March
2023
Quarterly

Agricultural Research Service
Small Farm Research Agri-news

Dale Bumpers Small Farms
Research Center
Booneville, Arkansas

Greetings from the Research Leader, Dr. Phillip Owens

Dr. Phillip Owens

I am looking forward to returning to the Dale Bumpers Small Farms Research Center on April 1. I am completing the second tour in the USDA ARS Southeast Area Office as the Acting Associate Area Director. I am really excited about getting back to the Center to continue our mission to utilize research to find economic solutions for small holder farmers. The U.S. is currently faced with issues related to national food security and rural economic prosperity that are inherently tied to the success of farms making up 89% of the U.S. Agricultural sector—small farms. The viability of small farms and rural economic prosperity in the U.S., similar to other commercial sectors, depends on the adaptability of technological advances that reduce costs while maintaining productivity. To-date, much research carried out for large production farms is applicable to small, low-capital farms, in theory. However, many of these technologies and practices for large-scale farms have not been translated into tools, guidelines, or systems that small farmers can adopt without significant risk. This persistent risk and lack of adopted technologies remains a significant challenge for small farms success and proliferation. Work carried out by the Dale Bumpers Small Farms Research Center has and will continue to take on this challenge and help increase profitability and sustainability of small farms. However, an expanded and continuing effort is needed to meet the increasing number and novelty of production challenges with translatable agricultural research that helps turn research and theory into user-friendly, practical tools and practices for farmers and producers.

In This Issue:

Dr. Joan Burke's Small Ruminant Research Spotlight

Dr. Joan Burke

The annual winter lambing season will be over by the time you read this at the Dale Bumpers Small Farms Research Center. Winter lambing occurs in January/February and is made up of mostly maiden yearling ewes. Winter weather has made for a challenging season recently, but ewes and lambs are thriving with plenty of shelter and care during times of poor weather conditions. During each lambing season (Fall and Winter), the dams participate in research aimed to develop genetic tools to aid U.S. sheep producers in the selection of healthier flocks. Current evaluations are on longevity and climate resilience traits that can be difficult to measure.

The National Sheep Improvement Program (NSIP) calculates genomic-enhanced estimated breeding values (EBV) for economically relevant traits in multiple breeds. Currently, NSIP EBV are limited to traits that can be recorded on farm/ranch (e.g., ewe prolificacy, lamb pre- and post-weaning growth, etc.) or relatively inexpensively through labs/ personnel with specialized equipment (e.g., fecal egg count, ultrasonic loin muscle and backfat depth, etc.). However, many other traits affect productivity but have not yet been evaluated to the extent necessary for inclusion in NSIP or to identify genomic regions associated with their variation.

The ARS DBSFRC Katahdin flock is enrolled in NSIP and has strong genetic connectedness to industry flocks. Furthermore, the recent wide-scale genotyping efforts of NSIP Katahdin flocks, thanks to the USDA NIFA OREI (awarded to DBSFRC) and current USDA AFRI (awarded to Dr. Ron Lewis at University of Nebraska-Lincoln and referred to as the GEMS project) grants, positioned the breed to be the first in the U.S. with genomic-enhanced EBV. Therefore, we are well suited to evaluate new trait complexes and further the development of genetic tools for stakeholders to use in the selection of more profitable and healthy sheep. This is part of the GEMS project that is described in the August 2022 issue of the American Sheep Industry's Sheep Industry News (Sheep Industry News August 2022 (digitaledition.pub)) found on their website (www.sheepusa.org). The DBSFRC flock is one of the three ARS Genetic Reference flocks also described in the issue. The other two reference flocks are at MARC (the Meat Animal Research Center, USDA, ARS, Clay Center, NE) and USSES (United States Sheep Experiment Station, USDA, ARS, Dubois, ID). (continued on page 3)

