

SAES-422 / NC 2042 Accomplishment Report, 2022-2023

Project/Activity Number: NC2042

Project/Activity Title: NC2042: Management Systems to Improve the Economic and Environmental Sustainability of Dairy Enterprises

Period Covered: 10/01/2022 – 09/30/2023

Date of This Report: 12/09/2023

Annual Meeting Dates: 10/12/2023 to 10/14/2023.

Participants

Present Faculty: Kate Creutzinger (U of Wisconsin – River Falls), Stephanie Ward (NC State U), Joao Costa (U of Vermont), Andre Brito (U of New Hampshire), Ken Kalscheur (USDA-USDA), Sushil Paudyal (Texas A&M U), Jackie Boerman (Purdue U), John Allen (NC State U), Pete Erickson (U of New Hampshire), Mireille Chahine (U of Idaho), Lizzy French (USDA-ARS), Matias Aguerre (Clemson U), Albert De Vries (U of Florida), Melissa Cantor (Penn State U), Marcia Endres (U of Minnesota), Gonzalo Ferreira (Virginia Tech U), Mike Schutz (academic advisor, U of Minnesota). Present Graduate Students and Others: Hailey Galyon (Virginia Tech U), Taylor Burrell (NC State U), Michaela Marciniak (NC State U), Maria Boggess (NC State U, research technician). Online: Steve Smith (USDA-NIFA)

Brief Summary of minutes of annual meeting

- Location: The StateView Hotel and Conference Center, Raleigh, NC
- Host: Stephanie Ward. Chair: Joao Costa. Secretary: Albert De Vries
- We need to double check the email list + check NIMSS website. Some people not getting emails this year. Action item for 2024.
- Minutes from annual meeting in 2022 were approved as written.
- The previous NC2042 project ended on 09/30/2023.
- The group expressed their sincere thanks to Jackie Boerman for leading the rewrite for project renewal that was approved earlier in 2023. New project period is 10/01/2023 - 09/30/2028. Title is again: NC2042: Management Systems to Improve the Economic and Environmental Sustainability of Dairy Enterprises. Website: <https://www.nimss.org/projects/view/mrp/outline/18980>
- Matias Aguerre accepted to be secretary for next year's annual meeting. Chair will be Albert De Vries.
- Host in 2024: U of Prince Edward Island (PEI, Canada). Katie Proudfoot (PEI) agreed to host us. Meeting: W T F. Add a full day for farm visits. Not many flights. Pete Erickson and Albert De Vries will organize 2024 meeting with Katie Proudfoot.
- Mike Schutz will be contact to approve meeting in PEI. He may need to reach out to NIFA but does not expect a problem getting approval.
- Backup host: Purdue (Jackie Boerman).
- Mike Schutz academic advisor report:
 - Slide set on Introduction to Multistate Research Projects (mostly for new members)
 - No 5-year termination report required anymore. Annual reports still required.
 - Ken Kalscheur has list of hosts, secretaries, chairs, names of project since 1971.
 - Annual project report due December 11, 2023. Albert De Vries action.

- Update NIMSS website for new chair, secretary. Albert De Vries action.
- Upload presentations for each station at:
 - https://drive.google.com/drive/folders/1Xm2M2M-2vF_B6vd_VCBQAX1iQ9KI_U-Z
- Joao Costa has invited several new people to attend the new NC2042 project.
- Joao Costa encouraged attendees to officially join the new NC2042 project.
- Similar project that also has USDA and industry participation: NC1211: Precision Management of Animals for Improved Care, Health, and Welfare of Livestock and Poultry: https://www.nimss.org/projects/view/participant_list/18777

Agenda

Thursday, Oct 12		
9:00 AM	Welcome and Introductions	StateView Hotel and Conference Center
9:30 AM	Business Meeting Approve minutes; Advisor comments;	StateView Hotel and Conference Center
10:30 AM	Break (Coffee available)	
11:00 AM	Continue Business Meeting University research/extension discussion; Future secretary and meeting location	StateView Hotel and Conference Center
11:45 AM	Depart for Howling Cow Farm and Creamery Transportation provided from hotel	
12:00 PM	<u>Lunch</u> <u>Tour Howling Cow Farm and Creamery</u>	100 Dairy Ln, Raleigh, NC 27603 Nacho Bar, Armadillo Grill
2:00 PM	Return to Hotel Station Reports (10, 15 min each)	
5:00 PM	Adjourn	
6PM – 9PM	Social and Dinner Group reservations will be made, dinner on own	Morgan Street Food Hall
Friday Oct, 13		
7:00 AM	Breakfast (on your own) @ NC State Farmers' Market	optional, van will leave hotel at 7AM
9:00 AM	Station Reports (10, 15 min each)	StateView Hotel and Conference Center
11:00 AM	Lunch and Centennial Campus Tour CRISPR Lab James Hunt Library Transportation from hotel provided	Partners II, 840 Main Campus Dr, Centennial Campus Village Deli
2:00 PM	Station Reports (10, 15 min each)	PSI Building, Centennial Campus
5:00 PM	Adjourn, Downtime @ hotel	
6:00 PM	Dinner Group reservations will be made, dinner on own	Downton Raleigh
Saturday, Oct 14th		
7:30 AM	Leave for farm tour	
8:30 AM	Tour Cherry Research Dairy Farm Grass based dairy part of CEFS program at NCSU	Goldsboro, NC
11:00 AM	Return to Raleigh/Depart for airports	

