

**“Fostering collaborative research between Wyoming and Ukraine on sustainable intensification of dryland winter wheat production in face of increasing climate variability”**

**Urszula Norton, PhD** – PI, Associate Professor of Agroecology and Biogeochemistry, Plant Sciences Department, College of Agriculture and Natural Resources, University of Wyoming

**Mykola Miroshnychenko, PhD** – Collaborator in Ukraine, Head of Soil Science and Agrochemistry Research Program and Deputy Director of Agrarian Sciences at the National Academy of Agrarian Sciences of Ukraine in Kharkiv

***Project Duration: 12 months***

Funds were used by Urszula Norton to host Dr. Mykola Miroshnychenko at the University of Wyoming and to visit Dr. Mykola Miroshnychenko at the National Academy of Agrarian Sciences of Ukraine in Kharkiv. The main purpose of this international exchange was to learn about winter wheat production in semi-arid regions of Ukraine and share experiences on sustainable intensification strategies to maintain winter wheat productivity both, in eastern Wyoming and Ukraine. These two locations have been currently experiencing increased frequency and intensity of droughts.

According to Professor Alexander Ivaschenko, the academic scholar of the National Academy of the Agrarian Sciences of Ukraine, during last two decades, the boundary of warmer and drier climatic zone has moved by 100-150 km to the north of Ukraine. This can result in annual losses of 24-40 million tons of winter wheat grain if farmers do not adopt appropriate management strategies that deal with drought (Miroshnychenko, personal communication, 2018).

The future of winter wheat production has to rely on sustainable intensification of the current agronomic practices. These practices gear toward better crop water-use efficiency and drought tolerance such as improvement in soil quality that have shown to increase water use efficiency by 10-25%. Such important change can have significant impact on crop yields under semi-arid conditions such as in Wyoming and eastern Ukraine.

Dr. Miroshnychenko's visit took place in June 2018. The visit focused on touring the research sites, visits with farmers-collaborators, presenting a seminar on winter wheat production in Ukraine, participating in the SAREC Forage Field Days and Winter Wheat Variety Field Days in Akron, CO. Meetings with CoANR leadership allowed to gain a better understanding for potential future collaborative research and expertise exchange.

Following Dr. Miroshnychenko's visit, Dr. Myoshnychenko and U. Norton exchanged a number emails with ideas for the project to be deployed in Ukraine. Specifically, we discussed the effectiveness of selected agricultural practices that utilize cover crops, organic soil amendments and reduced tillage on winter wheat performance and soil parameters. An inclusion of a series of cover crops in winter wheat rotations was one of the explored options by Dr. Miroshnychenko in WY, so the experiments were designed and later deployed in the field in the fall 2018.

During the summer of 2019, PI Norton travelled to Ukraine in July to visit the on-going research experiment, meet researchers and producers, and travel to three research stations. This was a unique opportunity to learn firsthand about the assessment tools

developed to evaluate agroecosystem productivity and practices used in Ukraine that can be applied in research and in instruction at the University of Wyoming. U. Norton also gave a talk on dryland winter wheat farming in Wyoming titled "Management of Soil-Plant Interactions under Climate Change". Audience included scientists and administrators from the National Academy of Agrarian Sciences.

The main concern for the local winter wheat producers in Ukraine was declining yields caused by the recent droughts. The use of reduced tillage or no-till was not a very popular practice as it was caused by the lack of sufficient funds for chemical weed control, soil crusting and poor crop establishment. However, a number of farmers was particularly interested in using cover crops for a short period of time during the period between the two cash crops. This practice would provide numerous benefits such as more plant residue, atmospheric N fixation (legumes in cover crop mixtures), smothering of the competitive weeds and reduced number of tillage operations, hence indirect use of reduced-tillage practices. The experiment established to assess these practices will continue for a number of years and we plan to write a research paper after its completion. We already started discussions on writing a white paper that would compare the two winter wheat production regions between Kharkiv Oblast, Ukraine and Wyoming, USA.

We also intended to jointly submit a collaborative proposal to Civilian Research and Development Foundation (CRDF) for the Independent States of the Former Soviet Union we started drafting a year earlier. This Foundation supports research collaboration between US scientists and researchers from independent states which were a part of the former Soviet Union. The anticipated deadline for the CRDF Global solicitation was July 31<sup>st</sup>, 2019 but the RFP was not announced.

This international exchange is already greatly benefitting Agronomy, Soil Science and Agroecology programs in the College of Agriculture and Natural Resources as well as numerous other programs campus-wide by initiating technology transfer and building connections between the University of Wyoming and Ukraine. I am in touch with two junior female scientists from Ukraine and am actively searching for funds to support their short term research stay in my lab.

Funds provided to U. Norton have increased global perspectives content within teaching, research, and extension on UW campus. Two classes U. Norton teaches every spring (AECL 4990- Capstone Agroecology Seminar and PLNT 4020/5020-Sustainable Agriculture) have sections that cover international case studies on international agriculture. None of the examples have related to Ukraine thus far. Based on experience U. Norton gained, new modules will be designed and deployed. U. Norton will also present a departmental seminar in the spring.

