Purdue University and USWDP continue to make progress toward establishing the Department of Food Technology in the Herat University Faculty of Agriculture (HUFA). Dr. Kevin T. McNamara (Purdue), Dean Yousef Jami (HUFA), HUFA Food Technology Steering Committee, and Purdue faculty have been working closely to design the department at HUFA. The Food Technology Bridge Program was initiated in the summer of 2015 with 15 HUFA students as a means of introducing Food Technology to HUFA. The Bridge Program (similar to a minor in the US higher education system) is a two-year program for HUFA undergraduate students in their third or fourth years. In August of 2015, students participated in a two-week, intensive introduction to food technology developed and taught by Dr. Ghoryar (HUFA), Dr. Shakhes (HUFA), Mr. Ghanizadeh (HUFA), Dr. Ebner (Purdue), Dr. Deering (Purdue), and Dr. Oliver (Purdue). Students spent 60 hours divided between lecture and practical laboratory skills training. In the summer of 2016, this same group of students will participate in a second two-week, intensive program with different topics, focus, and depth. In the interim, Purdue and HUFA faculty members are maintaining engagement with students in the bridge program by conducting a series of Applied Food Technology Skills Workshops. Each of these workshops uses a hands-on approach where students:

1) Learn the laboratory techniques and protocols that are widely used in food quality analysis;
2) Use these same techniques to address current issues in food production and processing Afghanistan; and
3) Develop educational and outreach materials for consumers, food processors, and other food business owners based on their results and knowledge gained.

Importantly, while each workshop focuses on different commodities, the techniques and principles are readily applied across all food products. The technical skills the students learn are also a direct reflection of the skills needed immediately in the Afghanistan food economy, which ensures that students will have much greater opportunities to find meaningful employment upon completion of the program.
Afghanistan depends on imported milk and milk products to meet its domestic dairy needs (e.g., powder milk and shelf-stable fluid milk). Small milk shops are an important link in supplying these products to customers in the local economy. These shops collect and sell fluid milk and produce other dairy products such as yogurt, cheese, and buttermilk. In the past three years there has been significant growth in new, small milk shops throughout Herat City. At the same time, Herat Province is home to a very large dairy factory as well as a milk cooperative. The products of these organizations are sold throughout Herat Province and Afghanistan.

**Workshop Objectives**

In both formal and informal needs assessments, large and small milk sellers consistently report that the Herat economy needs individuals skilled in assessing and troubleshooting milk and dairy product quality and safety challenges. To address these needs, Dr. Ebner (Purdue University) and Dr. Ghoryar (Herat University) conducted the Milk Quality and Safety Applied Food Technology Skills Workshop with students in the Food Technology Bridge Program. The workshop directly built upon prior Bridge Program training, which provided students with a strong foundation in the science behind milk quality and dairy production. The current workshop sought to teach the students how to properly:

1. Collect milk samples;
2. Catalog milk samples; and
3. Inspect and analyze milks samples for quality and safety.

The program afforded students not only the ability to measure milk quality, but the capacity to interpret results and troubleshoot different milk processing challenges.
Workshop Activities
Students were divided into groups of 2-3 and sent to local milk shops and bazars daily to collect milk samples. The students conducted physical inspections of milk samples and cataloged each sample based on location and type of business where purchased, price of the milk, and the original source of the milk. Students analyzed each of the 100 milk samples for quality according to standards and protocols used not only in Afghanistan, but throughout the dairy world.

The laboratory analysis started with students measuring overall bacterial and fecal coliform concentrations. Students were exposed to these techniques during the inaugural Bridge Training in August 2015, but in this hands-on laboratory setting, students were able to contextualize their skills and directly apply them to food processing.

Following microbial measurements, students tested milk for a series of common adulterants: starch, calcium carbonate, and antibiotic residues. Students were able to see and quantify how these factors impact overall quality and sustainability of different dairy-based businesses. Finally, students characterized the full composition of milk samples in terms of percentages of fat, protein, lactose, and salt. Students had previously learned how each of the factors impacts the processing capacity of milk and, once again, they were able to contextualize their skills and directly apply them to food processing.

Workshop Outcomes
During this workshop, students learned the skills needed to:

1. Inspect and catalog milk samples;
2. Measure overall bacterial and coliform concentrations;
3. Test milk for additives such as starch, calcium, carbonate, and antibiotic residues;
4. Interpret test results; and
5. Characterize the composition of milk samples (percentages of fat, protein, lactose, and salt)

Next Steps
Milk processors had a great deal of interest in the project. Students will use the data to prepare milk quality factsheets and educational programs for different audiences including home-kitchens, small milk shop owners, and milk testing laboratories. This is part of a larger Extension/outreach program focused on strategies that milk processors can use to improve quality, consistency, and profitability of their products (e.g.,

Dr. Ghoryar instructs students on the use of milk composition analysis equipment.

Student prepares milk for composition analysis.
sanitation and hygiene protocols, animal health practices, procurement strategies, etc.). Students will be directly involved in the outreach program, which will build on the relationships between HUFA and industry stakeholders, while allowing students to show potential employers the workplace skills that they have gained. Overall, the workshop produced high quality data, and Dr. Ebner and Dr. Ghoryar will work with the students to further analyze the data and prepare a manuscript for publication in a relevant scientific/research journal.

References
