The 2025 NC1034 Annual Meeting

March 28-29, 2025

241 Giannini Hall, UC Berkeley,
Berkeley, CA

Final Program

Friday, March 28, 2025

8:00 am, continental breakfast

9:00 am, Selected Papers Session 1
(hybrid, zoom link: https://auburn.zoom.us/j/5155201979)

Title: The contribution of startups, venture finance, and patenting to innovation in U.S. agriculture
Presenter: Gregory Graff (Colorado State University)

Title: The Impact of Information on Input Market Pricing: Evidence from a Bull Market
Presenter: Jared Hutchins (University of Illinois Urbana-Champaign)

Title: Drought-Tolerant Corn and Drought Adaptation: Productivity, Input Complementarity, and Risk Effects
Presenter: Jonathan McFadden (ERS, USDA)

Title: A Half-Century of Genetic Engineering: Advancements and Foregone Benefits in Research on Enhancing Nitrogen Use Efficiency in Rice
Presenter: Yu Yvette Zhang (Texas A&M)

11:00 am, Selected Papers Session 2
(hybrid, zoom link: https://auburn.zoom.us/j/5155201979)

Title: Natural Disasters, Infrastructure, and Income Distribution: Empirical Evidence from Global Data
Presenter: Gahl Hochman (University of Illinois Urbana-Champaign)

Title: Navigating the Interplay of Social Media, News Coverage, and Market Decisions in Food & Agriculture
Presenter: Valerie Kilders (Purdue University)

Title: GTAP-SIMPLE-G: Enhancing Localized Agricultural Production and Land Use Assessments under Global Trade Policies
Presenter: Zhan Wang (Purdue University)

Title: Optimal Exploration and Observed Price Paths in a Hotelling Model with Stochastic Discoveries
Presenter: Brian Wright (UC Berkeley)

1:00 pm, Lunch and Bioeconomy Roundtable
(hybrid, zoom link: https://auburn.zoom.us/j/5155201979)

Introduction by David Zilberman (UC Berkeley) -- the emerging circular bioeconomy

Panelists:

John Coates, Distinguished Director, Energy & Biosciences Institute, UC Berkeley;

Susan Jenkins, Executive Director, Bakar Fellows Program, UC Berkeley;

Brad Ringeisen, Executive Director, Innovative Genomics Institute, UC Berkeley.

3:30 pm, Panel Discussion on Current Research Funding Issues
(hybrid, zoom link: https://auburn.zoom.us/j/5155201979)

Panelists:

Tala Awada, Associate Dean and Associate Director, Agricultural Research Division, University of Nebraska.

Lowell Randel, the Randel Group;

Laura Wood, the National Coalition for Food and Agricultural Research (NCFAR).

6:30 pm, Dinner at Alborz Restaurant; Guest speaker: Gordon Rausser (UC Berkeley)

Saturday, March 29, 2025

8:30 am, Breakfast and Business Meeting, 241 Giannini Hall, UC Berkeley

10:00am, Selected Paper Session 3
(hybrid, zoom link: https://auburn.zoom.us/j/5155201979)

Title: Plant Breeders' Rights Certificates Values: Evidence from Canada
Presenter: Wojciech Florkowski (University of Georgia)

Title: Seed Innovation and Climate Resilience in China: Evidence from China's Agriculture
Presenter: Yanhong Jin (Rutgers University)

Title: How is China Shaping Global Food Supply Chains? Insights from the Seed Industry
Presenter: Carl E. Pray (Rutgers University)

Title: Repercussions associated with traceability, labeling, and coexistence requirements for plants obtained by New Genomic Techniques in the European Union
Presenter: Justus Wesseler

12:00pm noon, Adjourn

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Option 2: You can also use the Berkeley-Visitor Wi-Fi Network (see instructions here: https://berkeley.service-now.com/kb_view.do?sysparm_article=KB0014552)

Organizing Committee Contact Information

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David Zilberman, email: zilber11@berkeley.edu, phone: 510-290-9515.

