRA, Water Resources Bulletin, 13(4), August 1977.
- Bishop, A.B. and R. Narayanan. "Seasonal and Stochastic Factors in Water Planning." ASCE, Journal of Hydraulics Division, 103(HY10), October 1977.
- Bishop, A.B., M. McKee, T.W. Morgan, and R. Narayanan. "Multi-Objective Planning: Concepts and Methods." ASCE, Journal of the Water Resources Planning and Management Division, 12(WR.2), November 1976.
- Bishop, A.B., B.C. Jensen, and R. Narayanan. "Economic Assessment of an Activity Analysis Model for Water Supply Planning." Water Resources Research, 11(6):783-788, 1975.

#### **BOOK CHAPTERS, PROCEEDINGS AND ABSTRACTS:**

- Miller E. and R. Narayanan. (Editors) "Great Basin Wildfire Forum: the Search for Solutions." Nevada Agricultural Experiment Station, University of Nevada, Reno, 2008.
- Harris, Thomas R. and Rangesan Narayanan. "Relationship of Non-Basic Sector Income Growth and the Gaming Sector." Journal of Agricultural and Resource Economics, Abstract, Vol. 24, No. 2, p. 590, 1999.
- Harris, Thomas R. and Rangesan Narayanan. "Relationship of Non-Basic Sector Employment Growth and the Gaming Sector." American Journal of Agricultural Economics. Abstract. Vol. 80, No. 5, p. 1194, 1998.
- Seung, Chang K., Thomas R. Harris and Rangesan Narayanan. "A Computable General Equilibrium Approach to Surface Water Reallocation Policy in Rural Nevada." American Journal of Agricultural Economics, Abstract, Vol. 80, No. 5, p. 1197, 1998.
- Bhattacharyya, A., T.R. Harris, R. Narayanan, and K. Raffiee. "Modeling Technical Efficiency of Rural Utilities: An Application to Rural Nevada Water Utilities." American Journal of Agricultural Economics. Abstract. Vol. 77, No. 5, p. 1372, December 1995.
- Narayanan, Rangesan, Arunava Bhattacharyya and Thomas R. Harris. "Demand for Grazing on Public Lands: A Disequilibrium Analysis Using Panel Data and Flexible Functional Form." Journal of Agricultural and Resource Economics. Abstract. Vol. 20, No. 2, p. 402, December 1995.

- Bhattacharyya, A., T.R. Harris, R. Narayanan, and K. Raffiee. "Allocative Efficiency of Rural Nevada Water Systems: A Hedonic Shadow Cost Approach." Abstract in American Journal of Agricultural Economics, Vol. 76, No. 5, p. 1247, 1994.
- Harris, Thomas R. and Rangesan Narayanan. "Incorporation of Expectations into Export-Base Models." Journal of Agricultural and Resource Economics. Abstract. Vol. 17, No. 2, p. 372, 1992.
- Harris, Thomas R., Rangesan Narayanan, John L. Dobra. "Estimation of Commercial Sector Activity: An Application of Tobit Procedures." Southern Journal of Agricultural Economics. Abstract. Vol. 23, No. 1, p. 268, 1991.
- Harris, T.R., R. Narayanan, and J.S. Shonkwiler. "Estimation of Thresholds for Rural Commercial Sectors." Proceedings of the Regional Science Association International, p. 41, 1991.
- Hughes, T.C. and R. Narayanan. "Optimal Design of Small-Scale Hydro Projects." Proceedings of International Conferences on Hydro Power, American Society of Civil Engineers, 1987.
- Narayanan, R., D.T. Larson, and T.C. Hughes. "Effectiveness of Drought Policies in Municipal Water Management." Abstract in CDIC Communications, Oak Ridge National Laboratory. Oak Ridge, Tennessee. Spring 1986.
- Bishop, A.B., R. Narayanan and D.R. Franklin. "Salinity Control through Water Conservation in the Upper Colorado River Basin." Proceedings of the 1983 International Symposium on State-of-the-Art Control of Salinity in Water Courses and Reservoirs, edited by Richard H. French, Butterworth Publishers, Boston, 1984.
- Narayanan, R., H. Beladi, R.D. Hansen and A.B. Bishop. "Seasonal Pricing of Municipal Water Using a Non-Linear Integer Programming Model." Proceedings of the Applied Identification Modeling and Simulation Conference, Edited by M.H. Hamza, ACTA Press, 1984.
- Mckee, M., R. Narayanan, and A.B. Bishop. "A Stochastic Programming Approach for Estimating Optimal Municipal Water Prices and Reservoir Operating Rules." Proceedings of the Applied Identification, Modeling and Simulation Conference, Edited by M.H. Hamza, ACTA Press, 1984.
- Narayanan, R., D.T. Larson, A.B. Bishop, and P. Amirfathi. "Economic Evaluation of Alternative Strategies for Maintaining Instream Flows." In Aquatic Resource Management of the Colorado River Ecosystem, ed. by Adams and Lamarra, Ann Arbor Science, 1981.
- Narayanan R. and T.R. Frickel. "The Impact of Changing Irrigation Technology on Agricultural Productivity and Water Rights." Proceedings of AWRA-TVA Symposium in Unified River Basin Management Symposium, ed. by R.M. North et al., 1980.
- Keith J.E., and R. Narayanan. "Water Use Tradeoffs between Energy and Agriculture." Utilizing Scientific Information in Environmental Quality Planning, AWRA Symposium, ed. by Grenney, September 1979.
- Narayanan, R. "Book Review: 'Mathematics for Business and Social Sciences: An Applied Approach'." by Mizrahi and Sullivan, John Wiley and Sons, in Intermountain Economic Review, VIII(1), Spring 1977.

## **REFERENCES:**

Dr. Stanley Johnson, Chair, Board of the National Center for Food and Agricultural Policy, and also Special Assistant to the Dean, College of Agriculture, Biotechnology and Natural Resources  
University of Nevada, Reno  
(775) 223-3087 [sjohnson@cabnr.unr.edu](mailto:sjohnson@cabnr.unr.edu)

Dr. Ron Pardini  
Dean and Director, College of Agriculture, Biotechnology and Natural Resources and the Nevada  
Agricultural Experiment Station  
University of Nevada, Reno  
Reno, NV 89557  
(775) 784 1610 [ronp@cabnr.unr.edu](mailto:ronp@cabnr.unr.edu)

Dr. David G. Thawley  
Dean and Director Emeritus, College of Agriculture, Biotechnology and natural resources and the  
Nevada Agricultural Experiment Station

2305 Peavine Valley Road  
Reno, NV 89523  
(775) 746-2848 [dgthawley@hotmail.com](mailto:dgthawley@hotmail.com)

Dr. J. Scott Shonkwiler  
Professor  
314C Conner Hall  
The University of Georgia  
Athens, GA 30602  
(706) 542-0847 [jss1@uga.edu](mailto:jss1@uga.edu)

Dr. Basudeb Biswas  
Professor Emeritus  
Department of Economics and Finance  
Utah State University  
(435) 755-9593 [basudeb.biswas10@gmail.com](mailto:basudeb.biswas10@gmail.com)

Dr. Bartell C. Jensen  
Professor Emeritus and former V.P. for Research  
Utah State University  
(435) 753-0270

Mr. Bob Alverts  
USGS (retired), Former BLM Science Advisor  
Portland, OR  
(503) 639-0405 [balverts@teleport.com](mailto:balverts@teleport.com)