

Chapter 18. Social Value of the Giannini Foundation

Alex F. McCalla and Gordon C. Rausser

Abstract

The history of the Giannini Foundation is replete with beneficial contributions to the understanding of contemporary issues facing California agriculture and its environment, as well as providing meaningful solutions to many impending crises. We argue that the Giannini Foundation is the causal source of what distinguishes the University of California, in the field of agricultural economics, from other land-grant universities. In assessing the social value of the Foundation as an institution, we briefly describe its unique origin with its well-articulated purpose to promote the “economic status of California agriculturalists.” Over the course of its history, its commitment to empirical insights, which continue to inform the practical recommendations made by the Foundation’s members, underscore a drive towards scientific excellence. Much of its social value stems from the immense human capital that has accumulated across the three university campuses that comprise the Foundation. It is not just that some of the most noted agricultural economists have studied and trained at the Giannini Foundation, but they have created an institution that emphasizes generating improved methodologies for empirical analysis, becoming the nexus for the best conceptual frameworks as well as statistical and econometric methodologies within not only California, but across all land-grant universities throughout the United States.

Authors' Bios

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Notes from the authors: We have chosen largely to avoid chronicling which specific members of the Foundation did what and when, and what in our subjective views were the merits of individual contributions. Instead, our focus is on the collective value of the Giannini Foundation for California food and agriculture.

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Introduction

The Giannini Foundation of Agricultural Economics is nearly 90 years old, having been established as a functioning institution of the University of California at the beginning of the Depression in 1930 following A.P. Giannini's gift of \$1.5 million in 1928. The letter from the Bancitaly (later renamed the Bank of America) transmitting the gift, dated Feb. 10, 1928, stated in part:

It should be understood that the activities of the Foundation are to be regarded as chiefly: (a) those of research, with the purpose to find the facts and conditions which will promise or threaten to affect the economic status of California agriculturalists; and (b) those of formulating ways and means of enabling the agriculturalists of California to profit from the existence of favorable facts and conditions, and to protect themselves as well as possible from adverse facts and conditions. (Johnston and McCalla, 2009)

Given this mandate, our purpose in this chapter is to assess the social value of the Foundation. It is clear that the intent was not to just be a passive research organization (finding facts and conditions that affect the well-being of farmers) but also to be an activist in “formulating ways and means of enabling the agriculturalists of California” to profit from favorable events and protect themselves from bad ones. In other words, this chapter evaluates how effective the Foundation has been in providing relevant information and analysis that helped individual agriculturalists do better. We also assess the effectiveness of the Foundation in helping formulate and evaluate policy options and policy performance.

In our assessment, over the almost 90-year history of the Foundation, it is critically important to recognize the evolution of California agriculture over the same period. At the outset of the Foundation, California agriculture in 1930 was just completing a comprehensive transformation from extensive dryland agriculture to intensive irrigated agriculture.

After falling in the 1860s and 1870s, the share of intensive crops in the value of total output climbed from less than 4 percent in 1879 to over 20 percent in 1889. By 1909, the intensive share reached nearly one-half, and by 1929, it was almost four-fifths of the total. In terms of the crops

produced—the scale of operations, the quantity and seasonality of the labor demanded, and the types of equipment needed—California agriculture was a very different place than it had been 50 years earlier. (See Olmstead and Rhode, Chapter 2)

It was also entering the Depression unprepared:

Thus California came to the beginning of the decade of the Great Depression with a vastly expanded and as yet unadjusted producing plant, with little experience in meeting Depression conditions and with a comparatively heavy load of debt. (Johnston and McCalla, 2009)

The Depression had hit hard and late in California. (Johnston and McCalla, 2009)

By 1930, groundwater depletion leading to water shortages was emerging as the dominant threat to the industry as the Depression struck full force. So, the new Foundation came into being in extremely challenging times. After surviving the Depression, California agriculture thrived during WWII and continued to grow in the post-war period so that by the 1960s it was the largest state agricultural sector in the United States.

California agriculture also greatly increased the diversity of commodities produced so that by 1950, the agricultural statistics report claimed California produced more than 200 commodities. That diversity doubled again by 2016 when the same report then boasted that California produced over 400 commodities. It was by then a \$50-plus billion per year agricultural industry, the largest in the U.S., producing output with value nearly equal to the sum of the next two largest states, Iowa and Texas.

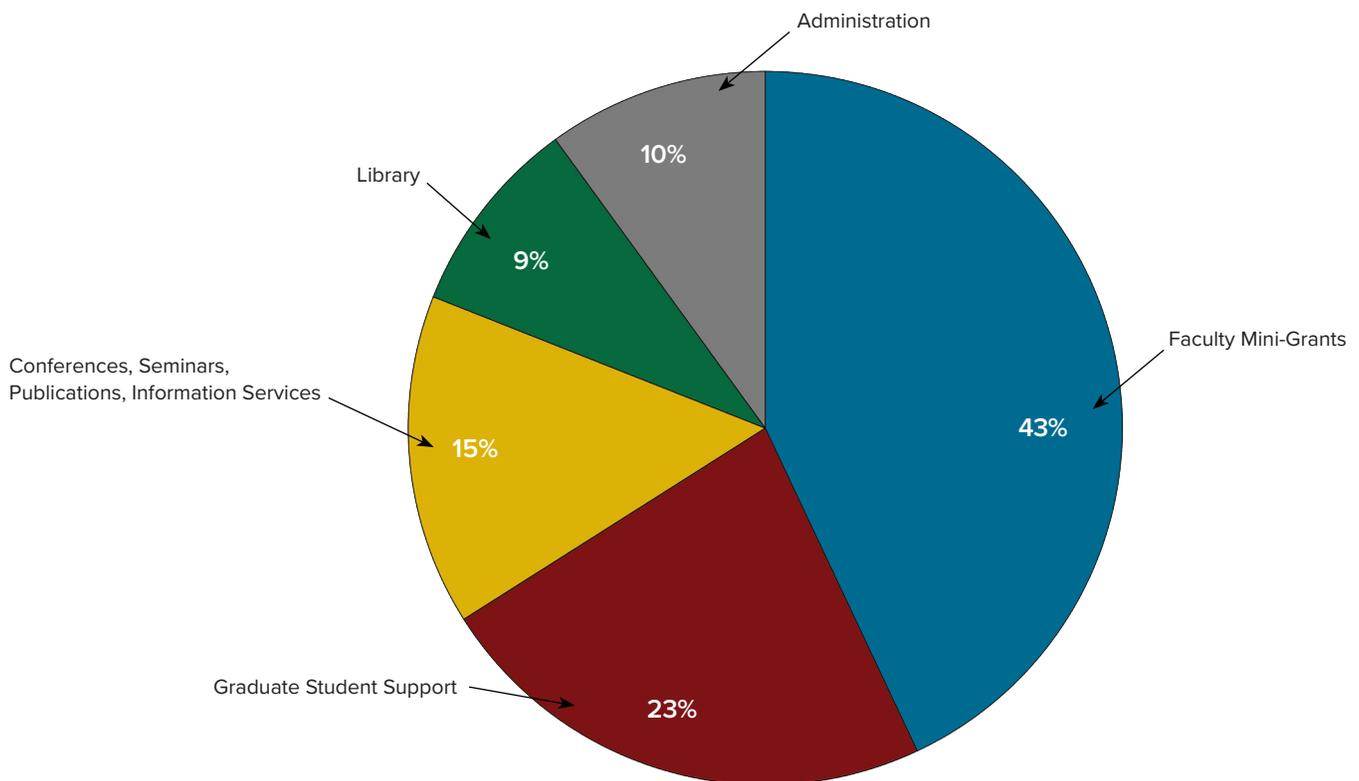
During this evolution of California agriculture, the overall purpose of the Foundation remained engaged in improving and enhancing the well-being of all participants in California agriculture. However the mechanisms used—human capital development; information collection and distribution; historical and descriptive analysis; applied research; projections and forecasts; and policy prescriptions—continuously adjusted as both California agriculture and the University of California grew and changed.

