

# University of Vermont Cluster Hire: Post-Doctoral Positions in Dairy Food Systems

Six post-doctoral positions are available at the University of Vermont (UVM) through a cluster-hire with a focus on sustainable dairy food systems. The two-year positions (with potential option for renewal) will work with UVM faculty in collaboration with US Department of Agriculture (USDA) Agricultural Research Service (ARS) scientists and will be based at UVM, in conjunction with the ARS Food Systems Research Unit. The post-doctorates and advisors will coordinate efforts across different positions and contribute to new knowledge on dairy within the spectrum of food system research. The expected start date is negotiable but anticipated for the summer or fall of 2021. All successful applicants will be expected to hold a PhD at the time of appointment in a relevant field and demonstrate academic excellence as evidenced through publications, conference presentations and collaborative engagement. Additional qualifications, position descriptions, compensation, benefits and instructions for applying are detailed below.

## **Please note:**

Inquiries about specific positions should be directed to the UVM faculty listed in the position descriptions, but please do not send your application materials to them. Application instructions are included below the position descriptions.

## Available Positions

### Position 1: Whole-farm dairy systems modeling: Adoption, Engagement, and Application

#### **Overview**

Modern dairy farms are complex systems that need sophisticated management to balance production, profitability, and environmental goals. These sustainability goals are often conflicting, and producers, farm advisors, and policy makers need systems-level information on options to balance the tradeoffs. Computer models like the Ruminant Farm Systems (RuFaS), a next-generation, whole-farm model being developed to simulate dairy farm production and environmental impact, help inform systems-level thinking because they can evaluate many farm types and management practices quickly and cost-effectively. RuFaS has a range of potential applications, including as a research tool for scientists, a decision-aid tool for the dairy industry, and a learning tool for interested stakeholders. Currently, however, RuFaS does not consider the “human” element of these systems. The dairy industry is nucleated by human decisions: to produce; to consume. Ultimately, to realize full efficacy, tools like RuFaS must be informed by the external economic and behavioral barriers to adoption and engagement by stakeholders. This project will incorporate RuFaS into ongoing work at UVM focused on understanding data-informed decision-making by producers and the effects of incentivization. We will evaluate and improve upon RuFaS’s user interaction with model inputs and outputs to lower barriers to affecting sustainable change in dairy systems through cooperation with partner farms in the Northeast, Midwest, and Western US. Our work will probe questions about trade-offs in the level of detail in model inputs and outputs needed to build trust while minimizing time commitments, methods for communicating model predictions and the degree of uncertainty associated with those predictions, and effectiveness of participatory modeling to build trust and ownership in the decision support tool. The results of this work will inform a new practical decision-making graphical user interface of RuFaS that delineates for producers, stakeholders, and policymakers, the costs, requirements, and catalysts necessary for successful transitions to new management practices.

This position will work with Drs. Jane Kolodinsky, Donna Rizzo, and Asim Zia at University of Vermont, and Dr. Kevin Panke-Buisse at the Agricultural Research Service. Inquiries about this specific position should be sent to Dr. Asim Zia at [Asim.Zia@uvm.edu](mailto:Asim.Zia@uvm.edu).

## Qualifications

The candidate should have a background in at least one (preferably multiple) of the following areas: ecological economics, system dynamics, agricultural management practices incentivization, agricultural engineering, human environmental sciences, or data science. Essential requirements are for a candidate to have a working knowledge of management and operation of dairy farms and their associated environmental impacts. Proficiency in experimental design and producer/consultant survey analysis to capture the effects of incentivization and data on producer decision-making and farm outcomes is expected, as well as an interest in the sociology of technology development. Preferred qualifications include a candidate who is familiar with and has some experience using hydrologic and/or nutrient models (e.g. Daycent, SWAT, IFSM, Manure DNDC, RuFaS), ability to discuss the mathematics of biological process modeling, and Python experience.

