Topics Available for Thesis Research in Agricultural Economics

Purdue University

2016-17
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Industrialization and Vertical Coordination in the Agricultural Sector
Understanding the Management Behavior of Large Farms in Indiana and Implications for Agribusiness and Rural Communities
Assessment of Performance Management in Food and Agribusiness Firms
Understanding Large Commercial Producer Buying Behaviors and Attitudes

Russell Hillberry
Modelling International Production Fragmentation
Impact Evaluation of Trade Facilitation Measures

Thomas Hertel
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Dynamic stochastic Modeling of Global Climate Impacts on Forestry Land Use and Sustainability in a Telecoupled World
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Bhagyashree Katare
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Effect of ACA’s Tobacco Surcharges on Use of Tobacco

Jess Lowenberg-DeBoer
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Maria Marshall
Small and Family Business Management Strategies (US)
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Philip Paarlberg
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Paul Preckel
Assessment of the Impact of Kirchhoff’s Law on Optimal Transmission Investments
Modeling the Supply and Demand for Ramping Services in an Electricity Supply System

Kwamena K. Quagrainie
Economics of fish farming (aquaculture) in the US and developing countries
Seafood supply & demand and sustainable fisheries and aquaculture

Gerald Shively
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Wallace Tyner
Economic and Environmental Impacts of Cover Crops
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Research on Questions in the Energy/Climate Change Area

Holly Wang
Chinese Food Demand and Food Safety
Risk Analysis for Agricultural Market and Insurance

Nicole Olynk Widmar
Changing Consumer Demand and Preferences for Credence Attributes of Livestock Production Practices (currently dairy focused)
Consumer Preference Assessments Regarding Human-animal bonds
Economics of Alternative Livestock Production Practices
Consumer Demand Analyses for Food Products and Food Retailer Attributes

Michael Wetzstein
Optimal Replacement Policies for Rejuvenated Power Plants

Steven Wu
Agricultural Market Structure and Robust Contract Design
Economic Analysis of Policies that Combat Obesity Through Restrictions on Food Retailing: A Mechanism Design and Experimental Economics Approach
PHILIP C. ABBOTT

Degree Level | Research Topic | Funding
---|---|---
M.S | Stabilization Policy in Developing Countries after the 2007-08 Food Crisis | not at this time

Stabilization Policy in Developing Countries after the 2007-08 Food Crisis

During the 2007-08 food crisis very high and volatile world grain prices brought stabilizing policy responses by many developing country governments. The isolationist policies pursued contradicted “best practices” risk management strategies that focus on long run agricultural development, trade liberalization, safety nets and private market solutions to risk. Some have criticized those recommendations in the wake of the food crisis, as countries that opened their borders were vulnerable to high import costs and pass-through to high consumer prices. Domestic market outcomes were conditioned to varying degrees by lagged price transmission, transactions costs and weak market integration in addition to policy responses. Stabilization of domestic markets also spilled over into greater international market instability. If world price spikes like those observed in 2008 are an infrequent but real event, policy recommendations need to take into account this more realistic characterization of world price distributions. Various questions related to food policy in developing countries are being pursued that emphasize the potential role of trade in determining food security in the wake of the 2007-08 food crisis.

TIMOTHY G. BAKER

Degree Level | Research Topic | Funding
---|---|---
MS/PhD | Risk Management | Pending
MS/PhD | Financing and Hog Contracting | Maybe
MS/PhD | Stochastic Dominance | No
MS | Machinery Cost | No

Risk Management

This project is to provide the background research for the department's risk management extension work. Essentially risk management alternatives are to be identified (marketing alternatives, hedging, crop insurance, diversification, revenue insurance, etc.), then the probability distribution of returns under the various alternatives will be determined.
Financing and Hog Contracting

This is a joint project with the University of Illinois. A survey of lenders attitude toward lending for contract vs. independent production has been completed and a simulation model is being built. There is the possibility that a student could define a thesis topic that would complement the work under way.

Stochastic Dominance

The literature on stochastic dominance includes the work by Jack Meyer on stochastic dominance with respect to a range of risk aversion. Meyer’s procedure uses a range of coefficients of absolute risk aversion. There is little agreement in the literature on the relevant range of absolute risk aversion, and many times stochastic dominance is performed on returns per acre and returns per dollar invested. This research is to rework the method of Meyer to use relative risk aversion. There is much less controversy regarding the range of relative risk aversion, and some of the problems associated with multiplicative gambles are alleviated.

Machinery Cost

This project is to use the machinery repair and remaining value equations in the literature to determine the marginal cost of using machines. Such costs are very relevant in the partial budgeting situations that frequently arise. The current literature contains frequent reference to average costs, but the marginal cost is often inaccurately assumed to be equal to the current repair cost per unit of use (without considering future repairs, remaining value, and trading time).

JOSEPH BALAGTAS

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Farm-Retail Price Transmission in U.S. Food Markets

This project evaluates empirically the response of retail food prices to upstream changes in farm commodity prices, such as those caused by the agricultural price boom of 2007-08. The project evaluates retail responses across brands and store format within a food category, and across categories with different degrees of processing. The purpose is to measure differences in retail price response, and to identify factors related to those differences, emphasizing consumer and market characteristics. Analysis of the farm-retail price relationships uses data from the Nielsen Homescan survey spanning a period of time that includes the recent commodity market events. Analysis of farm-retail price transmission will rely on standard, time-series econometric methods that relate retail prices for private labels and national brands to
A self-control problem occurs when present behavior does not accord with a rationally chosen desired future outcome. In economics this has been variously modeled as “hyperbolic discounting” and as a principal agent problem. These models explain why consumers often make commitments in the present to certain forms of future behavior. Voluntary restriction on future choice serves as a mechanism to impose self control before the fact by increasing the time between decision and consumption. Examples abound in personal finance. For example, buying a home is often cited as a method of forced savings.

Self control problems are especially relevant to food consumption. In the obesity debate, one economic study attributes much importance to the role of innovation in reducing the time for food preparation and thus the delay before consumption. “People with self-control problems respond more to the ready availability of food than people without such problems.” One such innovation is the vast growth in the restaurant sector and the availability of a large variety of highly palatable, reasonably-priced offerings. In the case of home consumption there is a significant delay between choosing foods in the supermarket and final consumption of the meal. A shopper may be able to resist fattening foods simply because consumption will occur in the future. Refusing to purchase these items imposes a restriction on future behavior. “Dieters try not to keep cheesecake in the refrigerator.” This mechanism is not available when dining out: the delay between decision and consumption is nearly eliminated, and giving in to temptation is likely for someone with self-control problems.

