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The Origins of CARD

The Center for Agricultural and Rural Development began its institutional life at Iowa State College as the Center for Agricultural Adjustment (CAA) in 1957. The center passed through two additional name changes (the Center for Agricultural and Economic Adjustment [CAEA] in 1959 and the Center for Agricultural and Economic Development [CAED] in 1961) before being designated CARD in 1971.

Over the past 40 years the center has had a significant impact on the field of agricultural economics and on agricultural policy in the United States and abroad. While CARD's reach has extended globally, its origins lie in the U.S. farm problem of the 1950s.

The Farm Problem

The decade of the 1950s saw strong economic growth in the United States. Industrial productivity expanded rapidly, as did the disposable income of most Americans. Unfortunately this prosperity was not universally enjoyed. Farmers were operating more efficiently and productively than ever before in a booming economy, yet their profits and standard of living kept falling. U.S. farm income was not keeping pace with overall income.

Research by agricultural economists at Iowa State College and other universities around the country during this period showed that demand for farm products was relatively inelastic in comparison



www.card.iastate.edu



In 1971, the center's name was changed to Center for Agricultural and Rural Development. Pictured from left to right are John P. Mahlstede, associate director, Iowa Agriculture and Home Economics Experiment Station; Leo V. Mayer, associate director, CARD; and Earl O. Heady, director, CARD.

with other goods. People generally do not buy more food as they become wealthier but rather seek wider variety and higher quality in their food supply. The share of consumer income used for food tends to decline as standards of living rise. Consumers spend more on nonfood items, for example, manufactured goods like automobiles and appliances.

Farmers adopted improved farming technologies to remain competitive and reduce their unit cost of production. This trend led to further expansion of farm operations and, consequently, increased production. More production led to a cycle of more depressed prices.

Many farmers found themselves in a price-cost squeeze. As consumers bought more manufactured goods, prices went up for such goods and their inputs (for example, steel for automobiles). As commodity prices fell, farmers had less income to spend on manufactured products. The resulting squeeze threatened the existence of formerly prosperous farm families.

In academic, political, and farming circles, the topic of agricultural adjustment—the process of adapting society to economic and technological change in agriculture—demanded greater and greater attention.

Defining Agricultural Adjustment Issues

Perhaps as early as 1955 an Agricultural Adjustment Research Committee (AARC) was established

September, 1956

Dear Dean Andre and President Hilton:

A number of us in the state who have occasioned to meet and talk at various times and under various circumstances regarding the welfare of Iowa agriculture have been concerned for some time with the question of how the Land Grant Colleges could play a more vital role in the solution of the urgent problems now facing American agriculture.

These discussions have indicated what we believe is the need for a careful reexamination and inventory of our current research and educational programs in the light of our currently pressing problems. We have attempted to spell out our thoughts on this matter in the attached memorandum.

This is a sincere attempt on our part to be as helpful to you as we possibly can. We are simply offering our support to you in your continuing efforts to make Iowa State College of maximum usefulness to the State of Iowa.

Be assured of our continuing support in the excellent job that you are doing and feel free to call upon us if there are additional ways in which we can be of assistance.

Sincerely yours,

Oscar Heline	Marion Steddom	Herbert Pike
Fred Ludwig	Richard Stephens	George Strayer
Carl Hamilton	Charles Hearst	William Sayre
Cedric Hall	Milford Beeghly	Robert Buck
Cy Warland	William Davidson	Wilbur Molison

The letter that initiated action resulting in the establishment of CARD.

at Iowa State College, chaired by Professor Earl O. Heady. Heady had already distinguished himself as an innovator in applied agricultural economics research (see article, this issue). Research and public outreach by the Iowa State Experiment Station and the Extension Service also elucidated some of the trends and characteristics of adjustment ques-

tions and helped to inform the initial exploration of core issues.

In September 1956, 15 Iowans wrote to Dr. James Hilton, president of Iowa State College, and Dr. Floyd Andre, dean of the Division of Agriculture, conveying their concerns about the agricultural adjustment problems facing Iowa. They proposed a three-point program to guide future work at Iowa State. The group

Timeline—Highlights of the First Ten Years

1956 •Fifteen Iowans prominent in the farming and business sectors petitioned Iowa State President James Hilton and Dean of Agriculture Floyd Andre. They requested the assistance of the college in addressing issues of agricultural adjustment.

1957 •The 57th General Assembly (Iowa) passed a resolution and appropriation of \$100,000 to support a research program at Iowa State College on issues of agricultural adjustment.
•By resolution of the Board of Regents, the Center for Agricultural Adjustment (CAA) was created in the Division of Agriculture at Iowa State College.
•Professor Earl O. Heady named executive director of CAA.

appealed to the leaders of the college asking that “particular and immediate attention” be directed toward (1) agricultural production adjustment issues; (2) marketing, processing, and distribution of agricultural products; and (3) new job opportunities for displaced farm labor.