Presentation Abstracts

(Listed alphabetically by presenters' last names)

Plant Breeders' Rights Certificates Values: Evidence from Canada

Presenter: Wojciech Florkowski (University of Georgia)

Abstract:

Plant Breeders' Rights (PBR) certificate, as a form of intellectual property protection, provides horticultural and agricultural individuals, companies, and institutions the exclusive right to produce and reproduce new varieties of plants and encourage the development and commercialization of new crop varieties for the benefit of society. Public entities breeding programs were commonly thought to be less sensitive to the PBR's value, because they served the broader public interests by providing an assortment of new crop varieties. However, studies have yet to explore the value of PBRs, especially the potential value differences between the private and public sectors. This study employs a renewal model to estimate the value of PBR certificates and further investigates how values can be influenced by whether applicants are private companies or public sectors and other applicant characteristics. PBR application data by crop kind are from the Canadian Food Inspection Agency (CFIA) and comprise applications filed between 1992 and 2012. The life cycle of PBR certificates include those that either matured in 2017 or surrendered prematurely due to non-payment of the annual renewal fee. The empirical model results indicate private-sector PBRs have lower values than public institutions. The values of PBRs from companies or individuals are Can$ 6,612.04, while values from the Department of Agriculture and university/research institutions are Can$ 20,439.24 and Can$ 28,651.34, respectively. This is the first study to examine the value gap differences of PBRs between public and private sectors, which suggests in terms of monetary value, the public sector values are at least 3-4 times larger than that of the private sector. Examination of the private-public value differences sheds light on government policy and the motivation behind R&D investment and innovation decisions, which helps promote the case for greater public sector investments in plant variety improvement and innovation.

The contribution of startups, venture finance, and patenting to innovation in U.S. agriculture

Presenter: Gregory Graff, Colorado State University
Co-authors: Charles deGrazia, Ecole de Management Léonard De Vinci
Nicholas Rada, United States Patent and Trademark Office

Abstract:
To evaluate the role played by startup companies in the innovation ecosystem of U.S. agriculture, we compile a unique dataset of 6,024 startups founded 1987-2019 that details their financing lifecycles, annual economic performance, and patenting activities. One-third of the startups in the sample have observable signs that they are contributing to innovation. Yet many of them operate in industry sectors or technology fields not generally identified as agricultural. In aggregate, external financing and patenting by startups have grown substantially over the time period, and those startups with patent applications have received more external financing than those without. We use a discrete-time survival analysis to test factors related to startups receiving investments as well as achieving successful financial exits. We find startups that filed for a patent have a higher likelihood of receiving investments than those that did not. Patent applications also increase the relative probability of a successful financial exit, which takes place primarily through mergers and acquisitions (M&As). In about a third of the M&A exits reported by startups with patent portfolios, the startups are acquired by corporate incumbents already conducting R&D in agriculture. The startups acquired by incumbents hold relatively larger portfolios of patents that are more highly cited yet technologically more narrowly focused. Importantly, a substantial portion of the startups in the sample are still too young to have attained venture financing let alone a financial exit.

Natural Disasters, Infrastructure, and Income Distribution: Empirical Evidence from Global Data

Presenter: Gahl Hochman

Abstract:

Natural disasters—such as flooding, hurricanes, and earthquakes—have, on average, affected 130 million people and caused more than 40,000 deaths annually worldwide over the last three decades. The average annual value of property damage is estimated at more than 90 billion dollars globally. Corresponding relief and reconstruction packages measuring in billions of dollars over the last three decades have brought large new investments and the formation of new capital assets. The literature has debated the distributional impacts of natural disasters across households by income group. Most studies focus on a specific country or region, and the findings do not converge. Some find that natural disasters reduce income inequality, while others report the opposite. This study adds new empirical evidence on the impacts of natural disasters on income inequality by pooling data from 130 countries for the 1990-2017 period. The study employs the generalized synthetic control method, which involves identifying the causal effects by comparing the actual post-disaster Gini index for treated countries with a counterfactual. The data are from the EM-DAT database maintained by the Centre for Research on the Epidemiology of Disasters and covers 70% of natural disasters globally. The key finding of the study is that catastrophic natural disasters have negative relationships with inequality, as measured by the Gini index, in both the short and long run. The study also discusses potential mechanisms, such as physical infrastructure, disruptive creation, institutions, political revolution, and financial aid, to further explain findings from the empirical analysis.

The Impact of Information on Input Market Pricing: Evidence from a Bull Market

Presenter: Jared Hutchins

Abstract:
I use a hedonic model to estimate the impact of introducing new product characteristics into an agricultural input market in the United States. In the dairy genetics market, the US Department of Agriculture routinely adds characteristics to dairy bulls for sale when improvements in research and data allow scientists to measure new outcomes. To understand how dairy farmers have reacted to new traits being added to the market for cattle genetics, I use the prices and characteristics of over 24,000 dairy bulls sold between 2000 and 2010 to estimate the impact of adding new health traits on cattle pricing. When examining a trait measuring fertility introduced in 2003, I find that the trait initially capitalized negatively into cattle prices but eventually capitalized positively. For dairy farmers, selecting on fertility selects against milk production and so presents a trade-off. My results suggest that understanding the correlations between cattle characteristics is key to understanding how new characteristics will impact cattle pricing and the demand for other, similar traits.