Initially, the Foundation had 14 founding members at UC Berkeley. Most, if not all, of them had joint appointments with other academic units, including Agricultural Extension. The Foundation had an endowment of \$1.5 million, one-third earmarked for building Giannini Hall. It was managed from Berkeley. Well over half of early returns from the endowment were invested in the Giannini Foundation Library. In the beginning, the Foundation members were principally agricultural economists focusing on all facets of the markets for California agricultural production and the distribution of food to final consumers. However, with the increasing generation of agricultural production externalities, the expertise of Foundation members expanded to include environmental economists as well. Similarly, the competition for finite resources led to enhanced resource scarcity and as a result the membership was expanded to create focal points for resource economists. As the performance of California agriculture began to depend increasingly on export markets due to increasing globalization, once again Foundation expertise was expanded to include trade and development economists. Finally, given the importance of government intervention

and regulation, Foundation members incorporated policy analysts into their membership.

Currently, the Foundation webpage lists 70 members and associate members. The market value of the endowment in 2017 approached \$25 million, generating spendable income of nearly \$1 million per year. Expenditures, averaged over the last five years, have been allocated as follows: 43 percent for faculty mini-grants (seed money) to encourage members to initiate innovative research with a broad interpretation of the endowment's focus on California agriculture; 23 percent for graduate student support similarly focused; 15 percent for conferences, seminars, publications, and information services; a declining share of 9 percent for the library; and 10 percent for administration. The faculty mini-grants and graduate student support allows Foundation members to pursue the Foundation mandate addressing problems that matter for which high-quality, nimbly-responsive research might well make a difference. Aside from the focus on California agriculture, the Foundation funding for research and graduate student support is unrestricted.

Figure 1: Giannini Foundation Expenditures, 2013–18



Source: Giannini Foundation of Agricultural Economics

Giannini Foundation Output

An early effort after the establishment of the Foundation, was to invest in the creation and development of a library. The Giannini Foundation Library that received much of the early investment became a world-class library of agricultural economics second only to the National Agricultural Library's holdings in Washington, D.C. Quoting a report to UC Board of Regents on April 22, 1966, "The Library, established in 1930, is believed unsurpassed in the world of agricultural economics and related fields, with its collections of approximately 12,000 books, more than 2,000 serials—including 700 periodicals—and a large collection of pamphlets" (Johnston and McCalla, 2009). The library enabled scholars, inside and outside the Foundation, to have the best possible access to a growing national and global literature. A library to a social scientist is as important a research tool as a herbarium is to a botanist, soil profiles are to a soil scientist, or a wet lab is to a biochemist. It encouraged research on the cutting edge by allowing access to the best existing knowledge. At its zenith, the Giannini Foundation Library was arguably one of the world's largest collections of agricultural economic information, and contributed to the quality and quantity of research by developing the skills of its users. Its existence was a powerful attractant for new faculty and it was a magnet for graduate students.

Computers, digitization, and the cloud have transformed how information and analytical results are stored. The Giannini Foundation Libraries at UCB and UCD have been mostly digitized. The commitment to ensure a high-quality source of global information endures, but the space required is now only a small fraction of what was formerly required.

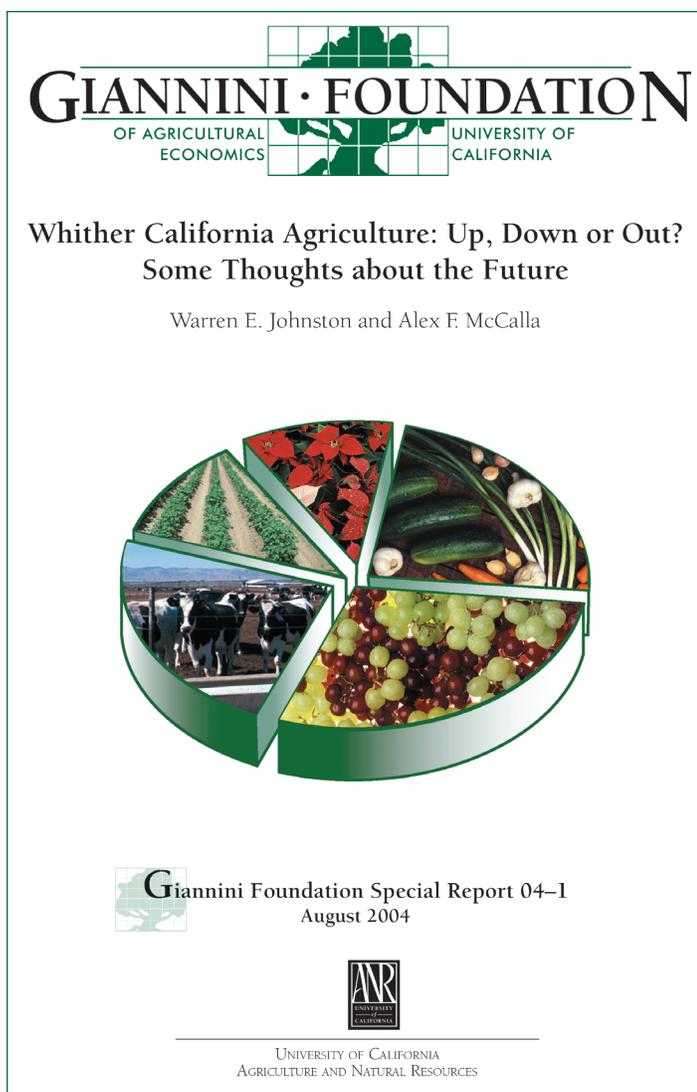
Giannini Foundation research has been published in three series: Research Reports 1930–2009, Monographs 1947–2011, and Special Reports 1978–2004. There are 351 Research Reports. The first two in 1930 were entitled "What Determines California Raisin Sales" and "Some Aspects of Shippside Refrigeration at San Francisco." Eight more followed in 1931, addressing issues from factors affecting prices of canned apricots, cling peaches, and

pears to marketing globe artichokes, a summary of the alfalfa industry, collective bargaining in the L.A. milk market, and cooperative marketing of poultry. These reports represented the beginning of an almost 90-year series that in the 2000s included analysis of marketing orders and organic crops; GMO traits; GMO rice; horticultural crops; the MBTE ban; and a Hass avocado promotion program.

There are 48 Giannini Foundation Research Monographs, starting in 1947, with the first 17 published in *Hilgardia*, a technical publication of the UC Division of Agriculture and Natural Resources. Monographs are substantial pieces of work, which in more than half the cases, are co-authored by Ph.D. students from Berkeley or Davis drawing on their thesis work. The topics covered include input markets such as fertilizer and water; product markets—domestic and international—for annual and perennial crops; livestock production and marketing; and food processing industries. The last Monograph was published in 2011 and was a literature review of methodologies in demand estimation.

Stiffening of merit and promotion processes on each of the three UC campuses where Giannini Foundation members are located (UC Berkeley, UC Davis, and UC Riverside) resulted in a transition to new publication outlets that were more academic, peer-reviewed journals rather than the more service-oriented Giannini publications. This, along with rapidly changing digital information sharing technology, eventually led to discontinuation of regular Giannini Foundation Monographs and Research Reports early in the 21st century.

Many early Research Reports provided price, cost, and market data and analysis while others presented the results of original qualitative and quantitative research. Thus, in 1963, the Foundation separated the two by initiating a third publication series called Information Series, of which this book is a part. This series published useful descriptive analysis, more applied than either the Research Reports or Monographs.



In 1997, the Foundation began publishing the *ARE Update* series. Its articles have included information summaries, topical issue reviews, and applied research summaries. The result is 21 years (volumes) of *ARE Updates*—four issues per year at the start and six per year since 2000—for a total of 114 issues containing more than 400 short articles. The first article in 1997 was “NAFTA: Neither Villain nor Savior” and the first article in 2018 was “Can Micro-Climate Engineering Save California Pistachios?” The Updates are published electronically and in hard copy to a mailing list of 2,248, primarily in California and Washington, D.C., but in other states as well. Over the last 12 years (2005–06 to 2016–17), there have been over 3 million downloads. The number of downloads has grown from less than 160,000 in the first two years to over 400,000 in one year (2012–13), over 300,000 in three separate years, and over 220,000 the remainder of the years.