This project will promote a possible knowledge transfer offered by University of Wyoming scientists and extension personnel. Such role may prove critical to help farmers and researchers in Ukraine to deal with adverse effects of climate and soil resource depletion, which is an incoming issue in the near future. Putting Wyoming on the map of experts may promote more effective sustainable intensification in grain based economy in Ukraine. Finally, one of the important outcomes of this exchange was to increase the capacity of UW employees and students to appreciate cultural differences and the importance of sustainable agriculture and dryland farming that are highly prioritized in Europe. This exchange was very important and meaningful to the U. Norton who greatly appreciates the generous support of the donor and the Global Perspectives grant initiative.

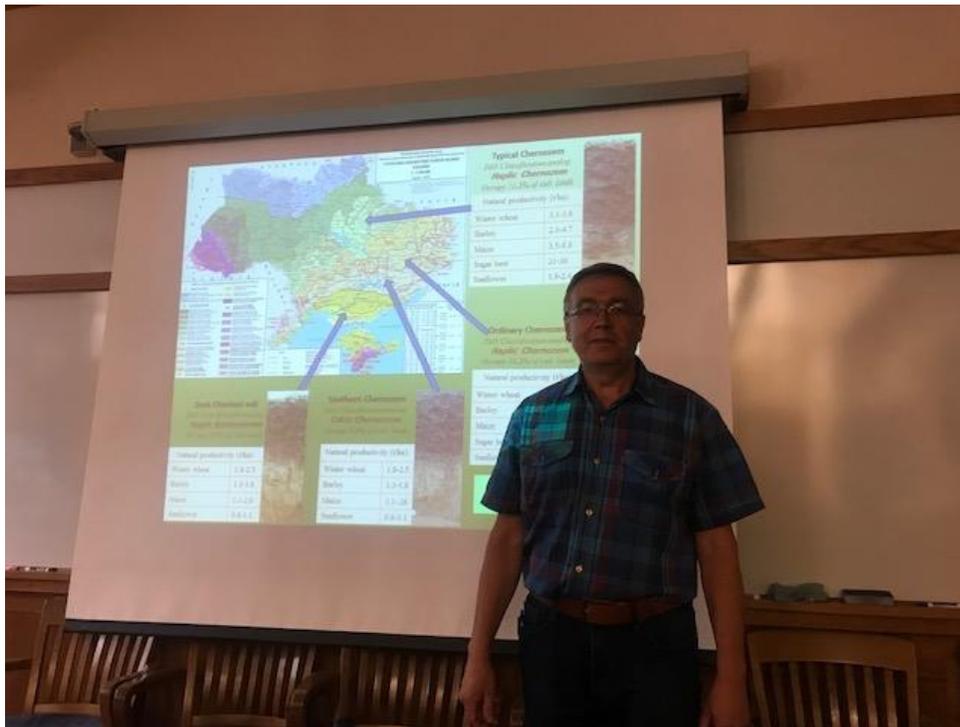


Photo 1: Dr. Myroshnichenko after his seminar in CoA in June 2018.

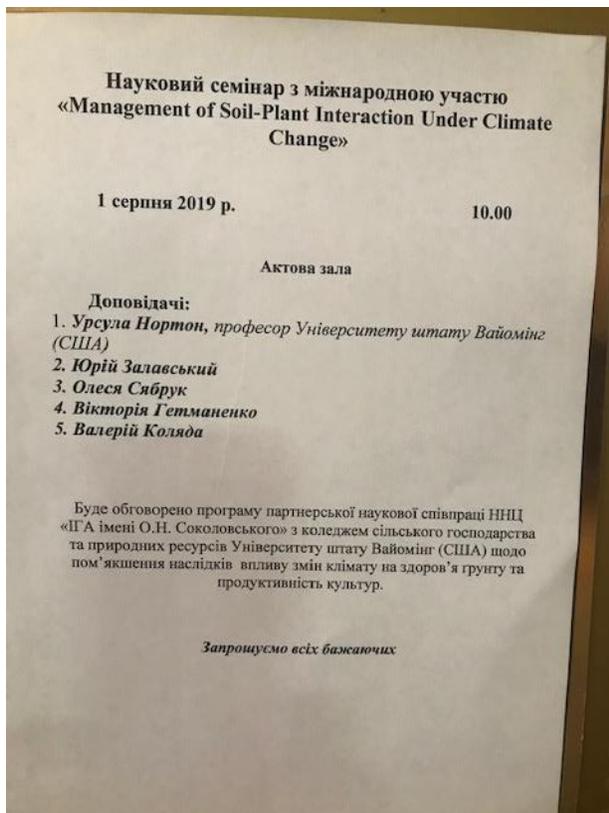


Photo 2: Announcement of U.Norton's presentation on 08/01/2019 in Kharkiv, Ukraine



Photo 3: No-till production.



Photo 4: Soybean/winter wheat (already harvested)/sunflower rotation.



Photo 5: Deep plowing following winter wheat harvest



Photo 6: National Academy of Agrarian and Soil Sciences.



Photo 7: 100-year old experiment comparing continuous corn with corn/cover crop/winter wheat rotation.



Photo 8: U. Norton with the Ukrainian researchers.