Minutes and State Reports

NE-1941 meeting is scheduled for August 17-18

August 17

1:00 pm to 5:00 pm

1:00 - 1:15 - Welcome

1:15 - 3:00 -  Afternoon Reports

* Carissa Wickens, University of Florida,
* Masoud Hashemi (if available), University of Massachusetts
* Bob Coleman, University of Kentucky
* Krishona Martinson, University of Minnesota

3:00 - 3:15 - Break

3:15 - 5:00 - Afternoon Reports

* Robert Causey, University of Maine
* Carey Williams, Jennifer Weinert, Rutgers University

Topic: NE-1941 Annual Meeting

Time: Aug 17, 2021 12:30 PM Eastern Time (US and Canada)

Join Zoom Meeting

<https://rutgers.zoom.us/j/93064856726?pwd=RFRpekNPTUZWYW0xVnlrL1MxUWJKUT09>

Meeting ID: 930 6485 6726

Password: 384477

One tap mobile

+13126266799,,93064856726# US (Chicago)

+16465588656,,93064856726# US (New York)

August 18

9:00 am to 1:00 pm

9:00 am to 10:45 am - More State reports

* Paul Siciliano, North Carolina State University
* Laura Kenny, Danielle Smarsh, Pennsylvania State University
* Robin Brumfield, Mike Westendorf, Rutgers University
* Amy Burk, University of Maryland

10:45 am to 11:00 am - Break

11:00 am to 1:00 pm - Finish State Reports, reporting requirements, Impact Statements, publications, etc., discussion of next year's meeting.

Topic: NE-1941 Annual Meeting

Time: Aug 18, 2021 08:30 AM Eastern Time (US and Canada)

Join Zoom Meeting

<https://rutgers.zoom.us/j/98468911389?pwd=dlI1a3h2cGxyc0VaRkxHMVZLbDVmdz09>

Meeting ID: 984 6891 1389

Password: 712614

One tap mobile

+13017158592,,98468911389# US (Washington DC)

+13126266799,,98468911389# US (Chicago)

State reports should be about 20 minutes in length, with appropriate audio-visuals, simple PowerPoint is fine. Please turn in a one-page description of your work that can go in this year's NIMSS reports submitted to NIFA.  Please also submit a list of publications from the past year and one impact statement about your work.   These statements can be transferred into an Impact Statement about the work that we have been doing.

Pennsylvania State Report

NE-1941 Meeting August 17 & 18 2021

Most educational activities in 2020-2021 were delivered virtually due to COVID-19 restrictions.

The Equine Environmental Stewardship Short Course was transformed into a virtual workshop using Zoom with 4 two-hour sessions. There were 29 registrants from 6 different states. Overall, the short course was successful, with positive evaluations and high impact on several planned behavior changes. This course is also being transformed into an asynchronous online course in partnership with our Digital Education team.

The Penn State team decided to compare the results of the online Short Course to a previous in-person offering with a similar number of participants. An abstract for Equine Science Society was developed and accepted. We found that the 2017 in-person course and the 2020 virtual course had similar demographics and evaluation results. However, we did find a difference in “Knowledge Change” between the years- the 2020 virtual course had an overall higher knowledge change than the in-person 2017 course. Specifically, participants reported higher knowledge increases in forage biology, resting pastures, weed biology, soil testing, pasture renovation, and manure storage topics in 2020. Their intention to adopt management practices covered in the course within 2 years did not differ between years. Technical difficulties were rare and improved over the 4-week course. Breakout rooms were used for engagement and activities, and reactions were generally positive. A surprising number of paying registrants did not attend any live sessions (36%), and it is unknown whether they watched the recordings sent out afterwards. The 2020 virtual course also had lower evaluation response rates than 2017, even when only live attendees were considered. Overall, we concluded that the virtual course was equally effective as an in-person course and had the added benefit of reaching a geographically wider audience.