The September 1956 letter resulted in decisive action at Iowa State. The administration met with the petitioners on November 19 of that year. Of the original 15 signatories to the letter, 11 attended along with at least part of the “Committee of Eight,” which was composed of Iowa State faculty and staff, including Heady. This committee assumed responsibility for the start-up of the CAA.

A series of interdisciplinary seminars in 1956–57 outlined the nature, magnitude, and causes of the farm problem, and suggested possible solutions. (The results were published in a three-part series entitled “A Basebook for Agricultural Adjustment in Iowa.”) The program steering committee recommended the creation of a center to study agricultural adjustment.

In the spring of 1957, President Hilton and/or Dean Andre submitted a proposal for the center to the 57th Iowa General Assembly. A group of 11 legislators in the House of Representatives enthusiastically received the proposal and introduced House

Minutes of the June 21, 1957,
Iowa Board of Regents Meeting

A Center for Agricultural Adjustment at Iowa State College will be established within the Division of Agriculture to coordinate and concentrate the research, teaching and extension resources of all departments on the problem which faces farm families and the agricultural industry . . . Primary object of the Center will be to provide solutions for the adjustment problem which will lead to:

1. Incomes for people engaged in agriculture which are on par with those received in other industries; and
2. The benefits of improved agricultural technological developments being fully realized by consumers.

There are four major reasons why Iowa State College should establish the Center for Agricultural Adjustment.

1. Problems of Agricultural Adjustment embrace various subject matter disciplines which require an interdepartmental approach. Such cooperation can be fostered and encouraged by this type of divisional organization.
2. Adjustments and reorientation of existing programs can best be achieved through a cooperative approach, under the guidance of the Center.
3. Grants and gifts for research on adjustment problems are encouraged.
4. The Center will emphasize to farm people and agricultural leaders that Iowa State College is focusing effort on the solution of major farm problems.

The Iowa Board of Regents established the CAA during their meeting in June 1957.

Resolution 15 to endorse the “reorientation” of Iowa State’s research and experimental program “for the purpose of studying problems in the marketing, processing, and utilization of farm products; new uses for present

production; and discovery of new crops and markets.” The House and Senate adopted the resolution. The legislature allocated an additional \$100,000 to the budget of Iowa State College to support new research in

1958

- CAA began first operational year in July, initiating research and educational programs throughout Iowa.
- CAA received five-year grant from W. K. Kellogg Foundation of \$448,500 to conduct educational programs.

1959

- CAA report series established to publish results of research and educational activities conducted by the Center.
- Center sponsored Interstate Farmer’s Study Group and issued reports on alternative scenarios for a free market for agriculture and effects of land retirement policy. Results sparked a major public debate on government intervention in agriculture.
- The first agricultural Editors Economic Conference and Workshop was organized by CAA to inform and educate the media on farm problems.

agricultural adjustment. Considering the background research done in agricultural adjustment, the support of prominent Iowans, the results of an agricultural adjustment study at Iowa State, and endorsement of a new research program by the state legislature, the Iowa Board of Regents was moved to establish the Center for Agricultural Adjustment (CAA).

A First-of-Its-Kind Center

The center was created as an integral part of the Agricultural and Home Economics Experiment Station and the Cooperative Extension Service in the Division of Agriculture. Dean Andre referred to the center as an “organizational technique” intended to facilitate an interdisciplinary approach to solving agricultural adjustment problems.

By October 1957 an organizational structure for CAA emerged. The structure called for two advisory bodies. The Coordinating Committee, composed of Iowa State administrators and faculty, was to provide oversight and direction for center activities and identify opportunities for project work. A National Advisory Committee was established and included representatives of the four land grant college regions, representatives of the U.S. Department of Agriculture, and selected farmers.

Two internal divisions were created in the CAA. The Research and Fact Finding Division collected

and analyzed existing data relating to agricultural adjustment and performed original research on adjustment problems. The Education and Training Division pursued educational tasks, including training college staff and disseminating information to the public.

. . . the CAA . . . demonstrated that it was possible for the land grant system to respond to public needs in a clear-cut and timely manner. The groundwork was laid for the future.

Heady, selected to be the executive director of the new center, took on the leadership of the Research and Fact Finding Division. He began by soliciting research proposals from college faculty. William Stucky, a specialist in education and extension work, was hired to manage the Education and Training Division.

The center’s early months were devoted to building linkages among other land grant institutions. It became evident that the land grant colleges and universities throughout the United States strongly endorsed the creation of the center, and they pledged cooperation to its fledgling programs. Heady and the ISU administration agreed that 1958 would be the organizational year,

with full operation beginning in 1959.

At first, the CAA was not an independent unit but rather a management tool to refocus the work of the Experiment Station and Extension Service. Consequently, the CAA “adopted” 49 agricultural adjustment research projects already in progress.

Although not yet enjoying an independent financial base, Heady established criteria specifically for CAA-sponsored research to get the most out of each dollar, to avoid duplication of effort in other departments, and to yield concrete results applicable to agricultural adjustment problems.

There was no precedent for agricultural adjustment education programs either for the Extension staff or for the public. The CAA broke new ground in this area by sponsoring conferences, workshops, and seminars, casting as wide a net as possible.