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Approximately half (56%) of U.S. ewes are culled each year because of age, meaning half are culled prematurely (USDA APHIS, 2014). The most common reasons for premature culling of ewes are: failure to lamb (7.7%), teeth problems (7.6%), hard bag syndrome (7.1%), and mastitis (6.7%). Other factors affecting ewe health and longevity are regionally dependent and thus not readily captured through national surveys. Two common diseases affecting ewes reared in more humid, higher precipitation regions of the U.S. are internal parasites and foot rot. The proposed experiment will sample ewes for indicators of internal parasite infection, udder, foot, and immune system health, and mouth and udder conformation. These conditions/diseases have large implications for the productivity and welfare of sheep flocks across the country. Most health traits are lowly to moderately heritable: clinical mastitis (0.04; O'Brien et al., 2017), somatic cell count (0.03 – 0.22; Oget et al., 2019; an indicator of mastitis), fecal egg count (0.27; Safari et al., 2005; an indicator of parasitic worm infection), and footrot (0.15 – 0.25; Raadsma and Dhungyel, 2013). Few joint evaluations of multiple common ewe diseases exist, and it is possible that selection for improved resistance/resilience to one pathogen could have corresponding (positive or negative) effects on others (Bishop, 2015). There is a need for such large-scale evaluations to develop genetic tools to aid U.S. sheep producers in the selection of healthier flocks, and this is the major goal of the proposed experiment.

In December, 174 fall lambs were weaned from dams. These lambs are included in long term research to integrate the following parasite control systems: Maintenance of parasite resistant genetics, selection for parasite resistance, grazing/forages, season of breeding, and interventions (deworming, nematode-trapping fungus or Duddingtonia flagrans, supplemental feeds). This research is critical for the small ruminant industry as chemical dewormer is not permitted for certified organic production and anthelmintic (chemical dewormer) resistance is highly prevalent in small ruminants and a growing concern in cattle (Gasbarre et al., 2009a, b, 2014; Sutherland and Leathwick, 2011), control of GIN remains a high priority for U.S. livestock production.

Genetic evaluations through collection of phenotypes (body weight, fecal egg count, number of young born/raised) can occur in any breed of sheep and in goats. In fact, it is highly recommended to participate in NSIP as costs can be recuperated by having more productive animals. More information can be found at www.nsip.org.

Small Ruminant Field Day Coming Up Soon

Upcoming activities. The Dale Bumpers Small Farms Research Center will be conducting a small ruminant field day. It will be co-hosted by Dan Quadros, Small Ruminant Specialist, UA System Division of Ag, Cooperative Extension Service. It will be held at the Center on April 29th, more information will be posted on our website later this month (DBSFRC Website: Click Here).

Dr. Christine Nieman Cattle Research Spotlight

Tall Fescue Toxicosis (using sheep research to further cattle research)

Dr. Christine Nieman

Production losses from tall fescue toxicosis are estimated to cost the cattle industry $2 billion annually (Kallenbach, 2015). These costs are associated with decreased calving rates and reduced weight gain in growing calves. Since the realization of production losses after the release of KY 31, scientists and producers have searched for the solution to the tall fescue toxicosis problem. Several management strategies have been suggested over the years such as diluting infected tall fescue pasture by interseeding legumes and renovation of toxic tall fescue pastures with novel endophyte tall fescue. However, persistence issues with both novel endophyte tall fescue and legumes have prevented long term success with these strategies. Therefore, there is continued interest in novel methods for prevention or mitigation of tall fescue toxicosis.

Condensed tannins have been suggested as a solution to tall fescue toxicosis. Condensed tannins are polyphenolic compounds synthesized by legumes such as sainfoin and sericea lespedeza. Condensed tannins have a known ability to bind with dietary proteins, which delay or prevent their digestion. Condensed tannins have also been reported to bind to the nitrogenous components of compounds produced by the endophyte on infected tall fescue, preventing symptoms of fescue toxicosis (Villalba et al., 2016). Therefore, we conducted a study to determine if condensed tannin supplementation could be used to mitigate tall fescue toxicosis in ewes.

The feeding study involved twenty non-pregnant, non-lactating 2-year-old ewes (Figure 1) that were randomly assigned to one of 4 diets. Diets consisted of 1) non-toxic, novel-endophyte tall fescue silage with no tannins, or 2) toxic, endophyte-infected tall fescue silage offered with no tannins or tannins at 1%, or 3% of the diet on a dry matter basis. Silage was used as the forage source as opposed to hay, because ensiling preserves the endophyte, whereas endophyte is not found (or is found in low concentrations) in tall fescue hay. Quebracho condensed tannin was used as the condensed tannin supplement. Quebracho tannin is sourced from the quebracho tree grown in South America, the tannins are a commercial product used for tanning leather (continued on page 5).