Several webinars were delivered on various pasture management topics. On April 20, 2021, “Pasture Seeding and Soil Testing” had 47 live attendees. On April 22, 2021, “Spring Pasture Management” had 37 attendees. On June 23, 2021, “Horse Pasture Management Tips” had 35 attendees.

When COVID restrictions eased, there was 1 in-person Pasture Walk program on May 27, 2021. Fifteen attendees learned about soil testing, grass and weed identification, and pasture management. A second pasture walk took place on August 9, 2021 with 8 in attendance.

Farm visits continued throughout 2020 and 2021. They mostly focused on pasture improvement and hay sampling. Since the previous NE-1941 meeting, 15 farms visits were performed.

A new initiative has been a phone hotline intended for the Amish community to receive educational livestock information while in-person meetings were suspended. The PSU team records a 3-minute horse-related message every Sunday. They cover horse care, diseases, pasture management, nutrition, and facilities. Most weeks we receive a minimum of 5 calls to the hotline and up to 26 calls.

We continue to offer horse health programming in addition to environmental and pasture programs. We are launching a survey about horse hay for both consumers and producers and tracking PA hay prices. We also developed a webinar series for new horse owners, and are working on parasite control/fecal egg count workshops.

Impact Report

Between August 2020 and August 2021, the Penn State environmental & pasture management program reached 170 clients.

Three webinars were delivered, and follow-up online evaluation surveys measured their impact.

* April 20, 2021 Webinar with Montgomery County Conservation District (47 attendees)
  + 85% plan to implement soil testing
  + 59% plan to implement rotational grazing
  + 89% plan to reseed pastures
* April 22, 2021 Webinar with Montgomery County Conservation District (37 attendees)
  + 69% plan to implement soil testing
  + 39% plan to implement rotational grazing
  + 69% plan to reseed pastures
* June 23, 2021 Horse Pasture Management Tips (35 attendees)
  + Value of webinar rated 4.27 (scale of 1-5)
  + 82% plan to use information from this webinar on a horse farm they manage

The Equine Environmental Stewardship Short Course was delivered virtually to 29 registrants. Evaluations were collected via Qualtrics surveys. Some highlights of program impacts include:

* Knowledge increase of 3.83 (scale of 1 to 4) on “The difference between annual, perennial, and biennial weeds and how life cycle affects management”
* Knowledge increase of 3.73 (scale of 1 to 4) on “How forage biology and growth influences grazing decisions”
* Over 50% of respondents reported that they will implement the following practices within 2 years as a result of the short course:
  + Soil test every 3 years (80%)
  + Apply lime/fertilizer based on test results (90%)
  + Choose herbicides based on weeds present at spray at the right time (50%)
  + Evaluate pasture condition at least annually (70%)
  + Identify forages and weeds present in pastures (60%)
  + Overseed a pasture (60%)
  + Add an improved base or cover to your manure storage (70%)
  + Apply composted manure to pastures (60%)
  + Contact a conservation professional for help with drainage problems (55%)

Publications

* Kenny, L.B. and Smarsh, D.S. 2021. Comparison of program evaluations for an extension short course offered in-person and virtually. Journal of Equine Veterinary Science. 100. <https://doi.org/10.1016/j.jevs.2021.103593>
* Kenny, L.B. 2021. Managing Horse Pasture During and After a Drought. Online. <https://extension.psu.edu/managing-horse-pasture-during-and-after-a-drought>
* Orr, E and Kenny, L. 2021. Rotational Grazing. Inforgraphic.

NE 1941: ENVIRONMENTAL IMPACTS OF EQUINE OPERATIONS

MAINE STATE REPORT - ROBERT CAUSEY AND COLT KNIGHT

RESARCH OVERVIEW:

Due to Covid-19 limited research was performed. However, the introduction of pigs to our research farm creates an opportunity for exploring foraging by pigs to reclaim overgrazed horse pasture. Specifically, the ability of pigs to up-root weeds and turn up soil may facilitate pasture renewal.