This project will investigate the importance of self-control by mining several large USDA data sets. In particular, data on individual food intakes will be used to measure and compare behavior in restaurants and when dining at home, and to relate differences to variables related to self control, especially weight status (BMI). A second possibility is to use commercial household “homescan” panel data purchased by USDA to examine home food consumption. For example, if diminishing time between food purchase and consumption is causing consumers to choose tasty, calorie-laden foods, frequent shoppers would be expected to buy more such items than “major trip” shoppers.
Degree Level | Research Topic | Funding
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MS/PhD | Industrialization and Vertical Coordination in the Agricultural Sector | No
MS/PhD | Strategic Risk, Assessment and Management for Agribusiness Firms | Pending

**Industrialization and Vertical Coordination in the Agricultural Sector**

Significant changes are occurring in the agricultural sector — changes often described as the industrialization of agriculture. One of these changes is increased use of alliances, contracts and negotiated coordination between the various stages of the food chain. As quality and other product attributes become more important and valuable to consumers, and technology for producing and measuring these attributes develops, the benefits of negotiated coordination are likely to increase. The objective of this project would be to evaluate the efficiency gains, transactions costs, and quality impacts of changing technology to measure quality and other product attributes, and changes in market coordination systems in the markets for nutritional and industrial products in the agricultural sector. Results will be useful in anticipating both structural changes in the sector and strategies that agribusiness companies may adopt to increase efficiency and market share. (in collaboration with Allan Gray)

**Strategic Risk Assessment and Management for Agribusiness Firms**

The accelerating speed of change in the food and agribusiness industries is resulting in more risk and uncertainty — the future is becoming much less predictable. Not only is the future more uncertain, the drivers of that uncertainty are also changing — strategic risk which generally has a low probability of occurrence, but large consequences, is becoming an increasingly important component of the decision environment. Managing these risks requires not only new assessment tools such as scorecarding and mapping, but also more systematic decision frameworks that can be best structured as decision trees. And managing time to redefine a strategic choice in an uncertain environment into a growth, divest, exit, pause or follow-on option that truncates the loss exposure and allows capture of the profit potential transforms strategy under uncertainty from a defensive posture of minimizing losses and protecting positions to an offensive posture of creating and capturing value. This work would expand the risk assessment tools and techniques typically used in agricultural economics to include strategic risks, options analysis and scorecarding and mapping and the application of these tools and concepts to the development of strategy for agribusiness firms. (in collaboration with Allan Gray.)
### Drivers of Indian Farmland Values

Research has shown that farmland values are influenced by both agricultural earnings and nonagricultural factors. One possible project in this area would be to identify those factors that are important in determining the value of Indiana farmland and in forecasting their future value.

An important source of income to an investor in farmland is the rent received from a tenant. Over time, the most common type of lease used for farmland rental has shifted from a crop-share lease to a fixed cash rent lease. With the upward spike in commodity prices, there is increased interest in using a flexible cash lease or other type of lease that adjust automatically to such unexpected surprises. This project would explore various types of lease arrangements and determine how the terms of a flexible lease may shift the risks and rewards for the tenant and landlord.

### Economics of Cropping Systems

The technologies associated with the cropping systems used in the Midwest continue to evolve. Questions have arisen regarding the appropriate application rate for nitrogen fertilizer on corn. The use of corn grain and plant cellulose for ethanol production has raised questions about the appropriate crop mix. The development of controlled drainage and underground irrigation systems has raised questions about the profitability of such systems. This project could explore one or more of these issues associated with cropping systems.
## OTTO DOERING

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### Resource Policy, Conservation Issues, Energy and Biofuel Issues for Agriculture

The areas of interest here include water quality issues related to agricultural production affecting such things as the dead zone in the Gulf of Mexico. There may also be an opportunity to work on economic issues related to reactive nitrogen pollution and trade-offs in nitrogen use. There is no firm funding at the moment.

### CLIMATE – Economic Impacts and Cost of Mitigation and Adaptation

There are sporadic opportunities through the Purdue Climate Change Research Center and its members for economic impact work on climate change. These are multi-disciplinary and can cover a wide range of climate related topics.

## W. Scott Downey

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<td>Possibly</td>
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### Buyer/Seller Relationships in Farm Business

Farm businesses in the United States are served by a complex set of relationships with manufacturers and suppliers. Often these relationships are described as partnerships in which both parties receive and create value. However, the nature of the value creation is shifting from tangible value through products to leveraging data and information into insights that lead to
profit. In addition, consolidation of both buyers and sellers has meant that the players are larger. There are more dollars at stake, and small percentage gains in productivity result in large dollar differences in profits. The sophistication of both sides of the relationship has increased and organization of the value co-creation process has become more complex. The objective of this project would be to evaluate the varying views of buyer-seller relationships, and describe how they form, evolve, and conclude from a behavioral perspective. This may involve the collection of new quantitative or qualitative data, or analysis of existing data collected through the Large Commercial Producer Study, conducted every five years in the Center for Food and Agricultural Business. Results will be important for agribusiness managers who are responsible for accomplishing their business objectives.

**Dealer Sales and Marketing Strategies for Working with Farmers**

In the agribusiness supply business, marketers must understand the goals of segments of customers, develop value propositions for serving each segment, and choose methods for communicating value to them. Sales strategies are a component of these marketing strategies. Historically, the sales process has been a primary tool for the communication function of marketing. Due to the complexity of farm businesses that are served and the volume of information generated on the farm, the potential exists for the sales function to play a different role – being involved in the value creation activity and gathering market intelligence that will be useful to more effective marketing. The purpose of research in this area is to examine how sales and marketing strategies are best integrated, to understand the roles of sales managers in creating organizations to accomplish these enhanced roles, and examining the metrics used by sales and marketing managers to determine performance. Looking for methods of communicating implications through multi-dimensional analysis and infographics that are meaningful to buyers and sellers is a potential outcome of this research that will lead to the ability to model and forecast more effectively. Data for this effort will come through partnerships the Center for Food and Agricultural Business has with agribusiness suppliers.