Figure 1. A dorper ewe in the feeding trial.

(continued from page 4)

The diets with endophyte infected fescue resulted in reduced blood prolactin (Figure 2). Reduced blood prolactin is a known symptom of tall fescue toxicosis and is therefore an indicator of the induction of toxicosis. Blood samples were taken after ewes were on the experimental diets for 21 days, and therefore, Figure 2 also shows that condensed tannin supplementation did not prevent tall fescue toxicosis. Prevention and mitigation of tall fescue toxicosis continues to allude us. Although the results of the study were negative, at least condensed tannins were evaluated and can be removed as a potential solution. Our evaluations of potential solutions to tall fescue toxicosis will continue. The next additive we are testing is red clover extract. Biologically active compounds in red clover have shown potential to mitigate tall fescue toxicosis by causing vasodilation, a reversal of the vasoconstriction caused by the compounds produced by the endophyte.

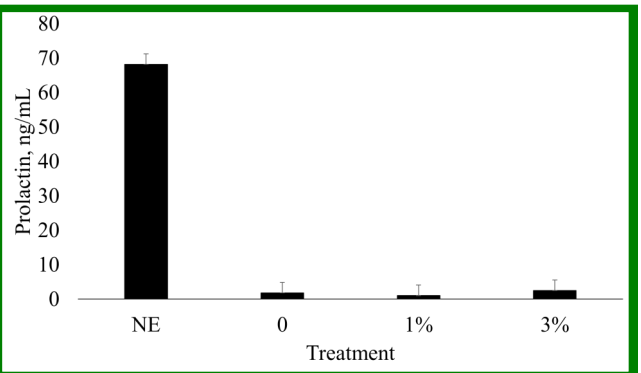


Figure 2. Serum prolactin concentrations in sheep offered non-toxic, novel-endophyte infected tall fescue silage with no tannins (NE), or toxic, endophyte-infected tall fescue silage offered with no condensed tannins (0), or condensed tannins at 1%, or 3% of dry matter DM. Means with different subscripts differ at $P < 0.05$. Standard error of the mean = 3.05 ng/mL and there were 10 observations/treatment.

Sources cited:

Kallenbach, R.L., 2015. Bill E. Kunkle Interdisciplinary Beef Symposium: Coping with tall fescue toxicosis: Solutions and realities. Journal of Animal Science, 93(12), pp.5487-5495.

Villalba, J.J., Spackman, C., Goff, B.M., Klotz, J.L., Griggs, T. and MacAdam, J.W., 2016. Interaction between a tannin-containing legume and endophyte-infected tall fescue seed on lambs' feeding behavior and physiology. Journal of animal science, 94(2), pp.845-857.

Cattle Update

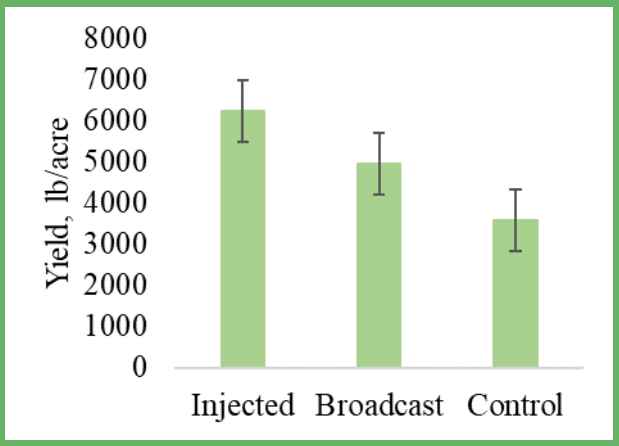
The cattle crew at Dale Bumpers Small Farms Research Center has endured an interesting winter! Drastic weather changes mean paying special attention to cattle health and forage needs. Hay and feed are put out to the herd regularly and the crew diligently watches the conditions of the cattle and weather to determine the forage needed for the following days. The crew is also prepared for the upcoming weeks which begins roughly a 75-day calving season! This season is one of the most tedious as well as rewarding times for the cattle herd and crew! The crew is also gearing up for the upcoming bull testing and spring vaccinations. All in all, an eventful time for the DBSFRC cattle crew!