## Position 2: Metagenomics identifies the diversity and frequency of human pathogens and antimicrobial resistance genes in milk and the farm environment on small to medium sized dairy farms

### Overview

Food safety is a critical food systems issue, independent of the scale of the system. Foodborne illness outbreaks occur in local decentralized food systems and large-scale centralized systems. Improved understanding of foodborne illness risk requires collection and analysis of data describing the prevalence and diversity of human pathogens and antimicrobial resistance genes. Developing novel approaches and systems to collect data on food safety hazards and risk factors is critical to preventing foodborne illnesses. Metagenomic approaches have the potential to revolutionize pathogen surveillance systems. These approaches may offer advantages compared to conventional culture-based systems, including higher throughput, potential to collect more information on the community structure in diverse matrices, and increased sensitivity. These potential advantages need verification in a diversity of food systems from farm-to-fork. This project will explore the application of metagenomic methods of surveillance for sources of human pathogens and antimicrobial resistance genes on small to medium sized dairy farms. We will characterize the microbiome and resistome in raw milk and the farm environment in different farm systems using amplicon and shotgun metagenomics approaches in parallel with culture-based approaches for selection and isolation of bacterial species and strains. The anticipated outcome is identification of potential mitigation strategies that reduce the prevalence of foodborne pathogens and antimicrobial resistance in dairy farm systems and their outputs.

This position will work with Dr. John Barlow at University of Vermont and Drs. Jo Ann Van Kessel and Bradd Haley at the Agricultural Research Service. Inquiries about this specific position should be sent to Dr. John Barlow at [John.Barlow@uvm.edu](mailto:John.Barlow@uvm.edu).

### Qualifications

The successful candidate will have a PhD degree in microbiology, molecular biology or a related field with demonstrated expertise in bioinformatics and next-generation sequencing approaches. We are particularly interested in candidates who are excited about and have experience in applied metagenomic approaches for addressing questions in microbial ecology. Candidates with a background or knowledge in food safety, food and agricultural systems or dairy farm systems are especially encouraged to apply. The candidate should have excellent written and spoken English; experience in R software environment (or comparable tools); experience with genomic, metagenomic, or amplicon sequencing data analysis; coursework or experience in statistics/biostatistics; and demonstrated communication and collaboration skills. The postdoctoral scientist will have an initial two-year appointment as a member of a collaborative team composed of USDA-ARS and University of Vermont researchers.

## Position 3: Impact of genetics, diet and management practices on milk components

### Overview

Studies will be conducted to understand the impact of different types of forage and feed in the dairy cow ration on milk production and the resulting nutritional composition of the milk. Types (grasses vs legumes), amounts, and quality of forages will be fed to high-producing dairy cows (of different genetic backgrounds) to evaluate their impact on the nutritional quality of milk. Both Holsteins and Jerseys will be used to determine if there are interactions of forages and breed on the nutritional quality of milk. Intake, milk production and milk composition will be measured. In addition, measures of nutrient utilization and feed efficiency will be determined to evaluate how soil/forage management can impact nutrient utilization from the field to the cow. Rumen samples will also be obtained to evaluate the impact of forages on the rumen microbiome. Milk samples will be collected and sent to human nutrition collaborators to evaluate the impact of forage production on nutritional value of milk. The postdoctoral fellow will work to elucidate how different forage and feed in the ration impacts milk composition in two breeds of cattle and how the rumen microbiome impacts milk fat composition and functionality of dairy products. In addition, new methodologies to isolate and characterize bioactive compounds in rumen microbes as well as in milk, such as the milk fat globule membrane, will be developed.

This position will work with Dr. Jana Kraft at University of Vermont and Drs. Ken Kalscheur and Naomi Fukagawa at the Agricultural Research Service. Inquiries about this specific position should be sent to Dr. Jana Kraft at [Jana.Kraft@uvm.edu](mailto:Jana.Kraft@uvm.edu).