We have also begun to apply GPS technology to study equine grazing behavior. Specifically, as part of student project, we have improved resolution of GPS tracking to 1 meter using a 1 second interval. By correlating GPS data with behavioral observations, we appear to be able to distinguish between resting, grazing and walking. By adding 3 axis (x, y, and z) accelerometer to the halter we may be able to improve our interpretation of GPS data, allowing us to identify sick, lame, and estrous animals. Ultimately this could lead to realtime transmission of data to a users cell phone.

IMPACT STATEMENT

We have established proof of concept for using GPS tracking to monitor equine behavior.

**Overview of Dr. Amy Burk’s Research and Extension Work**

As the state’s Extension Horse Specialist, I serve as the face of the University of Maryland and a leading voice on matters related to horse care and management to the citizens of Maryland. I have developed an applied research program to produce practical management solutions that address specific issues related to equine nutrition and environmental stewardship of horse farms. The first of my two long-term extension programs is focused on training horse farm operators to adopt grazing and farm best management practices to reduce sediment and nutrient run-off into nearby water sources. This program is of particular relevance to Maryland given that the state ranks first in the country for horses per square mile and that 94% of the state is located in the Chesapeake Bay Watershed. To deliver this program, I have partnered with county extension educators, conservation specialists, and agricultural service providers who work directly with horse farm operators. I am skilled at utilizing a variety of approaches to extension education including creating print and online resources, coordinating seminars, giving engaging presentations, and using social media and online video platforms to reach an international audience. While my main outreach and research focus has centered on Maryland, my extension resources, in particular my online extension videos, and my research findings have reached audiences across the U.S., Australia, Mexico, and Canada.

In 2020, Dr. Amanda Grev and I received a 3-year $78k NE SARE Grant titled “Implementing Rotational Grazing Practices on Livestock Operations in Maryland” whereby we visit farms and provide plans and tips on proper grazing and pasture management. In 2020, I coordinated a 7 week online webinar series titled “Zoom-ing in on Healthy Horses Webinar Series” featuring talks by Univ. of MD Extension faculty on soil testing, nutrient management, managing pastures with all talks archived on our UME Horse Extension YouTube channel. In addition, I gave an invited lecture on “Productive Pastures for Happy Horses, Humans, and the Environment to the Managed Grasslands Class in the Department of Plant Agriculture. University of Guelph and a similar lecture titled “Productive Pastures for Happy Horses, Humans, and the Environment” to the Professional Association of Therapeutic Horsemanship International at the Region II Conference.

**Amy Burk Impact Statement**

TITLE: Adoption of Environmentally-Friendly Best Management Practices by Horse Farm Operators

ISSUE: Horse farm operators that use poor pasture and manure management practices may be negatively impacting the environment by polluting ground and surface water with sediment, nutrients, and pesticides. This program aims to increase adoption of environmentally friendly horse pasture best management practices (BMPs) to reduce negative environmental impact. Extension clientele for this program are horse farm operators, extension educators, conservation specialist, and agricultural service providers who work directly with horse farm operators.

WHAT HAS BEEN DONE: This program uses a variety of approaches to meet its goal including conducting an applied research study to identify the current use of BMPs on horse farms, developing a model rotational grazing demonstration site to showcase the BMPs, hosting 27 educational seminars at the site, coordinating 5 in-person seminars and 3 online webinar series, giving 27 invited presentations, producing three horse pasture management videos, answer questions from general public via e-mail, phone, and social media and more formally through Ask the Experts Column and eXtension “Horse Quest” Community of Practice, co-published thirteen print resources through the Maryland Department of Agriculture’s “Horse Outreach Workgroup.”

IMPACT: This program has served 5,349 horse farm operators, conservation specialists, agri-entrepeneurs, and students through technical assistance and outreach. Over 1,500 acres of pastures used for grazing horses have been renovated. Post-event survey results indicate increases in knowledge in the majority participants who attend seminar as well as adoption of at three least out of the eleven best management practices in as many as 75 horse farm operators.