**Management Metrics for Agribusiness Sales and Marketing Managers**

The evolution of selling in agribusiness is a relatively recent phenomenon. Scientific innovation in the mid-20th century resulted in product differentiation that required explication. Economic efficiencies and market dynamics resulted in mergers of many, small, farmer-facing organizations. These two factors have created today’s farmer-facing organizations with large sales forces. Past approaches to leading these forces have centered on persuasive revenue generation. The sophistication of purchasers and complexity of on-farm solutions requires a different approach to selling today. Different approaches to selling may require changes to how sales managers analyze, plan, implement, and monitor sales activities. The purpose of this research is to examine the current state of these activities, create models of effective organizational structures, and identify sources of performance variation that result from various management practices. Data for these efforts will come through interviews and surveys conducted with partners of the Center for Food and Agricultural Business. Outputs include journal articles and/or case studies.
Modeling Spatial Dynamics in Regional Economic Growth

Data availability at relatively low levels of spatial aggregation has contributed to the use of spatial econometric techniques in the study of economic growth. Although the utilization of such techniques is proliferating, their application has been rather mechanical and explicit links to theory are oftentimes not very well developed. This project focuses on analyzing regional economic growth data (for US counties, with a special emphasis on the Mid West and the state of Indiana) in comparison to NUTS 2 regions in Europe. The theoretical emphasis includes developing a link to the New Economic Geography literature, where a strong emphasis has been put on the relevance of agglomeration economies. In addition, the development of a link between the literature on economic growth and income (in)equality, for which specific spatial econometric techniques are available, will be pivotal. A potential extension of the project could focus on the development and use of appropriate econometric techniques to analyze space-time data.

Meta-Analysis in Economics: Does Publication Bias Distort our View of the World?

Meta-analysis centers on the use of statistical tools to analyze and summarize an existing body of empirical literature. The technique was originally developed in the context of experimental sciences, but its use in economics is quite extensive nowadays and includes publications in high quality journals. The merits of meta-analysis in the economics profession are, however, not necessarily undisputed and two issues are rather prominent in the assessment of the pay-off of meta-analysis. One issue focuses on the assessment of the validity of the technique in a non-experimental (or quasi-experimental) setting, which is relevant for large parts of the economics literature. The other concerns the potentially distorting role of publication bias, which has been raised some ten years ago by Card and Krueger discussing the impact of minimum wages. The main purpose of this project is to assess the potentially distorting role of publication bias in meta-analysis in economics. Specific objectives of the project include: a) a theoretical and conceptual analysis of selective sampling and publication bias, b) a review of basic statistical indicators that have been used to test for publication bias, c) the development of a statistical test in a meta-regression framework, and d) the determination of the impact of publication bias in a prominent empirical literature.
The Impact of Spatial Spillovers in Complying with Environmental Regulation

Spatial spillover effects are at the core of many areas of applied economic research. For instance, in trade theory, economic growth, location theory (including Foreign Direct Investment), rural-urban linkages, etc. In environmental economics spatial spillovers are relevant as well, but their impact has not been very thoroughly investigated. Exceptions include work on the environmental Kuznets curve, the valuation of air quality, and hedonic pricing models. This project focuses on modeling spatial spillovers in environmental economic models. The project centers in particular on determining the impact of spatial spillovers in complying with environmental regulation (e.g., set maximum values for air pollution). Spatial spillovers are likely to be relevant both with respect to economic development of an area as well as with respect to air pollution, making a systems approach desirable. Concurrently, several problems related to the spatial sampling design of air quality data need to be tackled, for instance, because it is not uncommon that air quality monitors are located in relatively polluted areas only.

KEN FOSTER

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<td></td>
<td>Impact of livestock waste management policies</td>
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<td></td>
<td>Measurement and explanation of the spatial distribution of wealth and income inequality</td>
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<td>Impact of changing procurement mechanisms on wholesale-farm and retail-farm margins</td>
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Contact Dr. Foster for further information on these topics.
This research addresses one of the critical issues the industrialization of agriculture poses for producers. Part of the industrialization process involved forming more tightly aligned supply chains that extend from the producer through the first handler to the processor or potentially the retailer. Examples of these organizations include New Generation Cooperatives, limited liability companies, as well as joint ventures and strategic alliances. The purpose of this research is to identify the returns and risks for producers who take the initiative in the formation of food supply chains through investment in value-added first handling, processing or other downstream activities. Key success factors associated with value-added businesses will be identified as part of this research. The results will be useful for producers as they consider significant capital investment in value-added processing.

Structural Change in Cooperatives and Agribusiness: Joint Ventures, Strategic Alliances and Mergers

The structure of all sectors of agribusiness is currently undergoing rapid change, including increased consolidation due to mergers, acquisitions, joint ventures and strategic alliances. This research will explore the structural changes in agribusiness, related to mergers, acquisitions, joint ventures, and strategic alliances, and identify the driving forces behind the reorganizations as well as the factors that contribute to the success of the new structures. The objectives of the research are to (1) analyze theoretically and develop a model of the structural change that is currently occurring in cooperative and investor oriented agribusinesses with particular emphasis on mergers, acquisitions, joint ventures and strategic alliances, (2) continue with the database development of the mergers, acquisitions, joint ventures, and strategic alliances that have occurred in the United States among cooperative and investor oriented agribusinesses at the regional and national level during the 1990s. In addition to listing the partners involved in the restructuring the database will contain the driving forces behind the reorganization as well as the factors that contributed to the success and/or failure of the reorganization. (3) perform empirical analysis of the data, draw conclusions and identify implications for agribusiness decision makers and policy makers.
Word of Mouth Marketing

In the changing, industrialized agriculture agribusiness firms are looking for new and innovative marketing approaches in order to remain competitive. One method of marketing that has not been the subject of a lot of research is word of mouth marketing. This research will examine how agricultural producers respond to different types of word of mouth marketing. Producers who have been part of a structured program (often a facilitated teleconference) will be interviewed to determine how effective the marketing program was. Demographic factors, associated with the participants, as well as characteristics of the program that have the greatest influence on success will be identified. The results of this research will be useful to agribusiness firms as they adapt their marketing programs to meet the changing economic conditions.

ALLAN W. GRAY

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Industrialization and Vertical Coordination in the Agricultural Sector

Significant changes are occurring in the agricultural sector — changes often described as the industrialization of agriculture. One of these changes is increased use of alliances, contracts and negotiated coordination between the various stages of the food chain. As quality and other product attributes become more important and valuable to consumers, and technology for producing and measuring these attributes develops, the benefits of negotiated coordination are likely to increase. The objective of this project would be to evaluate the efficiency gains, transactions costs, and quality impacts of changing technology to measure quality and other product attributes, and changes in market coordination systems in the markets for nutritional and industrial products in the agricultural sector. Results will be useful in anticipating both structural changes in the sector and strategies that agribusiness companies may adopt to increase efficiency and market share. (in collaboration with Mike Boehlje)

Understanding Large Commercial Producer Buying Behaviors and Attitudes

Every 5 years the Center for Food and Agricultural Business conducts a survey of large commercial producers regarding the input purchase behaviors and attitudes. The new survey will be conducted in January of 2008 with new data available by April of 2008. This dataset can
be used to explore a number of issues associated with large commercial producer buying preferences. In the past research has been conducted on producer brand loyalty, segmentation of producers according to preferences for various attributes of the marketing bundle, and producer preferences for distribution channel linkages. Many other questions related to producer buying behavior remain and the dataset provides a rich source to explore these questions.

