Minnesota Applied Economist

Department of APPLIED ECONOMICS

IN THIS ISSUE

Applied Economics at the University of Minnesota

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FROM THE DEPARTMENT HEAD

I just returned from the annual meetings of the Agricultural and Applied Economics Association (the AAEA), a professional association that connects the University of Minnesota to the wider world of applied economists focusing on agriculture, food, natural resources, development, and the environment. The AAEA is an organization that is so solidly a part of the fabric of our profession that it's easy to take for granted, but it's worth taking a moment to recognize just how valuable it is. The AAEA is a big-tent organization, engaged in publishing scholarly work and helping to bring that scholarly work into policy arenas. The annual meetings of the association give members a chance to get together, share their work, learn from others, make new contacts and refresh friendships from long ago.

Here's my report from the recent meetings, where the Minnesota presence was inescapable:

At the Awards Ceremony, where I sat next to **Rob King**, I saw several Minnesota-connected folks receive professional recognition for their work. A group from the Center from Farm Financial Management, including **Bob Craven**, **Laurie Dickinson**, **Kevin Klair**, **Curtis Mahnken**, **Jeff Reisdorfer**, **Wynn Richardson**, **Dale Nordquist, Dave Nordquist**, **Jane Sandstrom**, and **Ed Usset** received a group Extension award for their work. **Harry Kaiser** and **Bob Myers**, who both earned PhDs from our department, were named Fellows of the Association. Harry brought **Jeff Apland** to the stage as he received his award, and mentioned **Donald Liu** and **Phil Van de Kamp** in his remarks. **Jean Kinsey**, also a Fellow of the AAEA, was there to congratulate the new class of Fellows.

One of the highlights of the meetings is the Minnesota reunion, and what a reunion it was! Current and former students showed up to reconnect with each other and with faculty. I ran into a bunch: **Chanjin Chung**, **Tim Delbridge**, **Joan Fulton**, **Lynn Hamilton**, **TJ Hansen**, **Bhagyashree Katare**, **Bryan Lohmar**, **Laura McCann**, **Paul McNamara**, **Gopi Munisamy**, **Dave Smith**, **Travis Smith**, and **Charlotte Tuttle**. It was also wonderful to welcome new faculty member **Joleen Hadrich** to the Minnesota group: more on her later in this newsletter.

The University of Minnesota has contributed energetically to the AAEA over the years: past presidents include **Jim Houck**, **Vernon Eidman**, **Jean Kinsey**, and **Rob King**. Several among us have served on the Board as well (**Claudia Parliament** and **Mike Boland**). **Terry Hurley** served as editor of the Applied Economics Perspectives and Policy journal, and is soon to take on an editorship of the American Journal of Agricultural Economics. We are proud to count these fellows among our faculty ranks: **Vernon Eidman**, **Rob King**, **Jean Kinsey**, **Phil Pardey**, and **Ben Senauer**. We remember those lights of our profession, named as Fellows by the AAEA, in our legacy: **Ed Schuh**, **Jim Houck**, **Phil Raup**, **Vernon Ruttan**, **Willard Cochrane**, **O.B. Jesness**, and **John D. Black**.

Although I missed seeing **Linda Eells** and **Julie Kelly** with their exhibit of AgEcon Search, we are all well aware of their invaluable resource, which has been supported by the AAEA from the beginning.

Cheers to a celebration of a wonderful summer and the beginning of another school year!

Frances Homans
DEPARTMENT OF APPLIED ECONOMICS

Better Natural Resource Management Through Machine Learning

BY STEVE MILLER

Applied economists increasingly have the opportunity to work with very large datasets, including satellite imagery, field measurements provided by modern farm equipment, scanner data from grocery stores, and global databases of patents. While these datasets present opportunities to answer new questions and better address long standing ones, they also present challenges. The data can be messy and technically difficult to work with, and the economic and natural systems that produce the data are likely complex and varied.

To help answer environmental and natural resource questions using these types of data, Assistant Professor Steve Miller is developing and applying new methods that blend tools from economics and computer science. In particular, he is interested in how a collection of algorithms known as machine learning can be used to better analyze the effectiveness of public policies and interventions. Machine learning, which underlies many advances in computer vision, translation, and product recommendations, is excellent at recognizing patterns and correlations. Only recently have economists found ways to harness those tools to move beyond correlations and try to credibly identify the causal effects of policies.

As an example, one of Dr. Miller's projects seeks to identify the effectiveness of one type of fisheries management policy: the use of cap-and-trade programs to keep fish harvests at levels that maintain food supply and employment while protecting the underlying fish population. Under that type of management, each fisher (or boat) is granted the right to catch a specific quantity of fish each season, and may buy or sell those rights. The idea is that overall catch can be limited to protect the resource, but that allowing trade can help rights to catch fish end up in the hands of fishers who are best at what they do.