For the last 10 years, the top 20 articles have attracted 758,880 downloads. The top 10 have attracted over a half million downloads. The top article by Colin Carter, “China’s Agriculture: Achievements and Challenges,” has been downloaded an impressive 141,201 times. In the top 10, China is a central topic in four articles; strawberries, organic agriculture, and biofuels each are the focus in three articles; and GM crops in two articles. Eight of the 10 address an international topic. Clearly, *ARE Update* has become the predominant form of providing written knowledge/information by the Giannini Foundation.

Along the way, the Foundation has sponsored seven periodic Special Reports. The last one in 2004 was written with concerns about the future of California agriculture, provocatively titled “Whither California Agriculture: Up, Down, or Out? Some Thoughts About the Future¹.” It continues to be widely requested. The original publication run of 1,500 copies is long since out of print. It is online at e-scholarship where it has received 1,157 requests since publication in 2004. It received 85 requests in 2017 and early 2018.

Over its history the Foundation has sponsored or cosponsored many conferences to highlight issues that were deemed important. During the last 10 years titles have included; Innovation in Agrifood Supply Chains; Water Pricing for a Dry Future; Farm Labor; Biofuels (2); Salinity; Climate Change; Pests, Germs and Seeds; California’s Climate Change Policy; and the 75th Anniversary Symposium of the Giannini Foundation. These provide an insight into what the Foundation saw as critical current and future issues.

1 Johnston, W.E., McCalla, A.F. 2004. “Whither California Agriculture: Up, Down or Out? Some Thoughts about the Future.” Giannini Foundation Special Report Series 04-1. https://s.giannini.ucop.edu/uploads/giannini_public/43/84/4384fd4a-266c-434a-b85c-83a1ec11e385/escholarship_uc_item_4232w2sr.pdf

Foundation expertise has been provided by members playing critical roles as Cooperative Extension specialists or providing governmental or public sector service to global institutions, not to mention national, state, and county governments. Foundation members have also lent their expertise to non-governmental organizations (NGOs), including

professional associations. The list is varied and includes global institutions such as the World Bank, CGIAR (formerly the Consultative Group for International Agricultural Research), and UN agencies like the Food and Agriculture Organization (FAO). In addition, Foundation members have contributed their knowledge to national, state, and local governments through the Council of Economic Advisers within the Executive Office of the President, federal and state departments of agriculture, federal and state environmental protection agencies, state and federal marketing orders, state advisory boards, and as farm advisors at the county level. In terms of impact on NGOs, Foundation members founded the Institute for Policy Reform, and four members provided much of the intellectual leadership for the formation of the International Agricultural Trade Research Consortium (IATRC).

In terms of quantity of output, over 1,000 Ph.D. dissertations have been completed at Berkeley, Davis, and Riverside since 1930. Between 40 and 45 percent were international students, approximately 35–40 percent were from U.S. states other than California, and the rest from in-state. More than 40 of these graduates have spent some or all of their careers in UC, most as members of the Giannini Foundation. Another 30 have worked in California employed in the state university system, state government, or the private sector. In addition, at UC Davis more than 1,000 Masters of Science degrees have been granted since 1950.

For the quality of output, there are a number of metrics available. The caliber shown is no surprise given the mandate of the Bancitaly letter charge. “The 1928 document called upon the University, in selecting members of the staff of the Giannini Foundation, to appoint ‘the most competent persons whose services are available, without restriction as to citizenship or race’” (Johnston and McCalla, 2009). A critically important metric is the National Research Council rankings released in September 2010 which listed Berkeley and Davis as the top two Ph.D. programs in the country. Another measure is the selection of Foundation members as Fellows of the Agriculture and Applied Economics Association (AAEA). In 1957, the AAEA began granting its highest honor—Fellow—to members. Since then, 251 have been elected (10 were honored the first year and between two and six per year since). Of these, 42 were members of the Giannini Foundation when

the honor was granted, 17 percent of the total (Davis 21, Berkeley 20, Riverside 1).

Forty-one (16 percent) of the Fellows received their Ph.D.s while students at Berkeley or Davis. Given that 13 of the Fellows were members of the Foundation when honored and were homegrown, i.e., had their Ph.D.s from Giannini Foundation departments, the Foundation was involved in shaping 70 AAEA Fellows, nearly 28 percent of the total. The Giannini Foundation currently has about 70 members while the AAEA membership is around 2,500; clearly it is an excellent performance for a small outfit. Eight Members have been elected Fellows of the Western Agricultural Economics Association (WAEA). Foundation members have also been honored as Fellows of other scholarly associations: American Statistical Association, American Association for the Advancement of Science, the American Academy of Arts and Sciences, and the Econometric Society.

Over the course of Foundation history, members have been recipients of many national awards including a multitude of Best Journal Article Awards, Research Discovery Awards, and Publications of Enduring Quality Awards from AAEA. Instructional or teaching awards have also been given to Giannini faculty and graduates. Many of these awards have been documented in detail in *A. P. Giannini and the Giannini Foundation of Agricultural Economics*, published for the 75th Anniversary Symposium in 2005. For UC Davis, much of this information, at least for graduate students, is updated through 2016 in the publication, *UC Davis Agricultural and Resource Economics Ph.D. Program: The First 50 Years*. In addition to the impressive list of elected Fellows of the AAEA, Foundation members have also been elected as president of the AAEA eight times and president of the WAEA 12 times.

Giannini Foundation History, 1920-2010

1931 - 2010

- 37 AAEA Fellows
- 7 AAEA Presidents
- 6 Editors of the *Journal of Farm Economics* and *The American Journal of Agricultural Economics*
- 34 Outstanding Ph.D. Dissertation Awards

1920 to 1950

- 1904: A.P. Giannini opens the Bank of Italy; becomes Bank of America
- 1928: Giannini gifts \$1.5 Million to the University of California
- 1930: Giannini Hall is completed on the UC Berkeley campus
- 1928: Claude B. Hutchinson: first Director of the Giannini Foundation of Agricultural Economics
- 1931: Howard R. Tolley: first economist named Director of the Giannini Foundation of Agricultural Economics

- MECHANIZATION, AGRICULTURAL EXPANSION, THE DEPRESSION, THE NEW DEAL, AND WORLD WAR II
- Farm Management
- Marketing Studies
- Cost of Production Studies
- Industry Analyses
- Cooperatives
- Agricultural Policy



Claude B. Hutchinson
AAEA Fellow 1981



Raymond G. Bruns, Jr.
AAEA President 1941
AAEA Fellow 1982



Raymond G. Bruns, Jr.
AAEA President 1941
AAEA Fellow 1982



Sidney S. Hoos
AAEA Fellow 1971



Vernon Fuller
AAEA Fellow 1979



Gordon A. King
AAEA Fellow 1981



Harold G. Carter
AAEA Fellow 1980



William E. Parrott
AAEA Fellow 1981



Ben C. French
AAEA Fellow 1981



Oscar B. Riser
AAEA Fellow 1982



George M. Korman
AAEA Fellow 1982



Gordon A. King
AAEA Fellow 1981



Sylvia Lane
AAEA Fellow 1984



Harry E. Williams
AAEA Fellow 1985



Henry E. Williams
AAEA Fellow 1985



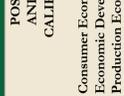
Alan F. McCalla
AAEA Fellow 1988



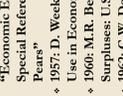
Richard E. Just
AAEA Fellow 1989



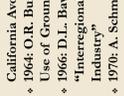
Gordon C. Ransser
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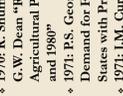
Harold G. Carter
AAEA Fellow 1980



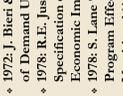
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Ben C. French
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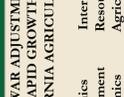
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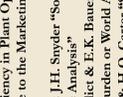
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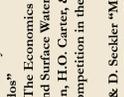
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AAEA Fellow 1981