In 1958, the W. K. Kellogg Foundation awarded the center its first grant, in the amount of \$448,500, to support an educational program on “trends, implications, opportunities, and alternatives in agriculture.”

Groundwork for the Future

The Experiment Station and the Extension Service allocated more than \$500,000 from their budgets to activities directly related to the CAA from July 1, 1957, through June 30,

1960

•The first public agricultural policy conference sponsored by CAEA, focusing on topics of adjustment, marketing, import and export programs, and government controls and price supports.

1961

•Publication of *Adjustments in Agriculture: A National Base Book*, summarizing agricultural adjustment research. This book-length study was intended for a broad public audience to promote understanding of the farm problem and to stimulate policy discussion.

1958. Of the 49 original CAA research projects, 27 were in agricultural economics, 17 were in technical science fields (agronomy, animal science, microbiology, etc.), and 5 were in social science areas (sociology and demography).

These early projects focused directly on the objectives of the agricultural adjustment research program. The center's rapid translation of this program into reality through publications and other means of dissemination quickly attracted attention to the CAA and demonstrated that it was possible for the land-grant system to respond to public needs in a clear-cut and timely manner. The groundwork was laid for the future.

The first educational project implemented by the CAA was in

cooperation with Extension and was entitled "Challenge to Iowa." Conducted from January through March 1958, the program was intended to present to Iowans the latest facts and figures associated with agriculture and economic development in the United States. The program was also geared to stimulate public discussion of agricultural and economic issues and to record public opinion relating to economic and social change. The program was based on six fact sheets prepared by CAA and Extension for wide distribution throughout the state.

An innovative approach to stimulating public debate was applied to the largest outreach program ever undertaken by Iowa State. By all measures it was a success. It seems

likely that the wide scope and novel approach of "Challenge to Iowa" attracted the attention of the Kellogg Foundation and helped to secure the award of the first educational grant to the center.

It is a testimony to all those involved with the early development of the center that words were made real so rapidly. But, as later events would show, innovation and responsiveness to contemporary issues became a standard at CARD.

Editor's note: The story of CARD's development as a public policy center will continue in installments in the fall issue of the CARDreport. See our Web site for the complete timeline from 1958–98 www.ag.iastate.edu/card/about/timeline.html. A detailed history of CARD is scheduled for publication in 1999. ♦

Early Model Development at CARD, 1958–83

The growth of CARD and of related public policy research institutes shows that the quantitative approach to analysis, design, and implementation of policy has passed the market test. In modern policy contexts it would be unthinkable to undertake major reform without systematically and quantitatively evaluating its implications. As well, quantitative policy modeling exercises can be credited with results that have heightened public interest and stimulated public action.

—Stanley R. Johnson
(from the Foreword to *Economic Models of Agricultural Land Conservation and Environmental Improvement*, 1992)

The development of CARD's economic modeling systems was largely driven by the application of quantitative analytical methods to real-life agriculture. Over the 25 years of Earl O. Heady's leadership as CARD director, farm-level quantitative studies expanded to include national commodity market and agricultural policy simulation models. The scope of these models grew to encompass thousands of domestic and international variables.

Several of the large-scale programming models developed at CARD resulted from collaborative projects with the U.S. Department of Agriculture's Economic Research Service (ERS) and Soil Conservation Service (SCS), and the U.S. Environmental Protection Agency

1962

- A national econometric model was developed at CAED.
- Center cosponsored the Conference on International Commodity Agreements in New York City with the National Planning Association and the Brookings Institution.

1963

- Earl Heady consulted with the Organization for Economic and Cooperative Development (OECD) regarding agricultural adjustment centers in Europe.
- CAED cosponsored (with Colorado State University) a national seminar on agricultural administration in the land grant system. The program was on how to be more responsive to public needs, foster better coordination of research and education efforts, and stimulate more effective use of funding.
- Center staff assisted the ABC television network on a documentary "What Is Happening to Our Farm Families?" (aired March 10, 1963) and a West German firm on a documentary comparing agricultural production issues in the United States and the Soviet Union.

(EPA). The analyses based on these models have helped to shape U.S. agricultural policy and have influenced policies worldwide.