**List of Publications**

1. Davis\*, K., M. Iwaniuk, R. Dennis, P. Harris, and **A. Burk**. 2020. Effects of grazing muzzles on behavior and physiological stress of individually housed miniature horses. Appl. Anim. Beh. Sci. <https://doi.org/10.1016/j.applanim.2020.105067>.
2. Davis\*, K., M. Iwaniuk, R. Dennis, P. Harris, and **A. Burk**. 2020. Effects of grazing muzzles on voluntary exercise and physiological stress of a miniature horse herd. Appl. Anim. Beh. Sci. <https://doi.org/10.1016/j.applanim.2020.105108>.
3. Jaqueth\*, A.L., T.R. Turner, M.E. Iwaniuk, B.J. McIntosh, and **A.O. Burk.** 2020. Relative traffic tolerance of warm-season turfgrasses and suitability for grazing by equine. J. Equine Vet. Sci. <https://doi.org/10.1016/j.jevs.2020.103244>.

Graphical user interface, application, PowerPoint

Description automatically generated

Diagram

Description automatically generated with medium confidence

NE1441 – 2021 NCSU State Report

Research:

An experiment was conducted to compare differences in equine grazing behavior and pasture utilization between continuous grazing (CG) or management intensive grazing (MIG) systems.  Six mature (15 to 18 years of age) horses with maintenance only requirements were randomly assigned to one of two treatments, CG (n = 3) or MIG (n=3), for 5 weeks.  Horses in the CG system grazed a 0.4 ha pasture containing a forage variety crabgrass with an initial herbage mass of 4,668 kg dry matter/ha continuously over the 5 week period.  Horses in the MIG system grazed a similar pasture, but were allocated approximately 1/5 of the 0.4 ha each week.  Horses were weighed weekly on a platform scale.  Each horse was equipped with a GPS data logger that recorded position in the pasture at 1 second intervals for six days.  Horse body weight was not different between the two groups, but decreased (relative to day zero) 32 +/- 6 lbs on day 21 and then remained unchanged (relative to day zero) for the remainder of the study. GPS data will be analyzed to determine differences in daily distance traveled and uniformity of grazing for each group.  The relatively small decrease in body weight over the 35-day-study followed by stabilization of body weight suggests there was adequate available forage to meet daily digestible energy requirements.  At the end of the 35 d there was no forage regrowth available for grazing in the CG pasture.  The only forage remaining in the CG pasture was dead plants that were lodged from trampling.  In contrast, the areas containing the first and second week's allocation in the MIG pasture had regrown to a height (approximately 8 to 10 inches) containing an estimated that could be regrazed1422 kg DM/ha. In conclusion, the MIG system had a greater potential to increase the number of grazing days thereby increasing the efficiency of pasture use. However, both treatment provided adequate energy for mature horses with maintenance only requirements for the 35-d period.

Education:

A course in livestock grazing management was designed and implemented. This course is an overview of scientific principles applied in managing grazing livestock species (e.g., beef cattle, horses, sheep and goats) with an emphasis on promoting animal health, plant health and production efficiency.  Topics include grazing behavior of livestock, nutritional aspects of pasture, effect of grazing on plant and soil health, plant identification, pasture allocation, pasture systems for each livestock specie (beef cattle, horse, sheep and goats), multi-specie grazing systems, watering systems, fencing, and economics of grazing.  The course was conducted as hybrid using asynchronous online lectures and one three-hour lab per week.

Impact:

Research conducted at NCSU indicates management intensive grazing, as compared to continuous grazing, has the potential to improve the efficiency of pasture as a nutritional resource by increasing the number of grazing days. The net result for horse owners/managers is a decrease in the cost of maintaining and producing horses.

The undergraduate livestock grazing management course developed at NCSU will train students to design and implement grazing plans for beef cattle, sheep, goats and **horses** that promote animal-health, plant-health and efficient animal production. These students are potential equine farm owners and/or managers, extension agents, or others that provide technical advice on pasture and grazing management.