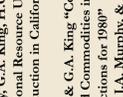
Warren Johnson
AAEA President 1991
AAEA Fellow 1995



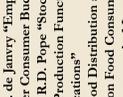
George C. J. Morrison
AAEA Fellow 1995



Irma Adelman
AAEA Fellow 1998



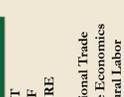
David Zellman
AAEA Fellow 1998



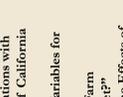
Donald A. Sumner
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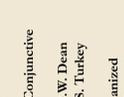
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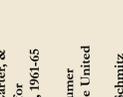
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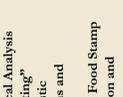
George C. J. Morrison
AAEA Fellow 1995



Irma Adelman
AAEA Fellow 1998



David Zellman
AAEA Fellow 1998



Donald A. Sumner
AAEA Fellow 1999



Julian M. Alston
AAEA Fellow 2000



Colin A. Carter
AAEA Fellow 2000



Richard J. Sexton
AAEA Fellow 2001



Brian D. Wright
AAEA Fellow 2002



Jeffrey M. Perloff
AAEA Fellow 2003



Richard J. Sexton
AAEA Fellow 2001



Catherine J. Morrison Paul
AAEA Fellow 2006



Colin A. Carter
AAEA Fellow 2000



Richard J. Sexton
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Brian D. Wright
AAEA Fellow 2002



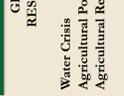
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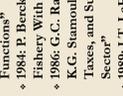
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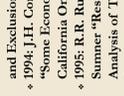
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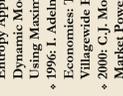
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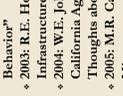
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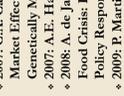
Brian D. Wright
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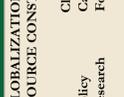
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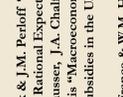
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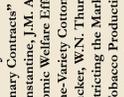
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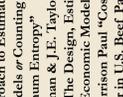
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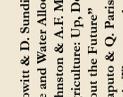
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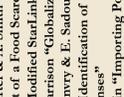
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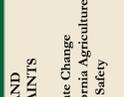
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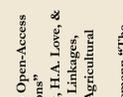
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AAEA Fellow 2001



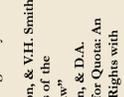
Catherine J. Morrison Paul
AAEA Fellow 2006



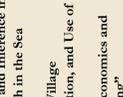
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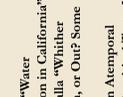
Richard J. Sexton
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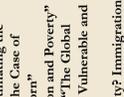
Brian D. Wright
AAEA Fellow 2002



Jeffrey M. Perloff
AAEA Fellow 2003



Richard J. Sexton
AAEA Fellow 2001



Catherine J. Morrison Paul
AAEA Fellow 2006

1980 to 2010

- GLOBALIZATION AND RESOURCE CONSTRAINTS
- Climate Change
- Agricultural Policy
- Agricultural Research
- Food Safety

- 1983: R.E. Just, D. Zilberman, & E. Hochman "Estimation of Multi-Crop Production Functions"
- 1984: P. Berck & J.M. Perloff "An Open-Access Fishery With Rational Expectations"
- 1986: G.C. Ransser, J.A. Chalfant, H.A. Love, & K.G. Staronidis "Macroeconomic Linkages, Taxes, and Subsidies in the U.S. Agricultural Sector"
- 1989: J.T. LaFrance & W.M. Hancmann "The Dual Structure of Incomplete Demand Systems"
- 1994: R. Innes & R.J. Sexton "Strategic Buyers and Exclusionary Contracts"
- 1994: J.H. Constantine, J.M. Alston, & V.H. Smith "Some Economic Welfare Effects of the California One-Variety Cotton Law"
- 1995: R.R. Ruckler, W.N. Thurman, & D.A. Sumner "Restricting the Market for Quota: An Analysis of Tobacco Production Rights with Corroboration from Congressional Testimony"
- 1996: A. Golan, G. Judge, & L. Karp "A Maximum Entropy Approach to Estimation and Inference in Dynamic Models of Counting Fish in the Sea Using Maximum Entropy"
- 1996: I. Adelman & J.E. Taylor "Village Economies: The Design, Estimation, and Use of Villagewide Economic Models"
- 2000: C.J. Morrison Paul "Cost Economics and Market Power in U.S. Beef Packing"
- 2003: M. Smith & J.E. Willen "Economic Impacts of Marine Reserves: The Importance of Spatial Behavior"
- 2003: R.E. Howitt & D. Sunding "Water Infrastructure and Water Allocation in California"
- 2004: A.E. Johnston & A.F. McCalla "Whither California Agriculture: Up, Down, or Out? Some Thoughts about the Future"
- 2005: M.R. Caputo & Q. Paris "An Atemporal Microeconomic Theory and an Empirical Test of Price-Induced Technical Progress"
- 2007: C.A. Carter & A. Smith "Estimating the Market Effect of a Food Scur: The Case of Genetically Modified StarLink Corn"
- 2007: A.E. Harrison "Globalization and Poverty"
- 2008: A. de Janry & E. Sadoulet "The Global Food Crisis: Identification of the Vulnerable and Policy Responses"
- 2009: P. Martin "Importing Poverty? Immigration and the Changing Face of Rural America"



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AAEA Fellow 2000



Richard J. Sexton
AAEA Fellow 2001



Brian D. Wright
AAEA Fellow 2002



Jeffrey M. Perloff
AAEA Fellow 2003



Richard J. Sexton
AAEA Fellow 2001



Catherine J. Morrison Paul
AAEA Fellow 2006



Warren Johnson
AAEA President 1991
AAEA Fellow 1995



George C. J. Morrison
AAEA Fellow 1995



Irma Adelman
AAEA Fellow 1998



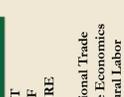
David Zellman
AAEA Fellow 1998



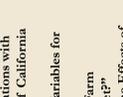
Donald A. Sumner
AAEA Fellow 1999



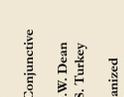
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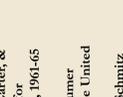
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AAEA President 1991
AAEA Fellow 1995



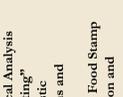
George C. J. Morrison
AAEA Fellow 1995



Irma Adelman
AAEA Fellow 1998



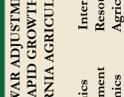
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AAEA Fellow 1998



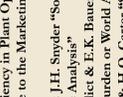
Donald A. Sumner
AAEA Fellow 1999



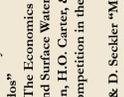
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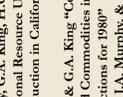
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AAEA President 1991
AAEA Fellow 1995



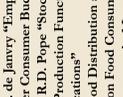
George C. J. Morrison
AAEA Fellow 1995



Irma Adelman
AAEA Fellow 1998



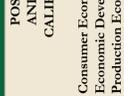
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AAEA Fellow 1998



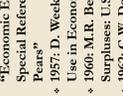
Donald A. Sumner
AAEA Fellow 1999



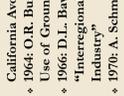
Julian M. Alston
AAEA Fellow 2000



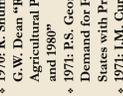
Warren Johnson
AAEA President 1991
AAEA Fellow 1995



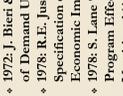
George C. J. Morrison
AAEA Fellow 1995



Irma Adelman
AAEA Fellow 1998



David Zellman
AAEA Fellow 1998



Donald A. Sumner
AAEA Fellow 1999



Julian M. Alston
AAEA Fellow 2000



Sylvia Lane
AAEA Fellow 1984



Harry E. Williams
AAEA Fellow 1985



Henry E. Williams
AAEA Fellow 1985



Alan F. McCalla
AAEA Fellow 1988



Richard E. Just
AAEA Fellow 1989



Gordon C. Ransser
AAEA Fellow 1990



Harold G. Carter
AAEA Fellow 1980



William E. Parrott
AAEA Fellow 1981



Ben C. French
AAEA Fellow 1981



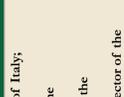
Oscar B. Riser
AAEA Fellow 1982



George M. Korman
AAEA Fellow 1982



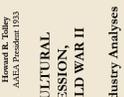
Gordon A. King
AAEA Fellow 1981



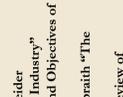
Claude B. Hutchinson
AAEA Fellow 1981



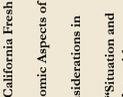
Howard R. Tolley
AAEA President 1931



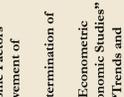
Raymond G. Bruns, Jr.
AAEA President 1941
AAEA Fellow 1982