Michael A. Gunderson

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**Industrialization and Vertical Coordination in the Agricultural Sector**

Significant changes are occurring in the agricultural sector; changes often described as the industrialization of agriculture. One of these changes is increased use of alliances, contracts and negotiated coordination between the various stages of the food chain. As quality and other product attributes become more important and valuable to consumers, and technology for producing and measuring these attributes develops, the benefits of negotiated coordination are likely to increase. The objective of this project would be to evaluate the efficiency gains, transactions costs, and quality impacts of changing technology to measure quality and other product attributes, and changes in market coordination systems in the markets for nutritional and industrial products in the agricultural sector. Results will be useful in anticipating both structural changes in the sector and strategies that agribusiness companies may adopt to increase efficiency and market share. (in collaboration with Mike Boehlje and Allan Gray)

**Understanding the Management Behavior of Large Farms in Indiana and Implications for Agribusiness and Rural Communities**

Large farms, while few in numbers, are important to the Indiana economy. In 2012, the largest producers, those with more than $5 million in farm sales, accounted for 16.7% of the total agricultural production but only 187 operations. These large farms are often multiple household farms – meaning that nearly half of large farms have multiple families involved with
the operations. These multiple household farms are sharing the farm income, management, and decision making functions of the farm. Very little work has gone into understanding the management structure of these large, multiple household farms. Understanding the organizational structure is the first step in understanding how these farms interact with their agricultural retailers and the communities in which they conduct business.

Assessment of Performance Management in Food and Agribusiness Firms

With productivity in mind, the focus on this research will be on the people side of productivity. Millions of dollars in research is done understanding and improving the flow of a grain elevator, or the capacity or a feed mill, or even the rate at which a sprayer can cross the field, but what about the difference that individual people make? How much more productive are a firms’ most productive employees? Beyond a given firm, how productive are the industries more productive employees? The natural follow-up to understanding the gaps in productivity is understanding the practice and process managers, and companies, use to develop and maintain productive employees. The research will look at the use of teams, incentives, employee development programs, recruitment plans, retention policies (and so forth) to being to understand how these practices and process might begin to explain the people side of productivity. (Just like using varieties, soil types, and fertility to understand some of the variation in yields)

Understanding Large Commercial Producer Buying Behaviors and Attitudes

Every 5 years the Center for Food and Agricultural Business conducts a survey of large commercial producers regarding the input purchase behaviors and attitudes. The most recent survey was conducted in January 2013. This dataset can be used to explore a number of issues associated with large commercial producer buying preferences. In the past research has been conducted on producer brand loyalty, segmentation of producers according to preferences for various attributes of the marketing bundle, and producer preferences for distribution channel linkages. New questions for 2013 focus additionally on producers’ strategies for success, risk management techniques, and dimensions for producer loyalty. Many other questions related to producer buying behavior remain and the dataset provides a rich source to explore these questions. (in collaboration with Allan Gray)
# Modelling international production fragmentation

The fragmentation of production processes across international borders has been a highly visible development in global trade. Assembly of an iPhone, an aircraft, or an automobile, for example, now typically requires value added in many different countries. These developments pose new analytical challenges for trade policymakers, government statistical agencies, and academics. Conceptual frameworks that can be used to support analyses of these phenomena are still being developed. In broad terms this proposal aims to develop new analytic tools and methods that can be used to support modeling and other analytical approaches to the study of internationalized production.

While the particular approach taken can build upon the strengths of the individual student, the skills that would be most useful at this stage would include a strong grounding in microeconomic theory, the mathematics of linear algebra and linear programming, and complementary skills in computational methods. Fally and Hillberry (2015) offers an example of recent work in the area that can serve as a building block for subsequent research.

# Impact evaluation of trade facilitation measures

Trade facilitation is a central component of international trade policy. WTO member countries’ signing of the Trade Facilitation Agreement in late 2013 turned new attention to a range of policies that are designed to reduce the time and cost of trading goods across international borders. The signing of the agreement also prompted the commitment of significant “aid-for-trade” funds to support trade facilitation reforms in developing countries. For example, OECD and WTO (2015) reports US$ 673 million in new international aid commitments in 2013 that are intended to support trade facilitation initiatives.

While large amounts of foreign aid have been allocated to support trade facilitation reforms, policymakers and academics still know very little about which reforms work best, and under what conditions. Foreign aid programs in education, or health for example, have generated a large number of formal impact evaluations that inform the effectiveness and operational design of aid programs. In the area of trade facilitation, efforts to conduct formal studies of this sort have only recently begun. This proposal aims to attract students who wish to participate in an attempt to inform the academic and policy literatures by undertaking formal impact evaluation studies of trade facilitation reforms in developing countries.
THOMAS HERTEL

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<td>Poverty Impacts of Climate Mitigation</td>
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<td>Ph.D.</td>
<td>Dynamic-stochastic Modeling of Global Climate Impacts on Forestry</td>
<td>USDA-AFRI</td>
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<td>Ph.D.</td>
<td>Assessing the Long Run Sustainability Of US Agriculture in an Integrated Global Economy</td>
<td>USDA-AFRI</td>
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<tr>
<td>Ph.D.</td>
<td>Understanding the Food-Energy-Water (FEW) nexus</td>
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**Poverty Impacts of Climate Mitigation**

While attention has recently shifted to the potential impacts of climate change on the poor, almost no attention has been paid to the likely poverty impacts of proposed programs aimed at climate mitigation. The hypothesis underpinning this research project is that, in many regions of the world, the poverty consequences of policies to mitigate climate change could dominate the poverty impacts of the climate change itself.

Forestry and agriculture account for roughly one-third of global greenhouse gas emissions (IPCC 2007) thus offering tremendous potential to contribute to climate change mitigation programs. Furthermore, at high carbon prices (e.g., $100 per ton CO$_2$ equivalent), the combined mitigation potential of agriculture and forestry is greater than that of any other individual sectors in the economy (World Development Report 2010, 25). Indeed, Golub et al. (2009) estimate that, in the context of a globally efficient carbon policy, implemented over the next two decades, these sectors could account for as much global abatement as would be attained from reduced fossil fuel consumption, based on a global carbon tax of $28 per ton CO$_2$ equivalent.

Much of this low cost abatement is due to avoided deforestation in the tropics. This has focused considerable international attention on programs for Reducing Emissions from Deforestation and Degradation (REDD). Indeed, a handful of wealthy nations committed a $3.5 billion down payment for REDD -- with much more to follow -- at the recent climate summit in Copenhagen. As it happens, much deforestation occurs in areas with relatively high poverty rates -- namely at the agricultural frontier in developing countries. This opens the possibility of significant interactions between climate change mitigation efforts and poverty.