Publications:

None

**Gemma Parente and Michael Westendorf**

**Rutgers University**

This survey described here provided a picture of the practices that farmers take once manure has been produced by the horse, but further study can be pursued to examine effects and components of the manure itself. Manure qualities are affected by the contents of the diet, and different levels of nutrients, such as phosphorous in the diet, increase the amount that is excreted (Westendorf, et

al, 2015). Phosphorous specifically is associated with adverse environmental consequences such

as eutrophication. If manure is high in this nutrient, even if it is managed safely, it can still

negatively impact the environment. This current study did not account for the horses’ diets that

may be affecting these concentrations, so it is not known from this survey what kind of risk the

manure itself poses. Further exploration into equine nutrition and waste management by the diet

can provide insight into how this method of minimizing environmental impact can be taken by

farmers.

In order to expand our understanding of equine farming environmental practices, further

studies and/or focus groups could be conducted. Because there are so many horses in New

Jersey, both commercially and privately owned and managed, it would also improve results to

increase the number of participants responding to the survey. This survey was taken primarily by

smaller farmers, with an average of below 20 horses, so expanding to see some of the larger

operations could give a different result of why and how environmental practices are used. It

would also be useful to conduct future surveys more specific to certain parts of environmental

management. For example, the waterbody protection questions did not give very strong results

about why practices were or were not utilized. This could have been due to the causes for error

of the answer options provided. A future survey could ask more detailed questions about what

type of water bodies are on or near the farm and ask about what types of protection are taking

place given these more specific situations. In conclusion, this survey provided important and

beneficial information about the practices that equine farmers are utilizing. This will allow future

education and outreach programming to be the most relevant and applicable to the New Jersey

equine industry, so that the solutions provided can be easily implemented to make this industry

more environmentally sustainable.

Amy Biddle

University of Delaware

NE-1941:  Environmental Impacts of Equine Operations

Overview of Research and Extension Work

  My research related to the *Environmental Impacts of Equine Operations* objectives is in three areas:  parasitology, pasture management, and the Equine Microbiome Project (the response of the equine microbiome to dietary factors, specifically forage).

**Parasite management**

  In the area of parasite reduction, we completed and published our study of the reemergence patterns of cyathostomin species following deworming. In this study we identified specific cyathostomin species that were recalcitrant to anthelmintic treatment. The identification of specific species that are sensitive and resistant to each class of de-wormers, and the mechanisms of their responses is underway. This data will provide new targets for the control of cyathostomins in horses.

  The goal of our second study is to identify genetic factors associated with cyathostomin sensitivity and resistance to de-wormers. We are currently optimizing culture, counting, and separation protocols to collect living and dead larvae following exposure to high/low anthelmintic concentrations. Here we will determine not only which species of cyathostomins are more sensitive to each treatment, but also track the transcriptional response. This work will provide new targets for anthelmintic drug discovery.

  A third study to identify climate factors contributing to the success of cyathostomin species has leveraged the sampling effort of the Equine Microbiome Project to obtain data nationwide from climate zones 4-10. Correlating species prevalence with climate factors such as precipitation, humidity, and temperature will inform deworming strategies and management practices designed to prevent cyathostomins.

  A fourth study is under development with the collaboration of Michelle DeBoer from UWRF. We are developing a grant proposal for fall submission to measure the reduction of L3 larval load in pastures following popular management techniques: grazing rotation by small ruminants, manure spreading/dragging, manure removal and mowing.

  The last study comes from the Equine Microbiome Project, a collection of fecal samples and metadata from horses nationwide. My lab has been using this database to generate and test hypotheses regarding the impact of factors on the equine microbiome. Analysis of 254 horses with no noted metabolic issues revealed that the gut communities of horses with access to grass were more diverse in numbers and types of microbes. The core microbiomes (90% cutoff) of horses with no access to grass was enriched in Proteobacteria, Spirochaetes, and Synergistes, while those with access to grass contained Bacteroidetes, Firmicutes, and Fibrobacter. This data points to deeper questions about the impact of different grass types, seasons, growing rates and other questions.