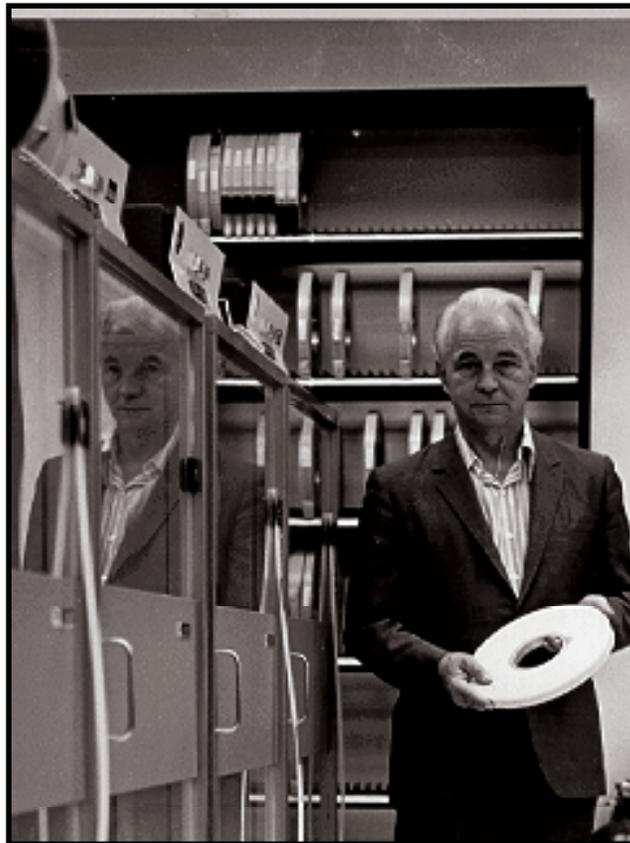
The economic modeling systems at CARD evolved from the need to quantify relationships in everyday economic life and to project likely outcomes. The disciplines of economics and econometrics (the application of statistical methods to economic theories) provided the tools for development of these models.

For the lay person, economic modeling may be generally understood as taking real-life processes and experiences, translating them into mathematical relationships (usually sets of equations), and analyzing these relationships using economic, statistical, and mathematical methods. The process also involves incorporating established knowledge, historical data, behavioral assumptions, and other relevant information.

Models are oriented to three specific goals:

- quantitatively analyzing an economic relationship to answer a question about it or add to the body of knowledge about it (for example, demand for a product in a specific market);

- projecting future trends (for example, patterns in commodity markets); and
- policy analysis (for example, analyzing the impacts of alternative policies).



Earl O. Heady in CARD's early computer lab.

Advances in computing technology have made it possible to incorporate thousands of variables relating to a wide range of economic activity into modeling systems. This has broadened the analytical capability of models.

Heady's contributions to research technology while at CARD included relatively simple models applied to production functions on individual farms as well as massive models incorporating more than 10,000 variables used to assess the impacts of national agricultural policies.

Down on the Farm— Micro Model Development

Agricultural adjustment was the general label applied to a set of problems that arose the 1950s (see article, this issue). From 1951 to 1955, prices for U.S. farm products fell 25 percent while surpluses of grain grew. Farms were increasing in size, and rural communities were declining. At the time, many of the trends relating to adjustment were not fully understood. The new center initiated quantitative research to inform the public debate on the farm and rural issues of that era.

Heady's contemporaries have observed that, having grown up on a farm in Nebraska in the Depression, he never forgot his roots. His early work reflected a strong focus on quantitative methods aimed at the economic improvement of individual farms.

In 1948 Heady published the journal article, "Elementary Models in Farm Production Economics Research," outlining the principles

Continued on page 9

<p>1964</p> <ul style="list-style-type: none"> • President Lyndon Johnson appointed Earl Heady to the White House Committee on Domestic Affairs to provide expert consultation on agricultural development issues. • Four major research projects were completed and results published: <i>Study of 16 National Farm Program Alternatives for Wheat and Feed Grains, 1963–67</i>; <i>Interregional Allocation of Agricultural Production in 1975</i>; <i>Controlling Agricultural Output by Controlling Various Inputs</i>; and <i>The Structure of U.S. Agriculture in 1980</i>. 	<p>1965</p> <ul style="list-style-type: none"> • Cooperative research relationship was established with the U.S. Soil Conservation Service (SCS) for exchange of soil data to support national and global analytical studies. • Center cosponsored a national conference with the Farm Foundation, the North Central NCR-4 Committee, and the National Extension Center for Advanced Study: "Structural Changes in Commercial Agriculture." • Research was provided to OECD regarding European problems relating to structural adjustments in agriculture.
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Hungarians Commemorate First East-West Conference

Thirty years ago, an unprecedented gathering of agricultural economists took place at Keszthely, Hungary. Officially titled “Economic Models and Quantitative Methods for Decisions, Planning, and Policy in Agriculture,” the seminar soon became known as the first “East-West Conference.” Organized by Earl O. Heady and funded by the Ford Foundation, this seminar brought economists from the Soviet Union and Eastern Europe together with economists from Western Europe and North America to discuss agricultural production as it existed in both communist and capitalist systems.

Heady believed that agriculture, despite the political/economic system in which it functioned, had certain basic characteristics.

- All countries actively attempt to improve their agricultural sector through the development of agricultural policy and the use of public machinery to aid in the planning and management of individual farms—for example, state or national extension agencies or advisory services.
- Agriculture is carried out over a wide geographical range and is subject to differences in climate, soil quality, location, and interregional connections and associations.

- Agriculture involves a large number of individual producing units that make individual plans and decisions. Yet, the products of these units must meet the aggregate demand and supply conditions of the market or nation.

Heady recognized that the modern mathematical programming techniques developed at CARD could be applied in determining resource use and management strategies on individual farms; determining demand and market conditions on national and international levels; or making projections concerning the future of the industry and adjusting for changes under economic growth.