Sidney S. Hoos
AAEA Fellow 1971



Vernon Fuller
AAEA Fellow 1979



Gordon A. King
AAEA Fellow 1981



Social Value of the Giannini Foundation

Historically, developments in agriculture and resource economics have exploited the synergies that exist between science, economic analysis, and practical knowledge of food and agricultural systems. Such synergies were institutionalized by the traditional placement of departments of agricultural economics and their various incarnations within land-grant universities' colleges of agriculture and the national Agricultural Experiment Station system. As experiment station researchers, members of agricultural economics departments are charged explicitly by the Hatch Act with undertaking research that contributes to the continued development and success of agriculture and rural America, including agricultural production, marketing, and management of environmental and natural resources. The Hatch Act of 1887, which established the U.S. Agricultural Experiment Station system, states that the purpose of this system is "to aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiments respecting the principles and applications of agricultural science." This institutional structure has facilitated a continuing dialogue regarding the purpose and usefulness of agricultural economic researchers and their respective clientele or stakeholders within agriculture and food systems. This structure has encouraged agricultural economics and related fields, certainly among the Foundation membership, to focus on practical questions, often with immediate implications.

In the context of instruction, the advancement of human capital not only at the undergraduate level, but also at the master's and Ph.D. degree levels, has reflected a number of distinguishing characteristics that differentiate agricultural and resource economics from general economics. Among distinguishing characteristics are: the view that economics and economic analysis are a segment of a larger coordinated social-natural system; the emphasis on integrating economic and scientific modelling; the focus on the importance of time and space in understanding economic phenomenon; the emphasis on identifying the flexibility or inflexibility of factors of production and economic agents; and finally the recognition of the importance of institutions. In particular, the distinguishing strength of agricultural economics over

the history of the Foundation lies in fusing together institutional and empirical insights with micro theory to capture operational solutions to understanding and interpreting critical policy issues. Given the demands emanating from direct clientele (or stakeholder) interactions, agricultural and resource economic research has naturally gravitated to seeking answers to real-world questions. This underlying philosophy has resulted in contributions to methodologies of measuring economic phenomenon and testing available theoretical constructs.

In this broader setting, throughout the existence of the Foundation, the advancement of knowledge on new frameworks for analytical evaluations of various segments of California food and agriculture has been a principal theme. Armed with empirical data, innovative technical tools, and a well-endowed library, Foundation members have engaged in developing new lenses and analytical paths whenever major challenges have emerged. Generally, they have not followed well-established roads but have blazed their own trails, generating new insights and sustainable methodologies for empirical analysis.

Any assessment of the Foundation must recognize that the members—faculty and Cooperative Extension specialists—have core financial support sourced with instruction on each of the three campuses, and from the Agricultural Experiment Station. This is a common characteristic of land-grant universities covering much of the United States. Any assessment of the incremental value of the Foundation above and beyond these sources of financial support must recognize the complementarities that exist among the three streams of financial support: instruction, experiment station, and the funding from the Foundation.

A hallmark of all of the members of the Foundation and the University of the California system is the fundamental value of academic freedom and the flexibility for agricultural and resource economists to pursue their intellectual curiosity, by focusing on the public interest rather than by administrative directives or the intense interest-group pressures felt by some other land-grant institutions. With respect to both graduate student support and project funding, the Foundation has been instrumental in creating

incentives for members to pursue research that may well not only advance the frontiers of knowledge but provide insights for improving public policies, as well as decision-making among California agriculturalists. The degree of academic freedom afforded Foundation membership has been enhanced by the Giannini endowment and the allocation of current funding for supporting the “free choice and passion” of Foundation members and Ph.D. students interested in the welfare of California agriculture, interpreted broadly. The existence of the Foundation within a university system that sets a premium on high-quality research has helped differentiate and ultimately distinguish the contributions of agricultural and resource economists in the state of California from those of other land-grant universities across the United States.

Given the three sources of financial support—instructional, experiment station, and the Foundation—it is the Foundation that has provided incremental value to the land-grant university mandate in the state of California. As noted earlier in this chapter, the agricultural and resource economics departments of Berkeley and Davis have emerged as the two best in the country, offering instructional and research contributions to the advancement of knowledge. In the case of the Foundation, fulfillment of this commitment began with the establishment of the library, which collected, cataloged, stored, and made available pertinent economic information and analysis. Foundation members have been actively engaged in collecting market price and cost data and making them available to the general public. This has been combined with numerous price and cost publications across the vast majority of the commodities produced and distributed within California food and agriculture. For public policy problems of all forms and shapes, Foundation members have provided not only a retrospective evaluation of policy impacts, which is sometimes required by the underlying legislation, but also a clear delineation of policy incidence (who wins and who loses). Further topics have included: mechanism design, analyzing strategic behavior and which private economic agents can exploit asymmetric information and/or moral hazard; political economics delineating the role of organizational structures, including the emergence of cooperative organizations and interest groups that have a vested interest in directing policies or institutions toward their special interest; and governance structures that delineate who have

access to collective decision-making processes within and across various commodity systems (Rausser, Swinnen, and Zusman, 2011).

Along the historical path of the Foundation, there have been numerous commodity systems analyses for most all of the major products produced by the California food and agricultural system. New methodologies have been developed for evaluating industrial organization and supply chains from one commodity system to another. Diverse forms of quantitative analysis have been applied to California food and agriculture, including various operation research methodologies (dynamic programming, quadratic programming, and linear programming). Much of the initial research on the competitive advantage of California food and agriculture was evaluated by Foundation members utilizing spatial equilibrium, optimal plant location, and time allocation analytical frameworks. This work has extended beyond just production economics and distribution of food products all the way upstream to estimating demand and supply of various inputs, particularly labor.

The emphasis on providing and generating improved methodologies for empirical analysis has lead Foundation members to be the first economists throughout the UC system who were pioneers in developing econometric methodologies for industry and commodity system analysis. Armed with the underlying data and library resources, Foundation members pioneered the use of econometric analysis to evaluate industry or commodity industrial organization modelling focusing on supply, the marketing chain, and the ultimate consumer demand for various food products produced within the state of California. In other words, Foundation members were the original focal point within the UC system and, for that matter, all land-grant university systems across the United States for empirical analysis using the best statistical and econometric methodologies available. Many of the historic leaders in econometrics, including Lawrence Klein, Zvi Griliches, Yair Mundlak, and Dennis Aigner, honed their skills as students of Giannini Foundation members at Berkeley including, importantly, George Kuznets.

Selected Examples of Giannini Foundation Support of California Agriculture

On numerous occasions, Giannini Foundation members have documented our role in various watershed events since the original A.P. Giannini grant to agricultural economics. Throughout the Foundation's history, members have addressed a number of fundamental questions, such as: Since markets are not perfect, what are the effects of identified imperfections? Which imperfections are important? How might they be mitigated or eliminated? Can the institutional structure be improved and, if so, how? In this section, we have selected a few key watershed events following the establishment of the Giannini Foundation that are indicative of the social value of the Giannini Foundation.² In our selection of these events, we have focused on controversial societal issues that have emerged for which the Giannini Foundation research improved our understanding and offered sound analysis and potential prescriptions.