  I do not have an extension component, but gave two invited presentations focusing on the equine microbiome and diet in which the impact of pasture-based diets on the health of horses was discussed with horse owners from around the country:

2021 Poseidon Equine, Australia

Presentation:  *Horse health and the gut microbiome*

2020 On Course Equine Nutrition Seminar, Zoom Webinar

Presentation: *The Equine Microbiome Project*

Two educational videos were produced to highlight Best Management practices at the University of Delaware’s Webb Farm. The first was filmed in the spring with emphasis on pasture rotation, manure management, and cool/warm season grasses for beef cattle and horses. The second will be filmed in late August to illustrate sustainable weed control measures such as the use of drought tolerant summer annuals (buckwheat, hemp, sunflowers) as highly palatable and pollinator friendly smother crops .

**Impact Statement**

My research has made progress toward the objectives for the *Environmental Impacts of Equine Operations* objectives is in three areas:

1. Parasitology: Identifying cyathostomin species that are resistant to anthelmintics and the genetic mechanisms of resistance will lead to new targets for control.
2. Pasture management: Highlighting the Best Practices underway at the University of Delaware Webb Farm through educational videos will enable students to understand how to better manage pastures for horses in the MidAtlantic region. Testing hypotheses regarding pasture management strategies for cyathostomin control will point to strategies with evidence for effectiveness.
3. Identifying specific drivers for equine gut microbiome structure and function, specifically the impact of grass in the diet provides evidence for the importance of forage for horse welfare and the necessity for maintaining healthy pastures.

**Relevant Publications:  2020-2021**

Johnson, A.C.B, **Biddle, A.S**. 2021. The Use of Molecular Profiling to Track Equine Reinfection Rates of Cyathostomin Species Following Anthelmintic Administration. *animals*. 11(5), 1345.

https://doi.org/10.3390/ ani111051345

Tavenner, M., McDonnell, S., **Biddle, AS**. 2020. Development of the equine hindgut microbiome in semi-feral and domestic conventionally-managed foals. *Animal Microbiome*. 2:43. <https://doi.org/10.1186/s42523-020-00060-6>

Blair, J and **Biddle, AS**. 2020. Stimulating *Duddingtonia flagrans* chlamydospore production through dehydration. *Parasitology Research*. 119:123-128

ROBIN BRUMFIELD PUBLICATIONS:

**Refereed Journal Articles (Published):**

Knuth, Melinda J., Hayk Khachatryan, Charles R. Hall, Marco A. Palma, Alan W. Hodges, Ariana P. Torres, and Robin G. Brumfield. 2021. Trade Flows within the United States Nursery Industry in 2018. *J. Environ. Hort.* 39(2):77–90.

**Abstracts of papers presented at professional meetings (Published):**

Brumfield, Robin G., Surendran Arumugam, Arend-Jan Both, Madeline Flahive Di Nardo, Ramu Govindasamy, Deborah Greenwood, Joseph Heckman, Nicholas Polanin, Ashaki A. Rouff1, Amy Rowe, and Richard VanVranken. 2021. A Successful Educational Program for Women Producers, Beginning Farmers, and Military Veterans That Helped Address Farm Risks during the COVID-19 Pandemic. Paper presented at the 2021 Annual Conference of the American Society for Horticultural Science (ASHS), Hybrid, Denver, CO, August 5-9, 2021.

Dube, Ahmed Kasim, Robin G. Brumfield and Burhan Özkan. 2021. The Effects of the Market Outlet on Welfare of Smallholder Horticultural Producers in Ethiopia. Paper presented at the 2021 Annual Conference of the American Society for Horticultural Science (ASHS), Hybrid, Denver, CO, August 5-9, 2021.