Heady also recognized that these modern analytical techniques were not being used nearly as extensively as they could be, for a number of reasons, including:

- the models and their potential applications were still largely unknown;
- the appropriate data for running many of the models had yet to be collected;
- the models needed further adaptation to match new situations; and
- people tend to be resistant to trying new methods.

Decision and planning models could be adjusted for conditions of

resource restraints, agricultural organization, methods of demand reflection, farm objectives or objective functions, national policy, and consumer welfare. His goal for the East-West Conference was: “The participants will not be arguing about different social and economic systems, but will be discussing methods by which the same economic principles and methods can be applied to all countries to improve the decisions, performance, and policies of agriculture.”

This seminar had been in development since 1964. Heady collaborated with colleagues from Hungary, Czechoslovakia, Russia, Sweden, and Italy. The Ford Foundation had agreed to fund the project through the International Institute of Education. The organizing committee invited 60 participants—selected for their scholarly work, not their political affiliations—30 from the East and 30 from the West.

A Cold War Era Conference

When Heady arrived in Hungary in July 1968, it became immediately apparent that it was a Cold War world. Keszthely was located near a Soviet air base and jet planes exercising Warsaw Pact maneuvers made so much noise that it interfered with the discussions. The Soviet governments had sent additional participants with

•Major research projects were conducted on the costs of land retirement programs, migration of farm families to cities, regional adjustments in grain production, demand for farm labor, and a projected organization of the farm industry by 1980.

1966

- A simulation model evaluated the impact of policy options on the structure of agriculture, resource use, rural sector employment, and farm income.
- Work was initiated on a major policy modeling study for the National Food and Fiber Commission (through 1967).
- The U.S. Department of Agriculture and the President’s Commission on Agricultural Policy contracted with CAED to undertake analysis of U.S. agricultural capacity and world food needs. These results were used in assessing long-range domestic and foreign policy alternatives.

no advance registration, thus throwing the carefully planned program (30 researchers from each side) off balance. Adding to the confusion, some of the invited participants from the East had fallen out of political favor prior to the start of the confer-

economists had an opportunity to meet several good people, whom they otherwise might never have met. He said: "While economists from East and West had often been at the same meetings, to discuss 'quantities and trends' in various countries, we knew

Heady credited the success of the conference to a number of factors: CARD had had previous collaborations with several researchers from the Soviet Union; Heady had lectured in Hungary on previous occasions; his books (especially *Economics of Agricultural Production and Resource Use*) had been translated into Russian and had been widely used in the Soviet Union and Eastern Europe prior to the conference.

Luther Tweeten, who attended the first East-West conference as a representative from Oklahoma State University, agrees with this assessment. "Everybody crowded around Earl and everybody wanted to hear what Earl had to say. . . . It is an indication of what that group of people in Eastern Europe found interesting, and it was Earl Heady's production functions and his linear programming. . . . Everywhere you went in Eastern Europe, he was very highly thought of."

The 1998 Conference

In March 1998, the College of Agriculture of Gyöngyös, Hungary, held a special observance of the East-West Conference and commemorated Earl O. Heady's career. The observance was part of an annual event, the International Scientific Days of Agricultural Economists, sponsored by the college. Special guests included Marian Heady, Earl's widow, and Steve and Barbara, two of the



Mrs. Marian Heady, her son Steve, and daughter Barbara, stand next to the bronze bust of Dr. Heady and a collection of his publications presented to the College of Agriculture of Gyöngyös in March 1998.

ence. These people were cancelled out of the conference, only to appear in Kreszthely "on vacation."

The conference welcomed all who attended. Heady later said that there was even an advantage in having more economists from the Soviet Union present. He felt that the Western

of no other meeting where they had come together to discuss the same principles, concepts, and models for economic decisions and planning. The participants from Eastern countries, even more than those from the West, pushed for a second seminar organized similarly."

1967

- Earl Heady was named to a panel of experts advising the U.S. State Department on world food problems and foreign policy.
- Center cosponsored two major agricultural policy conferences: "Implications of Changes on Farm Management and Marketing Research," and "Alternatives for Balancing Future World Food Production and Needs."
- Cooperative work was extended with the Federal Extension Service, USDA Land-Grant Association Committee, and the Canadian Department of Agriculture.

1968

- CAED helped organize the first East-West Conference of agricultural economists in Hungary.
- CAED issued a report, *Farm Programs for the 1970s*, outlining a major shift in national farm policy. These recommendations had a significant influence on the development of U.S. land retirement programs and policies.

Headys' three children. David Topel, dean of the ISU College of Agriculture; William Meyers, CARD interim director; and John Miranowski, chair of the ISU Department of Economics, presented papers at the 1998 conference.

A bronze bust of Heady was also unveiled and dedicated. Mrs. Heady presented the College of Agriculture of Gyöngyös with a complete set of her late husband's publications.