There are two channels through which mitigation policies can affect poverty. The first of these is through payments for environmental services. When the poor are involved in efforts to sequester carbon, the payments to these households may directly serve to alleviate poverty. In addition to these direct impacts from payments for environmental services, mitigation policies can have indirect poverty impacts through commodity and factor markets (in much the same way as the climate change impacts discussed above). This potential for indirect effects is illustrated by the contribution of biofuels programs -- motivated themselves in part by
greenhouse gas (GHG) mitigation objectives – to the recent run-up of world food prices. The poverty impacts of higher commodity prices induced by mitigation efforts are unclear since higher prices may hurt low income consumers, even as they have the potential to benefit rural agricultural households where many of the world’s poor reside.

The recent push for biofuels has, to date, been heavily concentrated in the US and the EU, which has limited the global price impacts. However, a major, global initiative to reduce GHG emissions from agriculture and forestry – with much of the spending in the tropics – could have even more significant commodity price impacts in agriculture. The reason is that most of the abatement strategies serve to increase the global demand for land. Carbon forest sequestration is most obvious in this regard, but policies to reduce nitrogen fertilizer applications (an important source of nitrous oxide emissions), sequester agricultural soil carbon, and reduce methane emissions from paddy rice production and/or livestock all have the potential to require more land for a given amount of agricultural output. This in turn can have important impacts on commodity prices. For example, Golub et al. (2009) estimate that a global agricultural carbon tax/forest sequestration subsidy of $28 per ton CO₂ equivalent could boost world average prices by 31% for rice, 28% for ruminants and 11-13% for other crops. In the context of the proposed US climate change legislation (the so-called Waxman-Markey bill), McCarl estimates that mitigation efforts could result in the diversion of nearly 50 million acres from cropland to forest cover in the US, causing corn prices to be twice as high as they would otherwise be in 2050 (McCarl 2009).

The broad objective of this proposal is to estimate the impact of alternative mitigation strategies on poverty in a cross-section of developing countries. The work will unify two strands of literature – all utilizing modified versions of the GTAP model of global trade and resource use. Firstly, the work of Golub et al (2009), as extended in the context of a series of projects with the UN-FAO, provides a starting point for the assessment of mitigation policies on global commodity and factor prices. A second strand of work is that by Hertel et al (2009) which develops a poverty module for assessing the impacts of trade reforms on commodity prices and factor returns and thereby on poverty. The third strand of work is that by Hertel, Burke and Lobell (forthcoming) which utilizes a poverty-augmented GTAP model to assess the poverty impacts of projected climate change in the year 2030. By combining these three lines of work, this project will test the hypothesis posed in the first paragraph above, namely that the near term poverty impacts of climate mitigation policy dominate the poverty impacts of climate change.

**Dynamic-stochastic modeling of global climate impacts on forestry**

This is a Research Project for Environmental and Natural Resource Economics within the AERC priority area under the AFRI Foundational Program. We aim to "advance theories, methods and applications that contribute to understanding an ecological approach to agriculture that embraces production and sustainable resource management simultaneously" through novel stochastic dynamic programming analysis of land use, forests and agriculture. The policy issue examined –how global change affects the US forest carbon sink – addresses the
impacts of agriculture, resource conservation and management" for a vitally important environmental resource -- forest carbon sequestration.

US forests offset 10-15% of gross national GHG emissions. However, recent projections by the US Forest Service suggest that this sink may be in jeopardy as a consequence of the confluence of climate change, biofuels, growing population and rising incomes. Existing research on this topic suffers from serious limitations, failing to accurately model climate impacts on forestry, link regional and global drivers, capture key economic responses to global change, incorporate uncertainty, and capture the interplay between forestry, agriculture and energy sectors. The proposed research will remedy these gaps, and by doing so, provide new tools to assess pressing policy issues, including: the interaction between biofuels and forest carbon sequestration, the valuation of new technologies in the context of uncertain future economic growth, the effects of climate change on land use, and optimal dynamic adaptations to climate change in the agricultural and forestry sectors.

Assessing the Long Run Sustainability of US Agriculture in an Integrated Global Economy

The overall goal of this project is to leverage existing knowledge, models and data to develop a framework for understanding the interplay between global change and local sustainability of US agriculture in the context of alternative national, state and local policies affecting agricultural productivity and environmental quality. We will examine the tradeoffs between: 1) crop production, prices and food consumption, 2) land use and associated carbon dioxide emissions, 3) groundwater depletion, and 4) nitrogen losses. Theoretical analysis shows that there are no ‘win-wins’ in this context. Environmental regulations aimed at reducing nitrate leaching, groundwater depletion and land use change reduce output and raise food prices. On the other hand, policies to promote agricultural productivity create additional incentives for intensification and cropland area expansion. By quantifying the separate effects we will be able to explore these tradeoffs individually as well as search for combinations of policies that can improve the environment while ensuring food security.

The project will contribute to the field of agricultural sustainability which finds itself in the midst of a spatial information revolution with dramatic implications for public and private investments across farm, local, national and global levels. To date, multiscale analyses have suffered from excessive complexity and insufficient validation, as well as lack of replicability. By developing a new, open source framework based on existing models, data and parameters, and fostering a community of practice around these tools, this project has the potential to reshape the way we think about long run sustainability of US agriculture.

Understanding the Food-Energy-Water (FEW) nexus

This project will investigate the long-term inter-connectivity between the agriculture, energy and hydrologic systems to explore the natural and social processes, trade-offs, and conflicts involved in delivering energy, food, and water to global and US populations. Accordingly, this
The proposal assembles an interdisciplinary research team of scientists in the fields of hydrology, engineering, and economics. Specifically, we seek to understand recent and future trends in the dynamics and interactions of water and food at the global level and the system-wide functioning of water, food and electricity in the USA to mid-century.

Our overarching research question is: How will the Food-Energy-Water system change in response to environmental and social pressures, what adaptive strategies would increase resilience to these changes, and what are the tradeoffs associated with alternative adaptation strategies?

The specific research questions are:

1) **What are the FEW system impacts of feeding and fueling the world’s population in 2050?** We seek to understand how the growing global population and their increasing demand for food, energy and water resulting from simultaneous increases in both population and per capita income and climate change results in local impacts on the food-energy-water system, and how these local impacts have feedbacks on the global system.

   **Global to Local to Global Hypothesis:** Drivers of global change, including population, climate and income, will lead to increased impacts at the local level which will interact within the FEW system, and these will, in turn, have regional, national, and global consequences.