To examine the performance of these markets around the world, Dr. Miller is adapting a technique known as a regression tree to automatically identify groups of fisheries for which the policy has had a similar effect. At its heart, the approach uses fishery characterist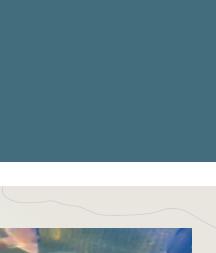ics and policy duration to build up a decision tree that best describes the effects of the policy across fisheries around the globe. Results indicate that these market-based policies have a beneficial effect on fish populations on average, but that impacts depend strongly on both the stock health before the policy change and the number of years the policy has been in place. These findings can help better target adoption of market-based policies and identify fisheries for which other forms of management may be more appropriate. Further, these types of methods may be applicable in a variety of other applied settings, e.g. understanding differences in farm productivity or identifying what makes aid interventions effective.

Many of Dr. Miller's other current projects share this focus on machine learning. With a collaborator at the University of California, Santa Barbara (UCSB), he is working to improve how policy effects are estimated when data points are subject to differing degrees of noise. On another project, he is working with researchers at UCSB and the University of Oregon to automatically identify aquaculture installations around the world using radar and imagery from satellites. As a rapidly growing source of protein and employment, especially in developing economies, aquaculture holds promise as a food source but also may have detrimental effects on nearby water quality or wild fish populations. Unfortunately, the growth of aquaculture has outpaced documentation of it, making an assessment of effects difficult in many parts of the globe. Automatic identification of aquaculture could help fill this gap, enabling a wide range of research on the topic. In addition, he hopes to soon begin applying these tools to the trove of patenting data that faculty, students, and researchers at InSTePP have collected.

Finally, in hopes that students in the department might benefit from these methods, Dr. Miller also developed and taught a graduate course on the topic in Fall 2016. Much to his delight, some students have since begun to incorporate machine learning into their theses and dissertations.

Joleen Hadrich joined our faculty this fall as an Associate Professor and Extension Specialist in Farm Management. She is in the first class of faculty hired through the Agricultural Research, Education, Extension and Technology Transfer (AGREETT) program, a program established by Minnesota's state legislature in 2015.

Hadrich grew up on a dairy farm in Avon, Minnesota, and went to the University of Minnesota, Morris for her bachelor's degree. She earned her M.S. and Ph.D degrees in agricultural economics from Michigan State University. Her first academic position was with North Dakota State University, where she taught farm management and worked closely with beef and crop producers. She later moved to Colorado State University, where her research and teaching program centered on farm management and agricultural finance with a livestock focus.

Hadrich's research focuses on farm-level decision making with an emphasis on maintaining or improving farm-level profitability as new constraints are imposed on the agricultural producer. Some examples of these constraints include the biological process of the system studied, environmental regulations, and fluctuating input and output prices. Much of this work is completed using farm-level data, which allows her to analyze how producer-level decisions change over time to suggest relevant management and policy recommendations.

JOLEEN HADRICH

NEW FACULTY MEMBER

OPTIMAL PUBLIC CONSERVATION
BY IAN LUBY

L ast summer, I had the opportunity to travel to West Central Minnesota as part of a project helping the US Fish and Wildlife Service assess economic strategies to value their conserved land. Early on a Thursday morning in July, I met up with Scott Glup, a project leader for USFWS in Minnesota. For several hours, we drove around Kandiyohi County where I got a firsthand look at some of conservation easements among the fields of corn and soybeans. We discussed aspects of the agency's conservation from how they reclaimed drained wetlands to how the agency handled the persistent political and cultural challenges facing conservation in rural Minnesota.

At some point during the ride I asked a pretty standard economist question: how does USFWS decide which land to conserve? This question launched a discussion more fruitful than I could have imagined at the time. Scott explained the goals and rules by which land is selected for conservation programs and some of the issues that the agency faces. The agency's general problem is that they get a yearly budget and can only buy land that is offered by private citizens. They have little flexibility to save money from year to year or borrow against future budget allocations. With no control of when land is put up for sale, the USFWS faces a tradeoff: buying land early in the year takes away their option to buy possibly more desirable parcels that may become available toward the end of the year. Owners of those more desirable parcels might not be willing to wait to sell until budgets are replenished in the new fiscal year. At some point in the discussion Scott turned to me and said, "I wish I knew the best way to do this."

I have been working to answer that question in my 2nd year qualifying paper. The question of where to conserve land is not a small or new literature. Dating back at least to 1974, economists and others have answered similar questions. However, for most of that time, site selection was treated as a one-time, static decision. This, of course, neglected the tricky intertemporal tradeoffs that conservation organizations face. The question that repeats itself for any group looking to construct a network of conserved sites is whether to buy what is available now. If they don't, the land might be permanently lost to development. If they do, they might not being able to buy a more important parcel later for lack of money. Over the past 10-15 years a few papers have explored these tradeoffs in a dynamic context but none from the perspective of a public agency with its unique constraints.