The recent ceremony and conference exemplify the continuing

friendship that Iowa State University and CARD have enjoyed with Gödöllő Agricultural University—the parent institution of the College of Agriculture of Gyöngyös—and several other Hungarian universities and organizations. ♦

Early Model Development (cont. from page 6)

that would guide his future research (and CARD's). In 1952 Heady published his landmark work, *Economics of Agricultural Production and Resource Use*. Thereafter known as the "blue book," this was one of the first systematic applications of the principles of general production economics to agriculture. It explained a variety of economic decision-making relationships never before explored. In 1958, Heady expanded on the quantitative work started by others in the 1940s with his *Linear Programming Methods*. Heady was among the first to apply linear programming to quantitative agricultural research.

The production functions analyzed in depth in the blue book formed the basis for a wide range of quantitative studies of farm operation using conventional statistical analytical tools. For example, early on Heady proposed more efficient sampling methods to provide useful results for farmers and agricultural economists. However, some of the most innovative modeling projects developed by Heady and others at CARD were linear programming (LP) applications related to farm production functions.

LP was applied to optimization studies of crop rotations, fertilizer

use, selection of management options, the efficiency of land leasing systems, adjusting income to meet changes in prices, maximizing farm profits, and a wide range of other problems. LP proved to be an effective tool in analyzing alternatives for cost-effective allocation of limited agricultural resources. Heady implemented interdisciplinary work to produce quantitative results that producers could use. However, even as micro-level model research continued, CARD began to adapt LP methods to large-scale simulation modeling aimed at evaluating national agricultural policy.

A National Focus—Macro Model Development

Macro model development at the center proceeded along two main lines: programming models and econometric models. Programming models (of which linear programming is only one method) adopt a normative approach to solving problems; i.e., given a certain objective and a certain set of constraints, a programming model will provide a solution for what ought to happen. A programming model does not necessarily explain why such an outcome occurs. Econometric models are said to adopt a positive approach;

they attempt to depict events as they truly exist and may explain why a certain outcome occurs.

Programming models permit economists to formulate "What if?" scenarios for the agricultural sector and are flexible enough to incorporate new technologies and policies into the sector when no prior experience is available upon which to base possible outcomes of policy decisions. So, it is possible to test, or simulate, the effects of proposed policies.

Econometric models are generally based on historical data and describe relationships based on past experience. Certain rules and constraints not estimated statistically from past data may be introduced into econometric models to facilitate their application to policy analysis. Econometric simulations help elucidate economic relationships among commodities within the agricultural sector.

The dynamic nature of econometric models provides for ongoing analyses as new sets of factors come into play. Programming and econometric models may be integrated into "hybrid" models that incorporate the most useful elements of both for a particular study.

During the first 25 years, CARD most often utilized variations of a large-scale static LP model and mainstream econometric models.

Applications of Macro Models

The first national linear programming model at Iowa State College was developed by Earl Heady and Alvin Egbert from 1955 to 1958. This model was used to investigate the impact of alternative policy and technology options for the wheat and feed grains sectors. With 300 equations and 1,200 associated variables, the model was too big for the college facilities (at that time) to run. So, computer time was contracted with other organizations. In the 1960s this model was developed at CARD and was extended to include a growing number of variables and an increasing number of agricultural commodities.

The basic LP model divided the United States into producing regions

and marketing regions and was capable of analyzing interactions among them. Constraints relating to the regional availability of resources, crop yields, regional demand, and other factors, could be introduced to evaluate the effects of government policies, agricultural sector capacity, interregional adjustments, land-use patterns, land retirement programs, and other factors. The model was flexible enough to incorporate additional activities, such as livestock operations, transportation, and international trade.

New priorities in the 1970s—especially the push in natural resource conservation—led to further adaptation of CARD's LP modeling system. Water was added as a constraint to agricultural production.

The model incorporating water was later modified to incorporate soil loss and fertilizer use to allow for analysis of soil conservation programs and chemical use policy alternatives.

CARD cooperated extensively with other land grant universities, the U.S. Department of Agriculture, and other government agencies in collecting and analyzing the data. Support for development of LP models came from the SCS, ERS, EPA, the National Science Foundation (NSF), and other government agencies, private agencies, and private foundations.

Using variations of the extended LP model, CARD performed a modeling study during 1970–72 for the National Water Commission of

Excerpts from an Interview with Stanley R. Johnson



The following excerpts are from an interview with Stanley R. Johnson (SRJ), CARD director from 1985–97 and current vice provost for Extension at Iowa State University. This interview was conducted by Ellen Balm (EB), CARD staff writer, on April 4, 1998. Additional selections will be published in upcoming issues of the CARDreport.

EB: Land grant colleges in the 1950s were accused of creating the agricultural surplus through research and technology and ignoring the plight of farmers who were not making a sufficient living due to low farm prices. Do you feel that this is a fair criticism?

SRJ: As technology improved, it was possible to farm more land and we required fewer farmers. That is good. If everybody is producing food, you do not have resources to produce the other things we consume. But the adjustment problems were difficult and, in periods of surplus such as occurred just after the Korean War, there always is the accusation that the research is not benefiting the farmers and, in fact, it does not. Except for the early adopters, it benefits consumers.