2) **What measures can be taken to alleviate the anticipated FEWS stresses in 2050?** This question addresses how humans can adapt to the changing FEW system. What decisions can be made to reduce stresses? What are the trade-offs between adaptations solely within the food or energy or water systems vs. taking a more integrated approach?

   **Interaction Hypothesis:** Responding to impacts within one sector of the FEW system will interact with the adaptation strategies in other sectors in ways that will have unanticipated consequences.

3) **How can the US FEW system become more resilient to global and local changes anticipated in the coming decades?** Guided by the understanding gained in the previous two research questions, we focus on the continental US to generate specific adaptation scenarios that will increase the robustness of this nation’s FEW system.

   **Resiliency Hypothesis:** Adaptive strategies designed when considering the integrated FEW system are more effective than strategies designed considering individual sectors independently.
**BHAGYASHREE KATARE**

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<td>Effect of Environmental Factors on the Health Outcomes of Individuals</td>
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<td>PhD</td>
<td>Measuring Food Waste in School Lunchrooms</td>
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<tr>
<td>M. S.</td>
<td>Effect of ACA’s Tobacco Surcharges on Use of Tobacco</td>
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**Effect of Environmental Factors on the Health Outcomes of Individuals**

While knowledge may influence health behaviors, research shows that external environments may also affect health behavior decisions that impact health outcomes over time. Access to healthy food and safe, affordable physical activity options can impact the ability to engage in physical activity or purchase healthy foods, especially in rural geographic areas. With this in mind, the Indiana Purdue Extension Nutritional Education Programs (SNAP-Ed and EFNEP) are focusing on improving the health of low income, food insecure population through direct education (increasing individual knowledge), and policy, systems and environment (PSE) interventions (strategies to improve external environments that impact health behaviors). The aim of this project is to develop an innovative, reliable, and validated tool that will measure the perceptions of participants of direct education programs’ environments that may affect their access to food, and physical activity. We will also assess the relationship between perceived interpersonal, community, and social environments and individual behavior and health. This tool will provide ongoing feedback that expands current knowledge about the perceptions of program participants, impacting the strategies implemented in NEP. The data analysis conducted using econometric and statistical tools will provide information about the existing problems and will help in designing effective policy measures for environmental modification. This project will allow the NC-NECE to leverage their understanding of the current environmental factors and health status of their NEP participants in the North Central region.

**Measuring Food Waste in School Lunchrooms**

In September 2015, the USDA and EPA announced the first national target for reducing food waste: 50% by 2030. This target is in response to food waste emerging as a major economic, environmental, and sustainability issue both domestically within the United States and globally. Reducing food waste directly attacks three major issues facing the United States: hungry Americans, sustainable development, and environmental degradation. Student lunchroom interventions are successful in increasing the amount of fruits and vegetables selected by students (Just and Price, 2013). However, after the implementation of new federal guidelines for healthier school lunches, reports have found a 56% increase in school cafeteria food waste (Welch 2015). Reports have shown that students are wasting large amount of fruits and vegetables (Hanks et al. 2013). School lunch interventions are aimed at
increasing the consumption of fruits and vegetables. However, it is important to quantify the amount of fruits and vegetables consumed and wasted to better understand the effect of interventions on increasing the consumption of fruits and vegetables.

A randomized control trial will be conducted to estimate the effect of the classroom Nutrition Educational Program on 2nd grade students in ten Indiana schools. The intervention involves providing nutritional education lessons to students in treatment classrooms. Students’ choice of food including vegetables and fruits will be recorded for both the treatment and control groups. The empirical data will be used to estimate of effect of classroom nutrition lessons on the choice and consumption of fruits and vegetables by the students.

**Effect of ACA’s Tobacco Surcharges on Use of Tobacco**

The Affordable Care Act (ACA) allows employers to impose a surcharge on tobacco using employee’s insurance premiums. This policy was implemented to account for the excess health care cost incurred by tobacco users and to encourage smoking cessation. There is little empirical evidence of the impacts of these tobacco use surcharge on smoking cessation or on tobacco users’ health care cost. Research shows that this policy has increased out-of-pocket premiums for many tobacco users. Using a unique employee health care data set from a biggest employer in Indiana, we will examine the effect of tobacco surcharges on insurance status and tobacco use.

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**JESS LOWENBERG-DEBOER**

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<td>Impact of Cowpea Storage Technologies in West and Central Africa</td>
<td>Gates Foundation</td>
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<td>PhD</td>
<td>Biotechnology and the Economics of the Seed Sector in West Africa</td>
<td>NGICA &amp;/or AATF</td>
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**Impact of Cowpea Storage Technologies in West and Central Africa**

Purdue and its partners in Africa are engaged in a ten country effort to disseminate the use of non-chemical cowpea storage technologies in West and Central Africa ([http://news.uns.purdue.edu/x/2007a/070606FultonGates.html](http://news.uns.purdue.edu/x/2007a/070606FultonGates.html)). Cowpeas (*vigna unguiculata*) are known as “blackeye peas” to most Americans. They are particularly susceptible to insect damage in storage. Insecticides can be used to control the storage insects, but in Africa the insecticides are often unavailable locally, too expensive for farmers, or if available and affordable frequently misused by illiterate growers. Every year the media in Nigeria reports illnesses and deaths linked to misuse of storage insecticides on cowpeas. Purdue faculty and researchers in Cameroon and Senegal have developed low cost and effective non-chemical alternatives to storage insecticides. ([http://www.entm.purdue.edu/entomology/research/cowpea/Extension%20bulletins/english.h](http://www.entm.purdue.edu/entomology/research/cowpea/Extension%20bulletins/english.h))
The objective of this research would be to measure the change in adoption of cowpea storage methods linked to the extension effort and factors that make the extension effort more (or less) effective. This research involves surveys to in several West and Central Africa countries, plus analysis using economic surplus methods and logistic regression. The surveys will focus on cowpea storage practices, economics of cowpea storage and how storage practices are influenced by extension communication.

**Biotechnology and the Economics of the Seed Sector in West Africa**

In West Africa the formal seed sector is not well developed. Most of the public sector seed system built in the 1970s and 1980s has collapsed. Only a few countries have for-profit seed companies (e.g. Ghana, Nigeria) and those companies are struggling. The main off-farm source of seed is from non-governmental organizations (NGOs), but they are not perceived as the long term solution. Seed sector underdevelopment has always constrained the dissemination of improved varieties in the region, but it becomes particularly important when genetically modified (GM) seeds are considered. With biotechnology seed companies typically acquire the additional responsibility of implementing biosafety and resistance management (e.g. refuges, rotations) plans.