American Forage and Grasslands Conference and Poster

Kolten Wright, Biological Technician, recently attend the American Forage and Grasslands Conference in Winston-Salem, NC. At the conference, Kolten listened to presentations from many experts in various fields of study on their research and impacts on agriculture in the southeastern US. A few of the topics covered were digital soil mapping, cover crops, native grasses, and data collection techniques.

Kolten presented a poster on a research project completed at the Center in 2021 and 2022. The project was a collaboration with Dr. Mike Popp and group at the College of Agriculture and Life Sciences at the University of Arkansas. The two-year study focused on yield of three different species and species mixtures, sorghum-sudangrass only, sorghum-sudangrass mixed with cowpea, and cowpea alone, and three different fertilizer treatments including no poultry litter application, broadcasted poultry litter, and subsurface applied poultry litter. Subsurface applied litter was injected using the “subsurfer” developed at the Center. The subsurfer injects poultry litter under the soil surface in bands of 15-inch spacings. The benefit of the subsurfer is reduced losses of nitrogen to volatilization, generally resulting in greater yields and nutritive value in forages.

For this experiment, annual forage species were planted in the spring of 2021 and 2022. Poultry litter was applied via broadcast or subsurface at 3 tons per acre. When using the subsurfer with annuals, the annual forages are sown between the poultry litter bands to prevent nitrogen burn. Two harvests were taken each year, in August and September in 2021 and July and September 2022. The data was analyzed over two years for the effects of poultry litter treatment and forage species. Our results showed that subsurface applied poultry litter did not improve yield compared to application by broadcasting, but both fertilized treatments were greater than the control (Figure 2A). (continued on page 7)



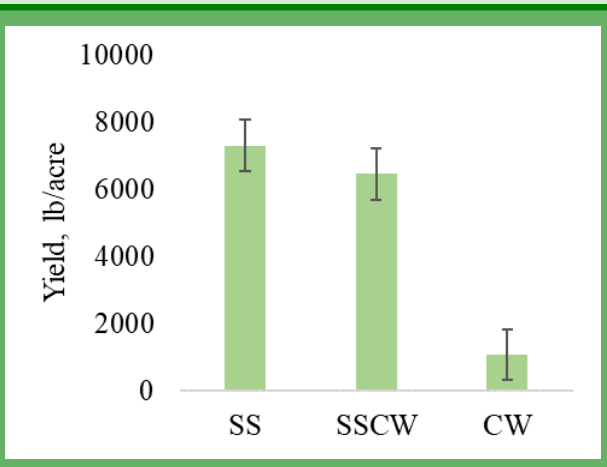


Figure 1A. Main effect of poultry litter on forage yield across two years $P = 0.001$ SEM=748. Figure 1B. Main effect of forage species on yield across two years $P < 0.0001$ SEM=757. SS = sorghum-sudangrass; SSCW = sorghum-sudangrass-cowpea mixture; CW = cowpea, SEM = standard error of the mean. Means without similar letters differ $P < 0.05$.

(continued from page 6) For species, intercropping sorghum-sudangrass with cowpea did not improve yield compared to sorghum-sudangrass alone, and cowpea alone was the lowest yielding (Figure 2B).

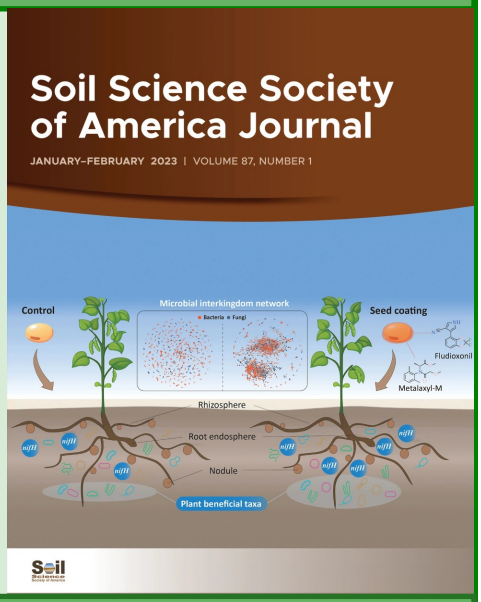
Plant responses to injected poultry litter versus broadcasted litter generally results in greater yields for treatments with injected litter. Other research at the Center has recorded increases of up to 30% in forage yield in rye-ryegrass hay plots fertilized with injected compared to broadcast poultry litter. The increase in yield is the result of greater nitrogen uptake in injected treatments compared to broadcast treatments in which nitrogen is lost to volatilization. Weather may have played an important role, with very wet fields in spring of 2021 and summer and fall droughts in both years. Further analysis including year in the statistical model will help us understand these relationships.