Seed Innovation and Climate Resilience in China: Evidence from China's Agriculture

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Abstract:

Rising temperatures have significantly impacted agricultural productivity (Lobell, et al., 2013, Lobell, et al., 2011, Schlenker and Roberts, 2009), raising key questions about how climate change drives agricultural biotechnological innovation and its effectiveness in mitigating climate damage.

Moscona and Sastry (2023) show that US agricultural innovation has increasingly targeted heat vulnerable crops, reducing 20% of economic losses in agricultural land value and potentially offsetting 13% of projected damage. However, little is known about how innovation has responded to climate shifts in low- and middle-income countries (LMICs), which rely more on public R&D funding (Fuglie, 2018, Nin-Pratt, 2021) and face an "adaptation deficit" due to lower institutional capacity (Birkmann and Welle, 2015).

The study investigates the relationship between climate change and seed innovation in China, providing insights for assessing the economic resilience of other LMICs countries. Specifically, it addresses a) how extreme heat influences crop seed innovations and the adoption of seed varieties of different traits; b) the extent to which seed innovation mitigates climate damage; and c) how these effects vary between the private and public breeding sectors.

Preliminary results show that rice seeds are climate-smart, as they are both resilient to climate impacts and yield higher than conventional varieties. In contrast, corn seeds are climate-adoptive, exhibiting lower yields than non-climate varieties, while wheat shows no statistically significant yield difference compared to conventional seeds. Furthermore, we find the effects of extreme heat on seed innovation and the adoption of seed varieties vary significantly by crop and between public and private breeding sectors. However, seed innovation is found to mitigate climate damage across crops.

Reference

Birkmann, J., and T. Welle. 2015. "Assessing the risk of loss and damage: exposure, vulnerability and risk to climate-related hazards for different country classifications." International Journal of Global Warming 8:191-212.

Fuglie, K. 2018. "R&D capital, R&D spillovers, and productivity growth in world agriculture." Applied Economic Perspectives and Policy 40:421-444.

Lobell, D.B., G.L. Hammer, G. McLean, C. Messina, M.J. Roberts, and W. Schlenker. 2013. "The critical role of extreme heat for maize production in the United States." Nature climate change 3:497-501.

Lobell, D.B., W. Schlenker, and J. Costa-Roberts. 2011. "Climate trends and global crop production since 1980." Science 333:616-620.

Moscona, J., and K.A. Sastry. 2023. "Does directed innovation mitigate climate damage? Evidence from US agriculture." The quarterly journal of economics 138:637-701.

Nin-Pratt, A. 2021. "Agricultural R&D investment intensity: A misleading conventional measure and a new intensity index." Agricultural Economics 52:317-328.

Schlenker, W., and M.J. Roberts. 2009. "Nonlinear temperature effects indicate severe damages to US crop yields under climate change." Proceedings of the National Academy of Sciences 106:15594-15598.

How is China Shaping Global Food Supply Chains? Insights from the Seed Industry

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Abstract:

China’s global expansion of state-owned enterprises like ChemChina and Longping High-Tech (LPHT), along with agricultural policy reforms, is revolutionizing global food supply chains. This study investigates China’s growing role in the global seed market and innovation, focusing on acquisitions such as Syngenta and LPHT and the rise of local companies. We find that while China has advanced in the seed industry efficiency and innovation, its influence on the global industry structure remains limited, primarily affecting South America’s corn seed sector. Ongoing government investment in research and international expansion are expected to drive further innovation and global market integration.

Navigating the Interplay of Social Media, News Coverage, and Market Decisions in Food & Agriculture

Presenter: Valerie Kilders (Assistant Professor, Purdue University, vkilders@purdue.edu)

Abstract:

A majority of U.S. news now relies on an online presence. Likewise, social media has become a central platform for public opinion, news acquisition, and shaping market perceptions. This presentation synthesizes three case studies using web scraping for social media listening to illustrate the multifaceted relationship between online discourse, news coverage, and decision-making in food and agriculture. One case examines the growing spotlight on “regenerative agriculture,” contrasting it with organic standards and probing whether corporate commitments align with broader public interest. Another explores how surging egg prices from early 2022 to mid-2023 triggered heightened online attention and negative sentiment. The third investigates how banana and avocado imports and sales relate to news coverage and public conversation.