EB: The original goals of the Center for Agricultural Adjustment (now CARD) were to solve the problem of adjustment to productivity growth in agriculture and to transfer benefits of increased agricultural efficiency and technology to consumers, presumably by keeping the food prices low. Aren't these contradictory goals?

SRJ: What was going on in agriculture at the time that CARD started was an adjustment or a transition to a different organization of agriculture. Perhaps at the time these impacts were felt more in Iowa than in other locations. One of the reasons for the center was to provide analysis for policy in the location

the potential future agricultural use of water under different conditions of technology, population, and exports. Shortly thereafter, the EPA contracted with CARD to study the environmental impact and costs associated with soil loss restrictions and nitrogen fertilizer limitations. During 1973–75, CARD conducted research for the National Water Assessment (NWA) using a variation of the LP model. Beginning in 1979 CARD began analyzing soil and water conservation programs for the SCS. The model evaluated the impact of these programs on agriculture as part of the environmental protection activities mandated by the Resource Conservation Act (RCA). The NWA and EPA models were refined into the Agricul-

tural Resource Interregional Modeling System (ARIMS) that provided the tool for the RCA appraisal.

ARIMS had 105 producing regions, 31 marketing regions, and 34 ecological regions. It could include from 120,000 to 140,000 marketing and production activities with 6,000 to 8,000 constraints. The model provided for minimization of agricultural production costs subject to the constraints on land availability, soil loss, and regional production patterns, and assessed the effects of tillage practices, crop rotations, producer and consumer benefits, and a variety of other factors.

Analytical Capability Expands

The first national econometric model was developed at CARD in

1962 by Heady and Luther Tweeten, currently professor of economics, The Ohio State University. Econometric modeling was used to analyze problems that programming models could not—for example, the performance of agricultural markets over time. In 1966 work began on the first econometric recursive simulation model.

Heady and Daryll Ray developed a model that incorporated several commodities (including wheat, soybeans, and cotton) and sequentially depicted annual production cycles. Government policy variables could be introduced for individual commodities and the impacts could be assessed through simulation runs. Updated versions were used to evaluate the effects of conventional

where the adjustments were occurring by researchers sensitive to the concerns of the farm and rural communities. The center helped develop policies consistent with the rapid adoption of technology. These technologies have contributed to decreasing the budget share for food, which in terms of the consumer dollar (in the 1950s probably 30 percent) is now about 11 or 12 percent.

Are these contradictory goals? Not unless you assume that you have to keep the same number of people in agriculture. One of the reasons that CARD evolved to be called the Center for Agricultural and Rural Development is that there was a significant release of labor from the farms and a big issue about how the rural communities would develop to have a broader economic base.

EB: Another early justification for the establishment of the center was that grants and gifts were to be encouraged. Was there a problem soliciting funds from outside sources under ordinary circumstances?

SRJ: There are many centers in the universities now, and these centers are mechanisms by which universities gather grants and contracts. Iowa State University was an innovator in recognizing that, in order to have success in attracting grants and contracts, you had to have units that work on contemporary and hot issues. CARD was something new in the way universities contributed to economic policy, but it was also something new in terms of the way to organize research efforts within universities.

EB: Why do you think Earl Heady became interested in policy research?

SRJ: Agriculture in this country was primarily a domestic industry and it changed in the period of his directorship of CARD to an industry where international markets and export markets were very important. . . . Until he came along, most of the agricultural analysts were people who studied the history and political trends. Nobody was doing quantitative analysis and projecting trends, and incidence of benefits, and that is what CARD did.

EB: Did Heady have any specific influence on your own work as an agricultural economist?

SJ: I have often told my story about coming to ISU at the AAEEA meetings in 1960 to interview with him. I was ready to go to graduate school and he offered me an assistantship to come and work with him. I turned down a CARD assistantship to go to graduate school at Texas Technological College. He often said to me afterwards that he hoped my judgment was better now than when we first met. ♦



CARD graduate students review a computer printout with Dr. Heady.

agricultural policies on farm income, farm sizes and numbers, employment and capital, investments, and other related phenomena.

In response to requests for analytical support from the Office of Planning and Evaluation of the U.S. Secretary of Agriculture in 1975, the econometric simulation model was expanded to furnish long-range projections for future alternative exports of agricultural products, to evaluate proposed government policies, and to assess levels of production efficiency. In 1977, CARD used this model to analyze the effects of alternative federal taxation policies on agriculture aimed at restraining production and improving commodity prices and farm income.

In the early 1980s a variety of simulation studies used expanded and modified versions of the econometric model initiated by Heady and Ray. For example, in 1980 CARD conducted an analysis of policy for the livestock sector, paying particular

attention to the effects of price supports for crops and increased beef exports. The model was again applied in 1981 to assess the impact of the Russian grain embargo on U.S. agricultural markets and producers. Heady and his colleagues undertook a simulation study in 1983 to judge the influence of energy prices on the long-term future of agriculture. In addition, throughout this period, CARD econometric models were applied in a variety of studies on the changes in farm structure, productivity, and export levels.