The Great Depression and Labor Unrest

Labor unrest became endemic during the Depression. In 1934, a general strike precipitated by longshoremen closed down the Port of San Francisco. Agricultural workers attempted to unionize and held strikes but were countered by growers who joined forces as the Associated Farmers. A 1939 Senate committee determined that agricultural workers' rights to organize had been violated, but the labor

2 For a larger set of events please consult:

Rausser, G. 2009. "The Giannini Foundation and the Welfare of California Agriculturists in a Changing State, Nation, and World." Giannini Foundation 75th Anniversary. https://s.giannini.ucop.edu/uploads/giannini_public/29/45/29453ba7-c473-4c33-a69c-1debb5f319f4/apgiannini-book-contributions-rausser.pdf

Johnston, W.E., McCalla A.F. 2004. "Whither California Agriculture: Up, Down or Out? Some Thoughts about the Future." Giannini Foundation Special Report Series 04-1. https://s.giannini.ucop.edu/uploads/giannini_public/43/84/4384fd4a-266c-434a-b85c-83a1ec11e385/escholarship_uc_item_4232w2sr.pdf

Scheuring A.F. 1995. *Science & Service: A History of the Land-Grant University and Agriculture in California*. Oakland, CA. UC ANR Publications.

question dissipated with the onset of the war. Yet, also in 1939, an extraordinarily insightful dissertation supported by the Foundation was put forth at UC Berkeley investigating the welfare of California agriculturists as a result of the events that took place during the Great Depression, entitled *The Supply of Agricultural Labor as a Factor in the Evolution of Farm Organization in California*.³ This was one of the earliest empirical studies of agricultural labor by someone who ultimately became a Giannini Foundation member that demonstrated the importance of the supply of seasonal (often immigrant) labor to the agricultural sector.

World War II

Without question, another watershed was the economic disruption that took place during World War II. The disruption caused food and labor shortages throughout the United States, necessitating research on price control and self-sufficiency. Even before Pearl Harbor, Foundation members had worked on quantifying the demand effects for California products so they were well-positioned to provide expert counsel. But perhaps the most lasting legacy of the Foundation on the war-time issue of price controls was by John Kenneth Galbraith, a Ph.D. student at UC Berkeley who was the first agricultural economics lecturer to teach courses at UC Davis. Galbraith credited his time at both Berkeley and Davis with forming the basic themes and ideas behind his important books—*American Capitalism: The Concept of Countervailing Power* (1952) and *The Affluent Society* (1958)—and his war-time management of the Office of Price Administration (OPA). Galbraith based *American Capitalism: The Concept of Countervailing Power* on the formation of cooperatives trying to rebalance the concentration that existed on the buy side of a number of commodity markets for crops produced in California and the marketing order experience for fresh fruits and vegetables.

3 V. Fuller. "The Supply of Agricultural Labor as a Factor in the Evolution of Farm Organization in California". 1939. Print.

Interstate Competition

Turning to the decade of the 1950s, competition intensified among various states involved in supplying the major Eastern metropolitan markets. This was especially true in the markets for fresh fruits and vegetables. As the competition from other Western states, Southeastern states, and various geographic locations within the Midwest accelerated, Foundation members assisted California agriculturalists with timely research. Foundation researchers provided practical advice and counsel on establishing a competitive advantage for California producers in their pursuit of growing markets. From the 1950s through the mid-1960s, the increase in interstate competition in the agricultural product and food sectors prompted Giannini Foundation members to study food packing and processing efficiencies, leading to development of several important operational models focused on plant location and optimal raw product assembly. Increasing interstate competition also prompted Giannini Foundation researchers to analyze the optimal distribution of California food products (form, time, and space) under unregulated and regulated conditions. Some Foundation members also integrated economics and engineering science through the application of time and motion studies to improve plant operational efficiencies.

Giannini Foundation members also contributed a significant amount of work on spatial equilibrium models that focused on positioning California to compete with other agricultural-producing states. Their work on plant location models was designed to determine the optimal location given the trade-off of balancing the cost of distribution with the cost of raw product assembly. At the end of this period, economists within the Foundation began measuring demand elasticities and the implications of such measures on pricing across seasonal periods and different geographical locations, as well as how agriculturists in California should allocate available supply to enhance commercial profits.

The Bracero Program and Tomato Harvesting

The Bracero Program is a historical watershed event with particular contemporary relevance, given the current public discourse on Mexican immigration to the United

States. As the labor-intensive fruit and vegetable sectors in California agriculture grew, so did the importance of migrant labor. When it became clear that U.S. involvement in World War II would lead to domestic labor shortages, the United States and Mexico negotiated the Bracero (farm-hand) Program to admit temporary migrants to work in the agricultural sector. After the war, agricultural interests succeeded in obtaining repeated extensions of the program until 1964.

Throughout its existence, however, opposition to the program grew from those who claimed that the migrants depressed agricultural wages for U.S. citizens and increased rural poverty. Representatives of tomato farmers claimed that the loss of reasonably priced and available workers would cause the processing tomato industry to move to Mexico where there was no shortage of labor. Instead of disappearing, the value of the industry grew as mechanical tomato harvesters began to replace manual labor. Tomato harvesters had been under development at the University of California for 20 years, but the state Legislature allocated money to speed up this research in anticipation of the end of the Bracero Program. The technology was introduced shortly before the program ended; by the end of the decade, nearly 100 percent of the tomato harvest was mechanical. The substitution of capital for labor precipitated by the loss of cheap labor has occurred throughout the history of agriculture (and in many other sectors), but seldom has it been as abrupt and obvious as in the case of the tomato harvester and the Bracero Program. The change had profound social effects. The tomato industry thrived but field employment fell by nearly 50 percent. Many small tomato farmers, unable to afford the expensive technology, left the sector—the number of tomato farmers dropped to less than 25 percent of the level in the late 1950s.

Social activists claimed that state support (via UC research) of the tomato harvesting technology handed a windfall to tomato farmers at a great cost to farmworkers and rural communities. Giannini Foundation economists emphasized that this state-funded research was the source for substantial economic return. However, they also recognized that private cost-benefit analysis neglects social costs, particularly those arising from a short-term adjustment of displaced and subsequently unemployed labor.

The fact that the university had financed the research led to more than a decade of litigation over the issue of whether the expenditure of Hatch Act monies (federal government matching funds to support agricultural research) required taking into account the likely social consequences of the supported research. On appeal, the California Supreme Court ruled that it was not practical to determine the effect of university-sponsored research *ex ante* and that it would be an infringement of academic freedom to require that research be vetted for its potential social consequences. Although the judicial decision was unambiguous, it was followed by many years of public controversy. This controversy continues today as questions about public-private partnerships become increasingly important in university research (Rausser, Ameden, and Stevens, 2016). One of the effects of this controversy is the wide acknowledgment of the public's legitimate interest in university research. Public interest in university research may seem self-evident but actually represents a major shift in perception. During the first 60 years of the 20th century, the general consensus was that increases in agricultural productivity made possible by university research automatically contributed to the public good. The advent of the tomato harvester and other technological developments made it evident that "progress" creates winners and losers.

The Rise of the United Farm Workers

The social activism behind the political decision to terminate the Bracero Program and the concomitant technological developments that weakened labor's bargaining power were important parts of the social environment that nurtured the United Farm Workers (UFW). This union, formed by Cesar Chavez and Dolores Huerta, began as a worker-rights organization. After a well-publicized, five-year boycott of table grapes that led to union recognition by most major growers and a 40-percent increase in wages, the UFW went on to organize workers in lettuce fields in Salinas and the Imperial Valley and orange groves in Florida.

During the rise of the UFW and its conflict with the Teamsters union, Giannini Foundation members conducted a number of labor productivity studies on California agriculture. They analyzed migrant labor contributions to the agricultural sector and the relative poverty levels of

migrant versus domestic laborers. They also analyzed the effect of legal migrants and the role of the UFW on various socio-economic status measures, including housing, wages, and other forms of compensation. Finally, they conducted a number of studies sponsored by the governor's office on the welfare of California agricultural labor. Giannini Foundation members contributed much of the analysis that informed the California Legislature and the governor's office.