A key hypothesis is that in West Africa the seed sector has not developed because improved varieties were not sufficiently better than traditional varieties to justify the transactions cost involved in seed marketing. Bt cowpea varieties may change that situation with 200% to 300% yield increases over traditional no-insecticide production. The first step in this research would be focus groups and key informant interviews with seed sector participants throughout West Africa. Case studies would be done of both functioning and failed seed businesses. Simulation may help us understand how introduction of Bt cowpea may affect the seed sector. This work would be done as part of the Network for Genetic Improvement of Cowpea in Africa (NGICA) plan to create Bt cowpea.
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<td>MS/PhD</td>
<td>Small Business Demise and Recovery after a Natural Disaster</td>
<td>Possible</td>
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<tr>
<td>MS</td>
<td>Intergenerational Transfer of Small and Medium Sized Farms and Rural Businesses</td>
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**Small and Family Business Management Strategies (US)**

Topics of interest in this area are family business management practices, self-employed women, minority business ownership and management practices. Another area of interest is the comparison of small farm businesses to non-farm family businesses. This is a collaborative study with multi-state partners in Human Ecology.

**Small Business Demise and Recovery after a Natural Disaster**

The process of business recovery from disaster has yet to be studied comprehensively. Understanding this process is important not only to characterize and reduce attrition post-disaster but also to determine whether private and government disaster relief policy, business owner practices and family and community factors are leading to recovery. Research to date has narrowly focused on business characteristics and not on the interactions and interdependencies among businesses, the business owner’s family, and the community. A systems theory approach advocates considering simultaneous stressors on the business, family, and community to understand what leads to business demise or recovery.

**Intergenerational Transfer of Small and Medium Sized Farms and Rural Businesses**

The transition of the business from one generation to another is an aspect of long-term sustainability that is often overlooked in research and educational programming. This study will identify the plans and processes that have been used by farm and non-farm rural family businesses for successfully making the management transition and for transferring business resources to a new generation, and thereby provide valuable information to help improve the long-term sustainability of small and medium-sized family farm businesses. This work will examine not only the family and the business but also the interactions that simultaneously influence the success of rural family farm and non-farm rural family businesses in Indiana, Illinois, Michigan, and Ohio, where success may be a qualitative measure of perceived achievement of family and business goals such as intergenerational transfer and/or a quantitative measure of business profit and household income.
PHILIP L. PAARLBERG

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<tr>
<td>MS/PhD</td>
<td>Plant Disease Surveillance Prioritization</td>
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**Consumer Price Expectations during Livestock Disease Outbreaks**

Traditional modeling of consumer demand specifies demand as a function of current prices and income which means single price elasticities capture consumer response to price changes during a livestock disease outbreak. Observed behavior suggests that consumers react differently to situations where price changes are perceived as temporary deviations versus situations where price changes are viewed as structural. This project is intended to support U.S. livestock disease surveillance efforts by re-specifying consumer demands for livestock products and crop products to incorporate long-run price expectations.

**Plant Disease Surveillance Prioritization**

Traditional methods of prioritizing plant disease surveillance efforts rely on crop production value. Crops with the highest production value receive the bulk of surveillance efforts regardless of the disease risk and likely spread. This research prioritizes surveillance efforts by combining disease risk, disease spread, and economic criteria. It develops a series of commodity models that can be shocked with demand and supply impacts from plant disease outbreaks to determine comprehensive measures of economic consequences. Supply shocks are based on disease spread. Using probabilities determined from risk assessment, expected welfare measures can be calculated and compared for alternative surveillance options.

PAUL V. PRECKEL

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<td>PhD</td>
<td>Modeling the Supply and Demand for Ramping Services in an Electricity Supply System</td>
<td>Indiana Utility Regulatory Commission</td>
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Assessment of the Impact of Kirchhoff’s Law on Optimal Transmission Investments

The electricity generation and transmission system is characterized by growth with a need for long term planning due to substantial lead times to get projects in place. The models that simultaneously optimize generation and transmission the typically large-scale lumpy investments are few. To date they have been primarily focused on transmission topologies that are radial from a back-bone rather than a more “grid-like” network that involves loops in the transmission system. This type of topology involves “loop flows” that are governed by Kirchhoff’s Voltage Law (KVL). KVL complicates the evaluation of investments in transmission in an electrical network because each time a new transmission link is added to the system, it changes the way that electricity flows throughout the entire network. The point of the project is to assess the potential for building a model for optimizing investment in generation and transmission over time taking KVL into account.

Modeling the Supply and Demand for Ramping Services in an Electricity Supply System

Traditionally in the electricity business we think of generation capacity as something we can dispatch – that is, we can choose to operate that capacity at any time we find it economically advantageous. Demand on the other hand is less manageable – it fluctuates based on electricity consumers’ needs which can and do change at any time without notice. Thus, there is a real-time balancing act that ensures that sufficient operating capacity is available to serve the fluctuating load (demand). The act of changing the level of generation in response to changes in the load is called “ramping” of generation. So in the traditional context, load fluctuations create demand for ramping services, while flexible generators create supplies for ramping services.

Intermittent technologies like solar power generation (and wind power generation) are more like demand in the sense that they cannot be dispatched at will – that is, if the sun is not shining, we are not generating solar powered electricity no matter how much we need it. Similarly, if the sun goes behind a cloud or the wind dies, there will be a drop in generation that is not controlled by the system operator. So, intermittent generators create demand for ramping services that may be in addition to the demand for ramping services created by load.

The rapidly expanding renewable electricity generation sector has created a need to develop techniques for explicitly modeling the supply and demand for ramping services. As with any other economic good, ramping services will have an associated price, and the supply must always be at least as great at the demand. The goal of this project is to create such a model and apply it in the context of evaluation of plans for expanding the use of renewable electricity generation.
Kwamena K. Quagrainie

Economics of fish farming (aquaculture) in the US and developing countries
Seafood supply & demand and sustainable fisheries and aquaculture

Contact Dr. Quagrainie for further details

GERALD SHively

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<tr>
<td>PhD</td>
<td>Dynamic Time Series Models of Agricultural Price Formation</td>
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I maintain a number of datasets that are appropriate for term papers and journal articles. I am always happy to work with students on related topics and methods. Two areas of special interest are the following.

Agricultural Intensification and Deforestation in the Philippines

I have four rounds of survey data focusing on agricultural production and the impacts of agricultural development near the forest margin in a remote part of Palawan, in the Philippines. Students and I have previously used these data to study the ways in which technological advances in agriculture (in this case irrigation development) have had spillover environmental effects. The data have also been used to look at production efficiency in rice production and other issues.