### Qualifications

Knowledge of ruminant physiology related to milk production, experience in analytical chemistry (gas chromatography, mass spectrometry, etc.), rumen/human microbiome, and “omics” approaches. Data science expertise to permit integration of different data sets (e.g. food intake, milk production/composition, functionality of dairy products, microbiome, soil/management impact on forage quality).

## Position 4: Precision agriculture and environmental impact of dairy cropping systems

### Overview

Researchers in Vermont are partnering with researchers in South Dakota in a recently funded, four-year, \$3 million NSF project that will use a unique approach to develop, test, and implement new precision agriculture tools and public policies that are socially and economically feasible for farmers, rural communities, and the environment. The goal is to use precision agriculture technologies to reduce environmental impacts and increase crop and livestock productivity. While the focus will be on nitrates in South Dakota, university and USDA scientists will seek to reduce the environmental impact of phosphorus through the use of sensor technologies in Vermont. Samples from approximately 70 Vermont soils have been collected and submitted for soil health assessment within watersheds currently being monitored as part of the existing Lake Champlain Basin CEAP Watersheds project. Our approach is to link soil health data to propensity to produce runoff and P loss and use hyperspectral and multispectral data to extrapolate the assessment across watersheds. Specific objectives are to 1) Conduct a field assessment of soil health on a population of soils within three watersheds that are being monitored as part of an ongoing USDA-funded Conservation Effects Assessment Project (CEAP) study and link those data to propensity to produce runoff and P loss, 2) Collect hyperspectral and multispectral data and use artificial intelligence to create algorithms that link these data to soil health data derived from the field study, 3) Extrapolate soil health and P loss potential across the watersheds using hyperspectral and multispectral sensors, and 4) Assess farmers' acceptance of this technology. The results of this study could potentially improve our ability to assign environmental risk to specific fields and adjust management accordingly.

This position will work with Drs. Joshua Faulkner, Asim Zia, and Donna Rizzo at University of Vermont and Dr. Ray Bryant at the Agricultural Research Service. Inquiries about this specific position should be sent to Dr. Joshua Faulkner at [Joshua.Faulkner@uvm.edu](mailto:Joshua.Faulkner@uvm.edu).

## Qualifications

We seek computationally savvy candidates with an underlying passion for working in the world of agriculture and environment and who would enjoy collaborating with a dynamic team of university and USDA scientists with a diversity of expertise. Expertise in data science, remote sensing, GIS, and geospatial data fusion techniques and modeling approaches is strongly recommended.

## Position 5: Precision Agriculture and High Throughput Phenotyping for Dairy Genetics

### Overview

This position will work on a project aimed at generating genetic merit predictions using existing data from infra-red spectroscopy data of milk components. The successful candidate will integrate high-throughput phenotyping derived from these existing data and available genotyping data to enable genomic selection and genome wide association studies for economically important traits in dairy cattle. Scientists at the Animal Genomics and Improvement Laboratory have access to the National Dairy Database through a collaboration with the Council on Dairy Cattle Breeding, and this data set is the largest collection of phenotypic, genetic, and genomic information on dairy cattle in the world. This data repository recently surpassed 5 million animals with medium- to high-density genotypes available. Additional resources available to the incumbent include the Cooperative Dairy DNA Repository and 1000 Bull Genomes data. Understanding of genetic mechanisms enhanced through this research could contribute to selection strategies to better optimize components in dairy products to meet the needs in human diets.

This position will work with Dr. Stephanie McKay at University of Vermont and Dr. Curt Van Tassell at the Agricultural Research Service. Inquiries about this specific position should be sent to Dr. Stephanie McKay at [Stephanie.McKay@uvm.edu](mailto:Stephanie.McKay@uvm.edu).

## Qualifications

Candidates must possess in-depth knowledge of a blend of skills including quantitative genetics, animal or plant breeding, and computational biology. Knowledge of genome assembly, population genetics, statistical genetics, complex trait mapping, high throughput sequencing and/or epigenetics is a plus. Strong programming skills with proficiency in R, Fortran, or Python is highly desired. Preference will be given to candidates with a strong publication record, evidence of substantial research productivity, and ability to successfully communicate scientific information.