The California Water Plan and Federal Projects

In California resource economics, management of water and water rights intensified in public discourse with the emergence of the California Water Plan in 1957. There is no question that water rights, allocations, and supporting institutions have a material impact on the welfare of California agriculturalists. Plans for water carriers were introduced throughout the first half of the 20th century in the California Water Plan. Members of the Giannini Foundation contributed to the evaluation and design of financial contracts of these state projects. They also provided the economic rationale for conjunctive use of ground and surface water to overcome droughts and instability. Moreover, they introduced pricing and trading schemes that made it possible to capture more value from existing water resources. Among the most significant of these contributions was the first major theoretical and empirical application of conjunctive water use, namely, the joint management of both surface and groundwater (Burt, 1964).

Over the years, a number of crisis events and institutional changes have emerged from California water resource systems, including the so-called 160-acre limitation for access to water cost subsidies, Kesterson Wildlife Refuge, the drainage crisis, water banks, and the CVPIA (Central Valley Project Improvement Act). In 1985, there was a major drainage problem in California that could not be resolved by the creation of a wetland. Access to federal water was threatened if solutions were not introduced, but the initial proposals were capital-intensive and simply too expensive. The crisis came about very quickly and was a total surprise to some California agriculturalists and most interested parties. In response, Giannini Foundation economists looked at restructuring the kinds of incentives

that existed for conservation, changes in land use, and, moreover, implementation of the fundamental notion of option value and the flexibility to wait before making commitments on capital investments. The federal and state governments gathered a drainage task force to assess alternative solutions; the composition of the task force included many Foundation members from Davis, Berkeley, and Riverside.⁴

Establishment of the Environmental Protection Agency

Another major event was establishment of the U.S. Environmental Protection Agency (EPA). In the early 1970s when the EPA was organized, the agency's founders looked around the country to find the expertise to deal with spatial pollution, air pollution, and land and ground-water pollution and found that agricultural economists were the best equipped to address these critical externality questions. Moreover, a review of all the major grants given by the EPA to academic researchers during the agency's early years would find that almost all went to researchers with formal training in agricultural economics.

Some of the best work on pesticide externalities in the world has been done by Giannini Foundation members. Furthermore, all the work on contingent valuation to determine how society values resources such as Yosemite National Park or Lake Tahoe remaining pristine emerged from some conceptual lenses developed long ago by a Giannini Foundation faculty member (Ciriacy-Wantrup, 1952). A number of current or former Giannini Foundation members became the intellectual leaders in applying these methods.

4 In particular, Foundation economists proposed a management solution that included incentives for conservation, changes in land use, and evaporation. This research allowed policy-makers additional time to select superior solutions. Subsequently, environmental interest groups pressured the CVPIA to divert water from agriculture to the environment. Giannini Foundation research showed that the costs of diversions would be much smaller if they were combined with water trading, a key component of the CVPIA-motivated Giannini Foundation research. Members of the Foundation helped establish an electronic water system, a mechanism that allowed increased efficiency and water security. More recent Giannini Foundation research has focused on the welfare consequences of reallocating water among urban, agricultural, and environmental uses, particularly the proposed San Diego – Imperial Valley water-transfer transaction.

The Giannini Foundation also conducted important research on pest control, including (a) the introduction of modern integrated pest management (IPM) and biological control; (b) the use of modern economics to evaluate health risk and trade-offs with agricultural productivity; and (c) pesticides as damage-control agents, their potential human health effects, and their substitutability with transgenic seeds. When the "Big Green" pesticide ban proposal was discussed by legislators in 1991, Giannini Foundation members conducted a study that showed that it would negatively affect low-income consumers. As a result, Giannini Foundation members offered remedies, published in a major science article at the time, including taxation and pollution regulations (Zilberman et al., 1991). The general public supported these alternative remedies by rejecting the "Big Green" initiative at the polls.

With respect to the proposed phase-out and ban of methyl-bromide, Foundation researchers showed how a total ban would be costly and counter-productive since scaling back to 25 percent of historical use would preserve 80 percent of the benefits. In the case of invasive species and plant diseases, Foundation research demonstrated how Medflies, Pierce's disease, and white flies may cost billions in damages and how distributional effects are more significant than the aggregate impact. Once again, Foundation researchers offered practical solutions emphasizing the use of monitoring, prevention, and rapid and targeted responses rather than heavy-handed public policies. Finally, to support AB 32⁵, the Foundation supported a number of conferences that focused on economic evaluations of proposed Cap-and-Trade to control carbon emissions and help reduce the environmental-damaging impacts of global warming. Such assessments helped inform the general public and the ultimate support of AB 32.

5 AB 32 or Assembly Bill 32 of 2006 requires California to reduce greenhouse gas emissions to 1990 levels by 2020. This is a reduction approximately 15 percent below emissions expected under a "business as usual" scenario.

Farm Financial Crisis

The farm financial crisis of the 1980s began in the Midwest but slowly made its way to California, affecting U.S. agriculture as a whole. Giannini Foundation researchers demonstrated that the major causal forces underlying this financial crisis were sourced with monetary policy, federal fiscal policy, trade flow, and exchange rates. In essence, the monetary policy of the federal reserve in the early 1980s forced interest rates and the relative value of the U.S. dollar to overshoot. The latter phenomenon reduced the export market for agricultural products across the United States, including California, and helped contribute to a dramatic downward spiral in commodity prices. These causal phenomena were almost a complete reversal of what took place over much of the 1970s. The rapid expansion in available debt capital to agriculturalists in the 1970s was asset-collateralization-based. Hence, as inflation began to recede and export markets turned upside down, the market value of underlying collateralized assets fell dramatically. Debt-service-based finance was relatively uncommon compared to the asset-based financing that took place during much of the 1970s. As a result, the agricultural sector throughout the United States was indeed vulnerable to the effect of reversal of external factors (trade, monetary policy, exchange rates, interest rates) on final market pricing traced all the way upstream to input pricing, particularly land prices. Giannini Foundation members helped to explain the major price bubbles that were taking place in the early 1970s. Foundation members were able to explain the difference between the 1970s and 1980s and the implications for the farm financial crisis of the mid-1980s. This crisis resulted in a bankrupt farm credit system that was resolved by a government bailout. Foundation members helped design the bailout to achieve sustainability and avoid the inherent moral hazard concerns.

Bayh-Dole Act and the Establishment of Private Intellectual Property

At the beginning of the genetic-engineering era, the Bayh-Dole Act gave universities the rights to any patents on discoveries financed by federal grants (1980). In the same year, a key Supreme Court decision affirmed that new life-forms were patentable subject matter. Patenting of plants and animals became possible during this period of emerging

private spending and stagnant public spending on agricultural research and development. One result is that universities have slowly been pulled into the commercial sector. Universities are generally not accustomed to capturing, let alone fully appreciating, commercial value. Nevertheless, they were given incentives to search for opportunities to realize the commercial value of discoveries that resulted from their scientists' research. This has led to numerous university/private research partnerships that Foundation members have helped to design. In fact, one Foundation member provided the intellectual leadership in the design and establishment of the Berkeley Novartis public-private partnership research agreement supporting research discoveries in plant biotechnology (Rausser, Ameden, and Stevens, 2016). Moreover, Foundation members have been actively involved in structuring patent-pooling arrangements to facilitate access by both the private and the public sector.

The Green Revolution

From the 1970s through the 1990s, the Green Revolution and subsequent increase in productivity in developing countries provided the opportunity to evaluate income versus substitution effects on the global demand for agricultural products produced in California. The indirect effects of the Green Revolution, marked by a notable increase in food production in the Third World because of improved strains of wheat, rice, and maize, not only helped prevent large-scale famine but also made the fundamental study of substitution and income effects possible. The economists of the Giannini Foundation have been actively engaged in demonstrating to California agriculturalists the benefits they derive from the growth of the agricultural sectors in developing countries because of income effects. To be sure, there may be some competitive suffering in the short run due to substitution effects. For example, Chile and Mexico have become more effective competitors for a number of products usually sourced in California. There are, however, complementarities between seasonal supplies from countries that facilitate year-round supplies of fresh fruits and vegetables, making them a regular part of consumers' diets. In the final analysis, major benefits accrue to California agriculturalists as a result of the income effects on demand resulting from economic growth in these countries.