Estimating Dynamic Time Series Models of Agricultural Price Formation

I have an ongoing interest in time series econometric work focusing on dynamic models of agricultural price formation and market integration, including models with spatial characteristics, structural breaks, and changes in regime. I have very interesting sets of data from Ghana and the Philippines that are ideal for graduate students interested in advanced time series econometric work. These data are available for term paper and thesis writers.
Economic and Environmental Impacts of Cover Crops

Cover crops are crops grown over the winter period that serve to reduce soil erosion, enhance soil organic matter, and provide other benefits. Our work to date suggests that under some conditions cover crops provide benefits in excess of costs even without considering downstream environmental benefits. This project will examine additional cases and production conditions and estimate the economic and environmental impacts of cover crop adoption.

Techno-economic Economic and Policy Analysis of Aviation Biofuels

The most promising market for biofuels is the aviation market. On the ground, there are other options for greener transportation such as electric vehicles and compressed natural gas vehicles. However, electricity and natural gas cannot be used in aviation. If the aviation sector is to be greener, then biofuels is the only option. There are numerous pathways to produce aviation biofuels from biomass feedstocks. What this project will entail is modeling some of the pathways and evaluating the risk associated with the different pathways. In addition, we will evaluate the effectiveness of alternative policies in reducing that risk. Only if private investor risk can be reduced will we see successful launch of an aviation biofuels industry.

Evaluation of Alternative Biofuel/Energy Policies

The U.S. has committed to reducing GHG emissions, but as of now has no set of coherent energy policies to achieve the emission reductions. Also, the biofuel Renewable Fuel Standard may be modified in the future. To prepare for actions in these areas, analysis of alternative policies in both areas is needed. We have research proposals pending in both areas.
Energy/Climate Change Research

Climate change is perhaps the most important issue being faced by our society today. Yet, we know very little about the economic consequences of different climate policies. Climate change is closely related to energy and energy policy. There is scope for several research topics related to energy and climate change. Some may use the GTAP model, and others may use an energy sector model called MARKAL. The GTAP model provides complete coverage for all sectors, whereas the MARKAL model provides very rich data and coverage of all energy sectors. I am open to considering any topics in this general area.

H. HOLLY WANG

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<tr>
<td>MS/PhD</td>
<td>Risk Analysis for Agricultural Market and Insurance</td>
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Chinese Food Demand and Food Safety

China is the most populous country in the world with a fast growing economy. Its food consumption and demand are an important issue internationally, especially for the US, the large agricultural exporting country. Chinese consumers’ preference on food, especially related to food safety issues can be evaluated by surveys, simulated experiments, and real experiments. New tools are constantly being developed in evaluating consumers’ preference. There will be plenty of opportunities to collaborate with scholars in China through field work, international conferences and paper coauthoring.

Risk Analysis for Agricultural Market and Insurance

Commodity futures market, crop insurance and US government agricultural programs have provided risk management benefits to crop growers. New policies have been developed from time to time, and their risk management effectiveness and income transferring effects are needed to be evaluated for farmers growing different crops. The impact of these programs may also in the crop choice decisions that interact with energy, environment and natural resources.
Changing Consumer Demand and Preferences for Credence Attributes of Livestock Production Practices (currently dairy focused)

Consumers are increasingly sensitive to processes and procedures employed in animal agriculture. Prior to changing processes on farms, economic impacts for both producers and consumers must be assessed.


As consumer demand requires changes in agricultural production practices, producers are faced with decisions regarding the adoption (or disadoption) of production practices on their farms. Producers can potentially face changes in the production practices available for their use through both market and regulatory mechanisms. As agricultural producers consider changes in the production processes used, economic impacts of such changes on both the producers themselves, as well as eventual impacts on consumers overall, must be assessed in order to provide insight into potential impacts on production and markets in the future.

Consumers are incorporating information (and/or their perceptions) regarding animal welfare, impacts on the environment, and social responsibility, into their food purchasing decisions. The line between food safety, animal welfare, and environmental impacts is often blurred; it is difficult to distinguish the motivation for purchasing decisions into only one of these categories. Regardless of the motivation behind these decisions by consumers, producers are facing tough decisions regarding adoption of alternative production practices to meet consumers’ demands for certain product attributes (i.e., pasture-based livestock rearing systems, alternative ration formulations, disadoption of previously widely accepted technologies).
Optimal Replacement Policies for Rejuvenated Power Plants

In 2015, more than 90% of America’s coal-fired power plants will be over 30 years old. Many of these plants do not have the emission technology to meet new EPA air emissions regulations. The hypothesis is under the right conditions and policies it may be feasible to rejuvenate the power plants through retrofitting and co-firing with wood pellets. With such rejuvenation the life of a power plant can be extended, which delays the decision of plant replacement. Providing an avenue for delaying a decision results in keeping the option of replacement opened, which has value. Considering this option value mitigates the cost of rejuvenation making it more attractive. The extended lives may allow for the replacement of new technologies not yet available, which can lower costs. There is value in this ability to extend a power plant’s life. The objective is to estimate this value and determine the optimal time of when to retrofit and then replace a power plant in a stochastic environment. The theory of asset rejuvenation/replacement will be combined with real options analysis in developing the optimization model. Policies directed toward the possible adoption of co-firing wood pellets with coal will be developed based on the model results.
Economic Analysis of Policies that Combat Obesity Through Restrictions on Food Retailing: A Mechanism Design and Experimental Economics Approach

We will use modern mechanism-design and experimental economics to study the economic consequences of public policies that restrict the marketing of foods and beverages believed to contribute to obesity. The most prominent example of such policies are recent proposal to ban large sized sodas in New York or to impose sugar taxes. Advocates of these policies base their proposals on linkages that medical researchers have found between “harmful” ingredients and obesity. But the economic consequences of such policies are largely unknown. We will fill this void by adapting mechanism design tools to model the behavior of food retailers, particularly their use of strategic marketing practices called nonlinear pricing. From this perspective, “soft” bans distort the returns to nonlinear pricing, and thus induce firms to change marketing practices. For example, a ban on large sodas might induce firms to change how they bundle sodas with other items (e.g., combo meals). This endogenous supply—which has been ignored in current debates—has consequences for seller and consumer welfare, and also for the efficacy of policy. Our modeling effort will yield analytic predictions on the economic consequences of food marketing policies and we use experimental economics to test the theoretical predictions and identify potentially important behavioral anomalies.

Experimental Economics and Applications to Agricultural Problems

Ph.D. students who are interested in experimental economics are encouraged to present ideas or jointly develop ideas with professor Wu to conduct economic experiments. Funding will be available for experiments that have potential to lead to joint publications. Professor Wu is flexible with regard to subject matter and is open to questions related to agriculture, development, energy, mechanism design, agribusiness, and/or contract theory/organization design. The primary criteria is that the idea is interesting and important, addresses an agricultural economics related issue, and potentially leads to publications and at least one dissertation essay.