Intercropping sorghum-sudangrass with cowpea did not provide yield. Cowpeas did germinate and appeared compete in mixtures early on (Figure 2A taken on 22 June). However, as sorghum-sudangrass grew in height, cowpea plants could not compete. Cowpea was productive in monoculture (Figure 2B taken on 12 July) but was not as productive as monoculture sorghum-sudangrass or mixtures. The lower seeding rate of cowpea in mixture may have contributed to low contribution in mixtures, 20 lb per acre in mixtures versus 50 lb per acre in monocultures. However, based on this research, if producers want to utilize both sorghum-sudangrass and cowpea together, planting them separately (in separate drill passes) will allow for greater proportion of cowpea yield. Planting pastures with alternating passes of cowpea and sorghum-sudangrass was tested under grazing in 2021 and 2022 in another experiment (Figure 2C).

Figure 2A. Sorghum-sudangrass intercropped with cowpea on 22 June. **Figure 2B.** Sorghum-sudangrass intercropped with cowpea (left) and cowpea only (right) on 12 July. **Figure 2C.** Image from a grazing study with alternative planting of cowpea and sorghum-sudangrass.

Congratulations! Dr. Zamir Libohova

Dr. Zamir Libohova have been selected as a 2022 Soil Science Society of America Journal Outstanding Reviewer for his excellent service as a reviewer. The quality of a journal's published articles is largely a consequence of comprehensive, thorough, and fair-minded reviews. These reviews provide justification for the release of manuscripts that are scientifically inadequate or provide constructive criticisms to the author to raise the caliber of the manuscript to SSSAJ standards. An article will appear in CSA News and SSSAJ in acknowledgment of his contribution.



ARS New Hires

Joe O'Bar

Joe O'Bar was hired as a Biological Science Technician in late November. He grew up on a small dairy farm in Booneville, Arkansas and was involved in 4-H and sports. He went on to play college football at Arkansas State and graduated with a bachelor degree in Agriculture Business. After collage, he worked for almost 2 years at Dale Bumpers Small Farms Research Center on a term limit appointment.

Joe also worked for a few of the businesses in town and has been running his family farm since college. His family operates 4 pasture range chicken houses and 65 cow-calf cattle operation. He and his wife have 4 kids and 2 grandchildren. Joe is the president of the South Logan County Fair board and the whole family is greatly involved in the county fair. Joe is active in the Catholic community, and involved with several local school youth groups.

Natalie Kline

Natalie Kline started as biological science laboratory technician at Dale Bumpers Small Farm Research Center in early January 2023. She was born and raised in Salt Lake City, Utah. She received her bachelor's degree in biology-natural sciences from Utah Tech University in 2021, along with certificates in marketing and entrepreneurship. For seven years she assisted on research focusing on the effects of human influence on wildlife distributions and behavior by leveraging remote sensing, advanced analytics, and citizen science at the University of Utah. In spring of 2022 she began working for the forest service as the timber crew lead in Wyoming before switching to ARS. Natalie's future work will focus on forage and soil analysis in Dr. Nieman's and Dr. Libohova's labs. Welcome to DBSFRC, Natalie!

Retirement of Darwin “GoGo” Jones

Darwin “GoGo” Jones has worked for USDA since 1988. GoGo retired on December 31, 2022. He worked 17 years with livestock crew where he helped with the day to day care of the sheep and cattle. He was part of the livestock crew back then they rode horses and roped cattle. Over the years he got to milk beef cows, pull calves, work on reproduction issues and maintain a healthy herd of cattle and sheep.

Since 2005, he has worked as a Welder Worker doing various jobs for the Facility Manager and Agronomist, Larry Huddleston. On the farm crew GoGo conducted jobs using tractors and heavy equipment. He also performed repairs on equipment and always helped where he could and kept facilities running well. We will miss him cooking for our events at the center. Over the years he has oversaw cooking many of our meals for meetings and events. His retirement party in January included his last annual fish fry lunch for us (unless we can bribe him back).