Accomplishments

Multistate research project NC-2042 (10/1/2018-9/30/2023) aims to optimize calf and heifer performance (Objective 1), to improve dairy cow management (Objective 2), and integrate data and technology to improve efficiency and sustainability (Objective 3) in dairy farming systems.

ID and NH collaborated to investigate specific factors that could be affecting colostrum yield, IGG concentration and IGG yield in Jersey cows. NH also found that sodium butyrate and butyric acid were effective in killing coccidial sporozoites in culture. NH led large field study involving 430 multiparous Jersey cows from herds across the US provided data to determine models regarding colostrum yield, colostrum quality, and IgG yield. Herds surveyed were contributed by many states in this project. ID initiated a study with Utah State University to compare the nitrogen use efficiency of Jersey and Holstein cattle under the same management conditions. UWRF developed a novel test for hunger in dairy calves using taste aversion in collaboration with VT. UWRF is currently investigating satiety of calves after feeding electrolytes or milk in collaboration with VT and the University of Guelph. USDA evaluated the economics of heifers raised either in pasture or in confinement.

Autofeeder work has been conducted by both MN and IN. IN collected data from a commercial dairy farm with autofeeders and have evaluated the impact of early life on future performance, factors that impact feeding behavior, and dairy calf resilience. MN found that machine learning algorithms were successful in predicting calves that were sick. Housing preweaned calves with their dams resulted in greater daily gain and serum total protein concentration without negative effects on calf health.

Much work has been accomplished in dairy cow nutrition, either through collaborative work or because of discussions at multi-state meetings in prior years.

An IL project investigated the association of dry matter intake, milk yield, and days to first ovulation with cytological endometritis in Holstein cows. IL studied effects of cut height and inoculant application on brown midrib whole plant corn silage yield, nutrient composition, fermentative profile, and in vitro degradability. SC conducted a study to evaluate the effects of 3 different sources of Cu and Zn supplementation on animal performance, nutrient digestibility, and absorption and retention of trace minerals when fed to dairy cows. CA performed preliminary experiments and identified two potential feed additives to alleviate milk fat depression. USDA evaluated the inclusion of forage and branched short-chain fatty acids (BSCFAs) on lactation performance of dairy cows.

IA led several experiments of products that interact with Monensin. Feed efficiency was one of the monitored outcomes. IA also led an experiment testing the effect of red seaweed on enteric methane emissions, nutrient digestibility, manure methane potential, feed efficiency, milk and manure residue levels, and health and wellbeing of cows. IA also collaborated with UW-Madison, MI, and FL to understand how genomic, microbial, and nutritional strategies would work together in mitigating enteric methane emissions from dairy cows. UWRF survey of

transition cow management practices on Wisconsin and Minnesota dairy farms in collaboration with UW-Madison.

Technology played an important role in several projects. MN studies used data collected from robotic milking farms and investigating associations with milk production. SC completed a project on monitoring pasture quality and quantity using field robotics (drones). TX presented new ideas and insights into dairy cattle health and wellbeing. The research conducted provides information on thermal comfort of dairy cows in automatic milking systems, impact of heat stress, minimizing cow and animal level stressors, and using novel tools to promote health and wellbeing in dairy cattle. IN has spent the last 3.5 years developing the Purdue Animal Sciences Data Ecosystem to automate data collection and integration from disparate data sources. This has allowed for additional collaboration and IN anticipates a considerable amount of research output from this effort. FL developed and licensed software that calculates optimal replacement and insemination decisions for dairy heifers and cows. The modeling is based in part on literature provided by multi-state collaborators.

Impacts

The accomplished works help better understanding of factors that influence productivity, therefore efficiency of milk production, can help improve sustainability of the dairy industry. Nutrition research has provided knowledge on practical aspects of forage production and dairy cattle nutrition. Using dairy technologies such as robotic milking and automated milk feeders more successfully, and housing calves socially can also help the dairy industry stay sustainable. Research had led to a better understanding of the genomic, microbial, and nutritional strategies that lead to the development of holistic approaches to mitigate methane emissions from dairy farms.

The research has also improved dairy cattle welfare during the transition period. Information gained in the on-going and future research is highly applied and optimizes management practices on dairy farms. Projects have also led to new insights into the approaches that could be utilized for farm data collected at the individual cow and farm level to develop decision support tools for dairy farmers. Software has been licensed to Dairy Records Management Systems (Raleigh, NC) and is rolled out as “KeepOrBeef” and is being tested on dairy farms.

Publications

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