## Position 6: Sustainable intensification of forage-based dairy farms through improved forage production and feeding

### Overview

Homegrown forages are a critical aspect of farm performance in both pasture-based systems and confinement dairy systems, as feed costs can exceed 50% of total operating expenses on dairy farms. Our research objectives are to 1) examine and improve the performance of traditional and novel forages in the Northeast, and identify high-quality forages that perform optimally under changing weather patterns, and 2) assess the impact of these forages and forage combinations on primary (forage) and secondary (animal) productivity relative to environmental impact. The combined results from these studies will provide dairy farmers with immediately applicable information regarding forage selection, forage management, and feed management for improved primary and secondary performance, and environmental impact. Project results will be especially critical to provide options for improving the sustainable intensification and economic sustainability of forage-based dairy systems. The successful candidate will have the opportunity to lead projects that use a combination of data mining, *in vitro* experimentation, small on-farm plot experiments, and *in vivo* animal assessment to examine forage performance and animal productivity.

These assessments will aim to encompass aspects of the following:

1. Economic stability (lower feed costs)
2. Environmental stability (particularly perennial forages)
  - a. Climate change
  - b. Carbon sequestration
  - c. Water quality
  - d. Reduction of methane emissions
3. Sustainable Intensification when optimized (greater productivity on the same land base without harming the environment)
4. Meeting specialty markets (e.g., organic/grass-fed, which can also impact #1 above)
5. Human health (e.g., fatty acid and/or protein profiles of meat and milk)
6. Social aspect (public prefers to see grazing cows and/or perennial forage fields rather than tilled annual crops)

This position will work with Drs. Heather Darby and Sabrina Greenwood at University of Vermont and Dr. Kathy Soder at the Agricultural Research Service. Inquiries about this specific position should be sent to Dr. Sabrina Greenwood at [Sabrina.Greenwood@uvm.edu](mailto:Sabrina.Greenwood@uvm.edu).

### **Qualifications**

Candidates are required to hold a Ph.D. in agronomy, forage science, animal science, agriculture or a closely related field. The assignment requires a working knowledge of ruminant livestock production, forage crop production, grazing systems, the US dairy industry, and statistics to function successfully in an interdisciplinary team. Knowledge of agro-ecology and sustainable agriculture is desired. Candidates must be comfortable working in both laboratory, field, and farm settings, working with large equipment and dairy cattle, and lifting up to 50 lbs.

### **Compensation and Benefits**

Salary range will be between \$50,000- \$55,000, depending on experience. In addition, each post-doctoral associate will receive \$3,000 annually for travel expenses associated with visits to ARS research facilities and with ARS scientists. Each post-doctoral associate will also receive \$5,000 for research, conference and/or publication costs associated with the post-doctoral research.

In addition, there are a number of generous benefits associated with the positions, which can be found at: <https://www.uvm.edu/hrs/postdoctoral-associates-fellows-overview>. The post-doctorates will also have opportunities for professional development and travel associated with the project.

### **How to apply**

Inquiries about specific positions should be directed to the UVM faculty listed in the position descriptions, but please do not send your application materials to them.

To apply for this position please submit:

- A cover letter that details your experience and interest in the specific post-doctoral position as described above
- A full Curriculum Vitae
- Contact information for three references

In order to be fully considered for the position, applications should be received by June 21, 2021. Applications should be sent to Alison Nihart at [alison.nihart@uvm.edu](mailto:alison.nihart@uvm.edu) with the subject line "Post-doc Application."

The University of Vermont is an Equal Opportunity/ Affirmative Action Employer. All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, disability, protected veteran status, or any category legally protected by federal or state law. Applicants are welcome from any region, and there are no associated citizenship requirements.