GoGo will not be lazy in his retirement because he has his own farm life; in which, he calls ranching a passion more than a business. He enjoys the old way of ranch life. GoGo says, “horses still have a place on the ranch.” On the ranch he still rides horses, pulls wagons, works cattle and remains a steward of the land. He loves to hunt and fish, fireside cook meals, bowling and playing pool. He has lived in the Booneville area all of his life.

Join us in wishing GoGo a happy retirement.

To view archived newsletters or to find more publications, please visit our website at :

https://www.ars.usda.gov/southeast-area/booneville-ar/dale-bumpers-small-farms-research-center/

USDA, Natural Resources Conservation Service

Booneville, Arkansas Plant Materials Center

Booneville Plant Materials Center's Cover Crop Research Study Spotlight

Dr. Rajesh Chintala

Booneville Plant Materials Center Germplasm Adaptability Study

The Booneville Plant Materials Center (PMC) is participating in a long-term multi-PMC field trail to evaluate the adaptation of new plant releases for the purpose of conservation and wildlife habitat restoration. In this long-term observational field study, thirty native germplasms of switchgrass, big bluestem, little bluestem, gamagrass, sunflower, indiangrass, gayfeather, mimosa, and wildrye are being evaluated for their establishment and adaptability to the Ozark's agro-climatic region. Plant performance data is collected twice a year (late spring and summer) from 2022-2026. Qualitative and quantitative performance data on plant survival, vigor, cold & drought tolerance, plant height, insect and disease incidence, was recorded in late summer of 2022. The final conclusive findings of this observational study will be determined by collecting and analyzing four more years of plant performance data of these thirty native germplasms.

A

B

Photo:

a) Observational plantings of transplanted germplasms for conservation purposes

b) b). Plant performance data was collected in late summer 2022

Conference:

PMC staff attended the "25th Annual Arkansas Soil & Water Education Conference and Irrigation EXPO" which was held on January 25, 2023 in Jonesboro, AR. The conference highlighted the significance of water stewardship in agriculture and emphasized the need for the adoption of climate-smart agricultural practices at farm-level to enhance the economic performance of food production for farmers and conserve surface and sub-surface water resources of the Mississippi delta region in a changing climate.

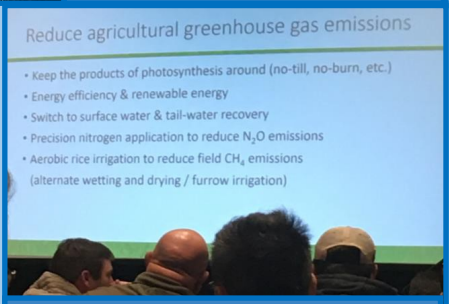


Photo: Annual Arkansas Soil & Water Education Conference and Irrigation EXPO

The Plant Materials Center has published their Annual Progress Report of Activities. To read the full report please visit their website below.

PMC Information is available online at: http://www.plant-materials.nrcs.usda.gov/arpmc/

Organic Production Meeting

Have you ever considered organic production or want to know more about the opportunities? An informational meeting will be held to discuss local research, agronomics, and economics for organic production.

Yell County Extension office

1002 E 8th Street

Danville, Arkansas

March 28, 2023

9 AM until noon. Lunch is provided.

Please contact the extension office by March 21st if you plan on attending.

2023 Arkansas Small Ruminant Field Day & Expo

Learn how to produce healthy sheep and goats and market them.

- Join in hands-on demonstrations and discussions that affect economic, social, and environmental sustainability of sheep and goat industries in Arkansas.
- Exhibitors will show new equipment, products and services that are in the market.

AGENDA (subjected to change)

8:00 Sign in and badge/materials pick up

8:45 Welcome – Dr. Owens and Dr. Burke (USDA), Dan Quadros (UADA).

9:00 Technologies for sheep & goat production: research update and innovative practices (small group demonstrations and presentations)

10:30 Break

11:00 Technologies for sheep & goat production: research update and innovative practices (small group demonstrations and presentations)

12:30 Lunch with selected lamb/kid meat cuts (for online pre-registers only)

1:30 Technologies for sheep & goat production: research update and innovative practices (small group demonstrations and presentations)

3:00 Break (snacks)

3:30 Round table

4:00 Closing remarks

4:10 One-on-one with the experts

5:00 Adjourn