Wei, Xuan, Hayk Khachatryan, Ariana P. Torres, Robin G. Brumfield, Alan Hodges, Marco Palma, and Charles R. Hall. 2021. Exploring Firms’ Marketing Choices in the US Ornamental Horticulture Industry. Paper presented at the 2021 Annual Conference of the American Society for Horticultural Science (ASHS), Hybrid, Denver, CO, August 5-9, 2021.

**Symposium Proceedings Articles (Published):**

Brumfield, R.G.2021. Building Financial Resilience During Tough Times. New Jersey Vegetable Growers’ Meeting. Atlantic City, NJ, February 22-25, 2021, Virtual. Pp. 20-21. <https://nj-vegetable-crops-online-resources.rutgers.edu/wp-content/uploads/2021/02/2021-VGANJ-Proceedings-Book.pdf>.

Brumfield, R.G.2021. Constructing and Interpreting a Balance Sheet. New Jersey Vegetable Growers’ Meeting. Atlantic City, NJ, February 22-25, 2021, Virtual. Pp. 22. <https://nj-vegetable-crops-online-resources.rutgers.edu/wp-content/uploads/2021/02/2021-VGANJ-Proceedings-Book.pdf>.

Brumfield, R.G.2021. Managing Risks Using 3 Key Ratios from Your Balance Sheet. New Jersey Vegetable Growers’ Meeting. Atlantic City, NJ, February 22-23, 2021, Virtual. Pp. 23. <https://nj-vegetable-crops-online-resources.rutgers.edu/wp-content/uploads/2021/02/2021-VGANJ-Proceedings-Book.pdf>.

Brumfield, R.G.2021. Income Statement: Measuring Profitability. New Jersey Vegetable Growers’ Meeting. Atlantic City, NJ, February 22-25, 2021, Virtual. Pp. 23-25. <https://nj-vegetable-crops-online-resources.rutgers.edu/wp-content/uploads/2021/02/2021-VGANJ-Proceedings-Book.pdf>.

Brumfield, R.G.2021. Building Financial Resilience During Tough Times. New Jersey Vegetable Growers’ Meeting. Atlantic City, NJ, February 22-25, 2021, Virtual. Pp. 20-21. <https://nj-vegetable-crops-online-resources.rutgers.edu/wp-content/uploads/2021/02/2021-VGANJ-Proceedings-Book.pdf>.

Govindasamy, R., S. Arumugam, R. Brumfield. 2021. Marketing Tools for Small Businesses. New Jersey Vegetable Growers’ Meeting. Atlantic City, NJ, January 16-18, 2007, Virtual. Pp. 13-16. <https://nj-vegetable-crops-online-resources.rutgers.edu/wp-content/uploads/2021/02/2021-VGANJ-Proceedings-Book.pdf>.

Brumfield, Robin G. and Burhan Özkan. 2020. Empowering Women Farmers and Their Families. Proceedings of Conference on Women Empowerment in the World, Pp. 375-389. Virtual, December 26-27, 2020. ISBN 978-93-5437-392-3.

Brumfield, Robin G., Deborah Greenwood, Madeline Flahive DiNardo, Arend-Jan Both, Joseph R, Heckman, Ramu Govindasamy, Nicholas Polanin, Ashaki A. Rouff, Amy Rowe, Richard VanVranken, and Surendran Arumugam. 2020. Farming in New Jersey’s Cities and the Urban Fringe: A successful educational program for women producers, beginning farmers, and military veterans. 2020. Proceedings of Conference on Women Empowerment in the World, Pp. 355-363. Virtual, December 26-27,2020. ISBN 978-93-

**Refereed Journal Articles (Pending):**

Brumfield, R.G., D. Greenwood, M. Flahive DiNardo, A.J. Both, J.R. Heckman, R. Govindasamy, N. Polanin, A.A. Rouff, A. Rowe, R. VanVranken, and S. Arumugam. 202x. A non-parametric approach to evaluate a risk management-training program designed to empower women farmers in New Jersey. Submitted for publication to Vimarsh Journal.