My research models the process in a dynamic way, taking into account the agency's yearly budget constraints. Each parcel on the targeted landscape has an associated probability of becoming available or unavailable every period leading to an uncertainty for the agency over future land availability. The agency purchases land quarterly (over many years) to maximize a conservation objective which might be something "simple," like a count of biodiversity, or more complicated, like ecosystem service calculations.

For those interested in technical details, the model is coded in R and applies Monte Carlo simulations to several different artificial landscapes. My results so far rely on simple 2, 3 and 9 parcel examples to characterize the tradeoffs among the many moving parts in the model.

Early results point to principles that can substantially benefit a public agency planning a conservation network, especially when there is a greater level of uncertainty over land availability. Volatility in land availability greatly impacts the strategy of when to spend your budget throughout the year. For example, depending on how stable the available land set is, it is sometimes not optimal to purchase a parcel in quarter 3 but instead wait to spend the remaining budget in period 4 in case better land becomes available in the meantime. The threshold for this decision changes depending on the relative value of the parcels, the probability of new parcels entering and currently available parcels leaving.

Though there are many steps before this research can be directly applied, my end goal is a refined model that can be applied to real world landscapes to help construct conservation plans. Applied to a county in Minnesota, for example, the model would use data on the local land market and spatial information about conservation value of parcels to construct optimal strategies with the possibility of updating as land is acquired or parcels lost to other uses.

The opportunity to work on projects like this, that might one day help us better achieve the goals of conservation, has been rewarding. Applying economic concepts to help solve environmental and agricultural problems is the reason I entered the Ph.D. program and I hope this project is the first in a long career of impactful research.

MASTER OF SCIENCE STUDENT PARTICIPATES IN USDA AG SCHOLARS PROGRAM

Breakfast on Capitol Hill, attending a "lock up,"' meeting with decision-makers at USDA agencies— These are just a few of the experiences Andrew Keller, a Masters student in the Applied Economics program, had this summer when he traveled to Washington, D.C., to participate in USDA's Ag Scholars program.

The Ag Scholars program introduces highly qualified graduate students across the country to career opportunities in commodity market analysis, agricultural finance, rural economics and other applied fields of economics. USDA has a large and growing need for talented professionals in these fields. Andrew was part of an impressive 2017 Ag Scholars class that included ten graduate students from five other land grant universities.

As part of the program, Andrew and the other Ag Scholars had breakfast on Capitol Hill with the House and Senate Agriculture Committees' Chief Economists and their staff, met with analysts and leaders at the American Farm Bureau, and toured the White House. As in prior years, a highlight of the program is entry into the World Agricultural Supply and Demand Estimates (WASDE) "Lock-up." At this meeting, the National Agricultural Statistics Service and the World Agricultural Outlook Board staff brief senior leaders and guests in a secured location on the forthcoming the WASDE for the U.S and the world.

Because of the potential market moving impact of the WASDE, "Lock-up" participants are let out of the secured space only after the WASDE is released to the public at noon EDT. While in the "Lock-up," participants see firsthand how analysts use market analysis and statistics to assess market conditions and how the information may be used by decision makers.

While in Washington, Andrew participated in meetings with leadership and staff across USDA, including the Economic Research Service, the Foreign Agricultural Service, the National Agricultural Statistics Service, the Farm Service Administration, the Office of the Chief Economist, and the Agricultural Marketing Service. Over the course of the two weeks, he met newly hired economic analysts and senior staff who described the nature and scope of their work. The interactions with the newer USDA staff provided an opportunity for Ag Scholars to learn more about life away from work in and around the Nation's Capital. These sessions, and a free weekend in Washington, give the Ag Scholars a taste of the transition between school and work life.

Plans for the 2018 Ag Scholars program are underway, and they include room for other students in the Applied Economics Department to follow in Andrew's footsteps. See Department Head Frances Homans for more information about the 2018 selection process.

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SUE POHLOD RECEIVES PRESIDENT'S AWARD FOR OUTSTANDING SERVICE

Sue Pohlod, Executive Office and Administrative Specialist, has been given the distinguished honor of receiving the University's President's Award for Outstanding Service. The University of Minnesota President's Award for Outstanding Service was established in 1997 to recognize faculty and staff who have provided exceptional service to the University, its schools, colleges, departments and service units.

Sue is a rock in the Department of Applied Economics. This metaphor applies not only to her years of service at the University (41.5 years), but to her work ethic and the quality of her work. We have all learned that you can absolutely count on Sue to be there, with the right support, the right information, and just the tools you need. From a letter in support of her nomination: "… it seems like whenever we have trouble with almost anything, we turn to Sue!"

Congratulations, Sue, on this most well-deserved recognition!