Across these scenarios, social media listening data reveal that online chatter is linked to news coverage, yet not always predictably. While spikes in coverage can drive sudden surges in sentiment and mentions, discourse often tapers off quickly, highlighting the complexity of sustaining digital engagement. Similarly complex is the connection between production, import, and sales decisions—along with consumption behaviors, which exhibit a heterogeneous relationship with both news coverage and public discourse. These findings underscore the value of integrating social media analysis into market strategies and policy considerations, offering a nuanced perspective on the public’s evolving priorities and concerns in the food and agriculture sectors.

Drought-Tolerant Corn and Drought Adaptation: Productivity, Input Complementarity, and Risk Effects

Jonathan McFadden (ERS, presenter), Sam Bailey (ERS), Dan Bonin (ERS), Laura Paul (ERS), and Jonathan Malacarne (University of Maine)

Increasing urgency of adaptation to weather extremes has spurred innovation throughout agricultural input markets, including the development of crops with heightened capacity to withstand stress. Improved tolerance to drought in corn, soybeans, and wheat could have significant implications for food security and income stability (e.g., Fisher et al., 2015, Malacarne and Paul, 2022). In the United States, use of drought-tolerant (DT) corn stood at over 22% of planted corn acres in 2016, partly facilitated by increases in DT mechanisms and conventionally bred DT varieties. Although adoption determinants have been studied (McFadden et al., 2019; 2023), less is known about economic effects and longer-term adaptation (Lee et al. 2024). We explore how DT traits: 1) influence moments of farmers' yield distributions under drought and non-drought conditions, 2) relate to irrigation and water-conserving management by estimating their degree of substitution, and 3) interact with risk by assessing the relationship between DT seed use, profit margins, and crop insurance levels.

Using field-level data from USDA's Agricultural Resource Management Survey (ARMS) in years 2016 and 2021, we estimate modified translog production functions that allow for the DT trait to influence both the mean and variance of corn yields. Control functions are used to instrument for the potential endogeneity of DT seed use. We find that DT traits increased average U.S. corn yields by 4-8% during 2016-21, with small negative effects on yield variance. Irrigation and DT are found to be weak substitutes in the (dual) Morishima sense, in addition to conservation tillage and DT.

GTAP-SIMPLE-G: Enhancing Localized Agricultural Production and Land Use Assessments under Global Trade Policies

Presenter: Zhan Wang (Purdue)

Abstract:
Understanding the localized impacts of global agricultural trade is crucial for designing effective agricultural and environmental strategies. Global trade policies, particularly tariffs, have profound effects that are not uniform within countries, but complex, heterogeneous effects on localized crop production land use conversion. To capture these dynamics, this study introduces GTAP-SIMPLE-G, a novel computable general equilibrium (CGE) model that extends the Global Trade Analysis Project (GTAP) framework. It incorporates crop production and land use systems defined at the grid-cell level with 5 arcminute resolution. Each grid cell determines its land allocation and crop production, while all grid cells are interconnected through markets of agricultural inputs and crop outputs, governed by supply – demand equilibrium at national and global levels. This Global-Local integration enables GTAP-SIMPLE-G to simulate the localized impacts of trade policies, accounting for spatial heterogeneity in agricultural productivity, environmental implications of land-use change, and market-mediated spillover effects across subnational regions. In this study, GTAP-SIMPLE-G is applied to simulate the impact of China's tariffs on U.S. soybean exports on Brazilian crop production and land use at a local level. Results show that the tariff not only increases Brazilian soybean production but also induces highly heterogeneous responses in other crop production and cascading land use conversions. These findings provide valuable insights for stakeholders by linking global trade dynamics with localized agricultural and environmental outcomes.

Repercussions associated with traceability, labeling, and coexistence requirements for plants obtained by New Genomic Techniques in the European Union

Justus Wesseler[a] (presenter), Kutay Cingiz[a], Maximilian Kardunga[a], Margherita Simonettia[a], Yan Jina[a]

[a] Agricultural Economics and Rural Policy Group, Section Economics, Wageningen University and Research, The Netherlands

Abstract:
The European Union (EU) aims for climate neutrality by the year 2050. This requires a reduction in greenhouse gas emissions across several sectors, including agriculture. The EU farm-to-fork strategy is expected to provide a major contribution toward climate neutrality in the agricultural sector. Studies on the impact of the farm-to-fork strategy have shown that this will not be possible without further substantial technical change in agriculture. New genomic techniques (NGTs) are among the technologies that can provide a major contribution to reducing the climate footprint of European Union (EU) agriculture while also providing additional environmental benefits including positive impacts on biodiversity and food security.