Gottlieb, Paul D., Robin G. Brumfield, Raul I. Cabrera, Daniel Farnsworth, and Lucas Marxen. 202x. An Online Tool for Estimating Return-on-Investment for Water Recycling at Nurseries. (Submitted for publication to HortTechnology).

Greenwood, D., R.G. Brumfield, M. Flahive DiNardo, A.J. Both, J.R. Heckman, N. Polanin, A. Rouff, A. Rowe, and R. VanVranken. 202x. Annie’s Project: Farming in New Jersey’s Cities and the Urban Fringe. Submitted for review to the Journal of Extension.

Wei, Xuan, Hayk Khachatryan, Ariana P. Torres, Robin G. Brumfield, Alan Hodges, Marco Palma, and Charles R. Hall. 202x. *Exploring Firms’ Marketing Choices in the US Ornamental Horticulture Industry* (Submitted for publication to Journal of Agricultural and Applied Economics).

**NE1941 Environmental Impacts of Equine Operations**

**State Report Summary**

**University of Florida**

Peer Reviewed Publications:

Vasco, A.C., J.C.B Dubeux, M.O. Wallau, C.L. Wickens, L.K. Warren. 2020. Characterization of forage utilization and pasture management practices on Florida horse operations. J. Equine Vet. Sci. 95:103253. <https://doi.org/10.1016/j.jevs.2020.103253>

Abstracts:

Vasco, A.C., A.S. Morrison, K.J. Brinkley-Bissinger, J.M. Bobel, J.C.B Dubeux, L.K. Warren, C.L. Wickens. 2021. Intake, digestibility, and nitrogen balance in horses fed rhizoma peanut hay. J. Equine Vet. Sci. 100:103513. <https://doi.org/10.1016/j.jevs.2021.103513>

Submitted to Journal of Animal Science, recommended for publication following minor revisions (Editor decision received August 9, 2021).

Multi-media presentations:

Hiney, K., C. Wickens. 2021. Manure and Ivermectin. Extension Horses Tack Box Talk. Recorded May 7. Available at: [‎Tack Box Talk: Manure and Ivermectin: The Story of answering listener questions! on Apple Podcasts](https://podcasts.apple.com/us/podcast/manure-and-ivermectin-the-story-of/id1492355719?i=1000520771357). Listeners: 205.

Hiney, K., C. Wickens, J. Schmidt. 2021. Manure Mountains: The story of turning horse apples into black gold. Extension Horses Tack Box Talk. Recorded April 27. Available at: [‎Tack Box Talk: Manure Mountains: The Story of turning horse apples into black gold on Apple Podcasts](https://podcasts.apple.com/us/podcast/manure-mountains-the-story-of-turning-horse-apples/id1492355719?i=1000518762424). Listeners: 147.

Composting: An effective manure management strategy. Video. 2020. Created and delivered as part of the virtual UF/IFAS Equine Institute and Allied Trade Show. [Compost - YouTube](https://www.youtube.com/watch?v=y3PnBA6OpQM&list=PLeMRfitORl-ffMHBFxmy0G06-nC3guATH&index=4). Live attendees: 75, YouTube views: 27.

Honors/Awards:

Bainum, C.L., M. Brew, C. Wickens. 2021. Equine Best Management Practices Program. National Association of County Agricultural Agents, National Finalist and Winner of the Southern Region Search for Excellence in Environmental Quality, Forestry, and Natural Resources Award. [Caitlin L. Bainum - Search for Excellence in Environmental Quality, Forestry and Natural Resources (nacaa.com)](https://www.nacaa.com/awards/apps/display_award.php?id=15113-20222)

Grants:

Bainum, C.L., C.L. Wickens. Equine manure management through composting: A look at compost system design and management. Florida Department of Agriculture and Consumer Services, Office of Agricultural Water Policy, Mini-grant Program. Funding period: 2020-2021. Amount: $3,643. Project provided materials to assemble a three-bin compost management system on a cooperator equine site in Marion County, FL (Hillcrest School), display educational signage, and conduct a composting