The Green Revolution is usually identified with the CGIAR. Various Giannini Foundation members have been actively engaged in the work of CGIAR and the various centers that comprise this global research network, participating as researchers and being involved in its governance. Perhaps more important, however, are the studies and analyses that have been conducted to analyze the economic consequences of new research discoveries and increased productivity of a number of basic crops. For California agriculturalists, much of this research has implications for the short-run substitution effects vs. the long-run income effects on export demand for California's higher-quality food products.

Trade Liberalization and the Globalization of Markets

Giannini Foundation members have conducted a large amount of research work on trade liberalization. The focus of this research has been on who wins, who loses, and what the environmental consequences might be from trade liberalization and/or globalization. This Foundation research includes an evaluation of the Uruguay Round of multi-national trade negotiations within the framework of the General Agreement on Tariffs and Trade (the GATT-Uruguay Round) that engaged and brought agriculture into trade negotiations, the North American Free Trade Agreement (NAFTA), and the World Trade Organization (WTO) Doha Round. Topics include: (1) assessment of effects of California's position as the nation's largest exporter of agricultural products; (2) income growth, especially in the Pacific Rim, driving an increased demand for higher-quality food and fiber; (3) international agreements opening more foreign markets to California exports; (4) better access of foreign products to U.S. markets due to the fall in U.S. import barriers; (5) improved assessment of technical trade barriers, which must be based on scientific evidence; (6) and investments by multinational firms and joint ventures in highly processed products that are changing the form and shape of agricultural trade.

The Giannini Foundation is uniquely well-equipped to evaluate formally the impacts of trade liberalization and globalization on California's agriculturalists based on the intellectual capital of its members. Foundation research has

assessed the impact of imperfectly competitive markets and state traders on national and California agricultural food exports. A few Foundation members helped orchestrate the formation of the International Agricultural Trade Research Consortium (IATRC). Giannini Foundation members have also been involved in trade policy and international trade disputes over invasive species, as well as in leadership of the Agricultural Issues Center. They have analyzed crop-specific effects of trade agreements on segments of California agriculture, such as wine trade and the associated industrial organization of the domestic and international wine markets. What we do know about the international effects of U.S. farm policy has been largely quantified by a few Giannini Foundation members. Finally, Foundation members have conducted analyses that addressed the environmental consequences of globalization.

Major Future Issues that the Intellectual Capital of Giannini Foundation is Uniquely Equipped to Address

When invited to write this paper, we were asked to be prospective as well as retrospective in our analysis. Accordingly, we now turn to a brief prospective about the future challenges the Giannini Foundation could tackle. We see that many of the issues of the recent past remain as urgent continuing challenges for the future. Recall that the Foundation sponsored or cosponsored many conferences to highlight issues that it deemed important.

In addition to our own thoughts on future challenges, we have canvassed some senior leaders in the Foundation and asked them to provide us with five crucial future issues they see as needing critical attention if California agriculture is to continue its preeminence. Here we highlight seven, which are composites of almost all of the advice that we received.

We present them in no particular order. We note they are all complex and interrelated involving multiple disciplines, multiple stakeholders, and range from California-specific commodities to global impacts in scope. Most of them involve California agriculture's interface with the broader environment within which it exists. The first two are global issues with potentially accelerating consequence for California agriculture. The second two are California issues, which define the ever-changing environment in which California agriculture exists, including population growth, rising incomes, and urban expansion that increasingly compress California agriculture's necessarily extensive character. The third two are internal to California agriculture but no less challenging. And the last is a cross-cutting issue of knowledge generation to address these issues. We make only brief comments on each.

Climate Change

Climate change is real, despite some lingering questions from chronic skeptics, but its speed and consequences remain uncertain. For California agriculture, a probable

impact is to alter the seasonal pattern of precipitation to be more rain and less snow. As snow provides a significant share of annual water storage capacity, a permanent reduction of the snowpack would have dire consequences for agriculture, which stills uses almost 80 percent of California's surface water. Also, will rising temperatures render some currently profitable crops non-viable? How will California agriculture adjust? Probably the same way it has for the past 160 years: by changing what it produces, how it produces it, and where it produces it. It will adapt because adaptation is its only choice. But it will also need intellectual capacity and research to continue its never-ending, dynamic adjustment.

Globalization

Globalization has been a continuing challenge to California agriculture over its entire existence. The challenge has been met by research, innovation, productivity enhancement, superior management, and forwarding-looking attention to the demand side of the equation. California agriculture benefits greatly by having in its ever-changing suite of products those of which people eat more, particularly as they get richer.

Competition for California's Limited Natural Resources

California may be the third largest state in the Union (100 million acres) but the majority of the area is in mountains, forests, and desert. Forty-four million acres are identified as having potential for agriculture. But only 10 million are identified as cropland, and of those, less than 8 million are irrigated. And, these last two numbers are declining. California's population may soon exceed 40 million people, most of whom live in ever-expanding urban areas built almost exclusively on prime agricultural land. Further, rising incomes increase the demand for recreation, water,

land, and environmental conservation. Without doubt, less water and land will be available to agriculture in the future and it will be more expensive. Therefore, cropping patterns are likely to continue to shift towards higher-valued crops, e.g., horticulture, grapes, tree nuts and fruits, and specialty vegetables.

Resource-Use Conflicts

Resource-use conflicts clearly will increase in intensity. Multiple demands for water—urban, industrial, agriculture, fisheries, recreation, environmental conservation, energy, and transportation—will press on limited supplies of surface and groundwater, which are unlikely to expand much and at some point will necessitate rational management of diminishing groundwater aquifers. Will large concentrations of dairy animals with high demands for water and production of incredible amounts of wastes eventually drive the dairy industry out of California? The other conflicts arising in the management of forests and fisheries inevitably will become more intense with climate change and population growth.

Coevolution of Organic and Industrial Agriculture

Coevolution of organic and industrial agriculture, along with developments in biology, will continue to offer challenges and opportunities for agriculture. Rapid advancement in precision genetic manipulation for productivity enhancement, management of stresses, and improved nutrition continue to emerge with positive potentials. However, pressure for increased yields has also increased the chemical intensity of industrial agriculture. This has led to concern about increases in toxic chemicals in the food supply, increased negative environmental impacts, and overall concerns about food quality and safety. The rapid rise of the organic movement, the continuing conflicts over GMOs, and the push towards less-intense conservation agriculture are countervailing forces that will make feeding a growing and richer population more challenging.

Labor Shortages and Future Technological Developments

California agriculture has always had intense periodic needs for field operations originally done by labor. The labor supply has always been international, chronologically from China, Japan, India, Philippines, Mexico, and Central America. Mechanization has reduced the demand somewhat; its pace is often accelerated by labor shortages and rising wages. But mechanical harvesting dominates a growing share of the nut industry and more and more of the fruit industry, including perishables such as peaches and boysenberries. Remaining hand operations are in the tree fruit and nut industry in terms of annual pruning and sculpting of nut and fruit trees. It is likely, given the current intense debate on illegal immigrants and California's planned increases in the minimum wage, that further limitations on human labor will occur. What will be next? Could it be robots programmed to precisely trim trees and vines? Could it be soft-handed robots that gently pick the most precious Cabernet Sauvignon grapes and juicy ripe strawberries? By then, there will be self-driving tractors and trucks. The farmer may well manage his operation electronically from a remote location.

Reduced Public Investment in Agricultural Research and Development

Our final challenge is reduced public investment in agricultural research and development, and the potential substitution of public-private research partnership agreements to advance knowledge, discoveries, and commercial value generated by California agriculture. Already, the majority of research and development expenditure for the United States agricultural sector is done in the private sector or by public-private partnerships and this trend is sure to continue. That will leave to Foundation members the task of evaluating the social costs and implementing the needed public-policy analysis. This is what the Giannini Foundation has always done and as we argue here—somewhat shamelessly—has done well. The demand for Giannini Foundation research will continue. The Foundation remains well positioned to continue to respond, delivering analysis with much social value.

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