The European Commission developed a proposal for a simplified approval process for crops derived by NGTs. A debate has emerged whether or not labelling and traceability as well as coexistence measures should be included.

This study analyses the economic effects of EU labeling and traceability policies and the application of coexistence measures for five crops with traits derived from new genomic techniques. We use an economic displacement model for assessing the welfare implications. Results show coexistence measures and labelling and traceability policies reduce potential welfare gains substantially with negative implications for food security. We discuss the implications for EU and international food policy.

Optimal Exploration and Observed Price Paths in a Hotelling Model with Stochastic Discoveries

Authors: Ivar Ekeland, Wolfram Schlenker, Peter Tankov, and Brian Wright
Presenter: Brian Wright

Abstract:

A model integrating optimal instantaneous exploration into the classic Hotelling model for non-renewable resources balances delaying costly exploration of a finite resource for deposits of reserve against the benefits of advance information regarding ultimately available reserves. Decisions to cease exploration are made after the next discovery anywhere in the remaining resource, implying a non-local alternative to the Hamilton-Jacobi-Bellman (HJB) equation. We demonstrate the existence of a frontier of critical proven reserve levels, dictating exploration dynamics: exploration halts above this threshold and proceeds infinitely fast below it. For large initial resources, this frontier defines three regimes. It starts almost flat, with insignificant minimum reserves, then increases as exploration exhausts the finite unexplored resource and minimum reserves rise to a maximum. Starting from the current price of reserves, the expectation of the future price always rises at the interest rate as the horizon recedes, but current price jumps up or down after an impulse, depending on resources explored and reserves discovered. Consistent with empirical studies of realized price series, the expected rate of increase of price over the sample interval, conditional on non-exhaustion, is lower, varies and tends to decrease with sample length.

A Half-Century of Genetic Engineering: Advancements and Foregone Benefits in Research on Enhancing Nitrogen Use Efficiency in Rice

Qiqi Chen[1], **Yu Yvette Zhang**[1](presenter), David Zilberman[2]

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Over the past half-century, genetic engineering (GE) has played a transformative role in agricultural development. This study develops a framework for sustainable crop production, focusing on increasing yields, reducing fertilizer use, and enhancing profitability for farmers through genetically engineered crops. The meta-analysis of research from the past half-century shows significant improvements in nitrogen use efficiency and yields in rice cultivation, making GE adoption economically viable. Global adoption of GE rice could increase food production by 25%, or maintain current production levels with a 20% reduction in cultivated land and a 20% decrease in global fertilizer use. Our study suggests that the wide adoption of GE rice could substantially expand the global food supply or reduce farmland use and fertilizer application. Even with partial adoption, the yield increase could lead to a significant drop in rice prices, promoting land conservation and diverse agricultural strategies. The delayed adoption of GE technology could mean missing out on these gains in crop productivity and environmental sustainability.

Our findings emphasize the importance of introducing regulations that enable biotechnology to maximize its potential in improving social welfare. GE rice could play a crucial role in enhancing food security while reducing environmental costs, such as greenhouse gas emissions and land use, offering valuable insights for policymakers and researchers in agriculture and sustainability.

Evolution of Innovation and Production Supply Chains: The Case of Microalgae-Based β-Carotene

Authors: Ruslana Rachel Palatnik, Michael Borowitzka, Gal Hochman, David Zilberman

Presenter: David Zilberman

Building a bioeconomy, which relies on biological processes and feedstock to produce renewable products is a key component of sustainable development. It requires analyses that integrate biophysical considerations into economic models. This, in turn, is driven by the establishment of two supply chains: an innovation supply chain and a product supply chain. We also need to model and understand the relationship between a new industry producing natural products, and a corporation producing a chemical product under different assumptions.

We bring the case of beta-carotene to illustrate how the new biotechnology sector has been introduced, and how the symbiotic relationship between the innovation supply chain and product supply chain evolved. Moreover, we show how this new sector has not only generated economic value but also enhanced the future of related algae sector industries through recombinant innovation. We rely on analyses from some of the leading innovators and entrepreneurs of natural beta-carotene (including Michael Borowitzka, one of the authors). The approach we take of combining modeling data and interviews should be useful for further studies of supply chain.