The CARD modeling system was also extended globally through a number of projects. In 1973, for example, CARD received a U.S. Agency for International Development (USAID) grant to undertake a project in Thailand. The long-term goal was to impart to the Thai government integrated analytical tools to formulate and refine agricultural policy using large-scale econometric and linear programming models. The

relationship between the Thai Ministry of Agriculture and Cooperatives and CARD extended into the late 1980s and yielded great successes for the Thai government. Other projects in Asia and Latin America broadened the center's reach and impact.

Legacy and Longevity

A primary strength of the early modeling systems at CARD was the practice of institutionalizing the analytical capacity. William Meyers, CARD associate director since 1985 and currently interim director, said: "The thing that was always different about CARD, which most of the other centers never did and in many cases did not want to do, was that Heady started the idea (and it has been continued up to today) of building capacity—research capacity—as you would in the laboratory. Through organizing [CARD] around analytical models and quantitative systems, he developed a capacity that went beyond one student, one professor, or one project. When people moved through and students graduated and went on, their work was retained in the systems that were built over time."

CARD's massive agricultural policy database, and core family of models able to be restructured in a timely fashion, permitted the researchers to respond efficiently to contemporary problems and issues. Heady's philosophical grounding—providing the means to solve real problems of resource allocation—provided the ideological fabric that not only tied the work together but also furnished a common outlook for his colleagues and graduate students.

The circumstances surrounding the historical development of CARD certainly played a major role in the evolution and success of the modeling

systems. Conditions favored the establishment and growth of CARD at Iowa State, while continued support from the university administration—ranging from major commitments, to retrieving data, building computational facilities, and providing salary parity for Heady when he received offers from competing institutions—ensured that the center would remain innovative and competitive in agricultural economics and public policy analysis.

Heady's professional reputation (combined with that of Iowa State) attracted the attention of U.S. presidents, government agencies, and private foundations. This led to the financial support that established CARD as a leading research center for national and international agricultural issues. Operating the center with a multidisciplinary base, Heady provided the degree of focus on specific research issues and accountability that appealed to public and private donor organizations.

The relationship established early on between CARD and USDA ensured that the center had access to timely and contemporary sets of agricultural data. In CARD, the USDA gained an analytical arm for setting a course for national agricul-

tural policy. The close working relationship with USDA agencies continues to this day.

“Heady started the idea . . . of building capacity—research capacity—as you would in the laboratory. . . . [And] when people moved through and students graduated and went on, their work was retained in the systems that were built over time.”

—William H. Meyers

Virtually all major changes in U.S. agricultural policies during the past 40 years have been in some way influenced by the research and simulation modeling developed in the CARD quantitative analytical systems. The ongoing evolution of farm bills, including the 1996 Federal Agricultural Improvement and Reform (FAIR) Act, have been partially based on the results of CARD research.

Under the leadership of Heady's successor, Stanley R. Johnson, CARD and FAPRI (Food and Agricultural Policy Research Institute) utilized research technology to respond to developments in method and theory. The faculty, graduate students, and staff continued to provide innovative analysis for national and international policies affecting U.S. agriculture, while bridging the interests and capabilities of scholars and the demands of the public policy process.

Johnson and the CARD faculty significantly expanded the center's analytical capability, multidisciplinary research, and outreach activities. Integrated modeling systems were developed to address the complex domestic and global issues of the 1980s and 1990s regarding trade policy, resource and environmental policy, food and nutrition policy, and rural development policy.

Editor's Note: The story of CARD's research capacity and application to agricultural policy analysis will be continued in subsequent issues of the CARDreport. See our Web site for more on CARD's history www.ag.iastate.edu/card/about/forty.html ♦

Where Are They Now?



Ken Nicol

Ken Nicol, a 1974 CARD graduate, is presently serving as a Member of the Provincial Legislative Assembly of Alberta, Canada. Dr. Nicol is affiliated with the Liberal Party for the constituency of Lethbridge-East. He first stood for election in 1993 and was re-elected in 1997. In the Alberta Liberal Caucus, Nicol occupies the positions of Critic Responsible for Economic Development, Critic Responsible for Agriculture, Food, and Rural Development, and House Leader. His is an active voice in current debates relating to agricultural and rural development in Canada.

While at CARD in the 1970s, Nicol worked with Earl Heady on a number of projects, including the application of programming models to evaluate economic and environmental policies. He conducted research under the National Science Foundation RANN (Research Applied to National Needs) grant awarded to CARD in 1972. Nicol coauthored several reports and papers with Heady, including projections of land and water use for the year 2000 submitted to the National Commission on Water Quality. He also worked in Thailand on the CARD agricultural policy project initiated there in 1973. Nicol's doctoral dissertation is entitled, "A Modeling Approach to the Economic and Regional Impacts of Sediment Loss Control."

In a recent interview, Nicol said: "My training at Iowa State taught me that you can't deal with specific issues in isolation. I think that in itself has to be the most significant thing that I learned at CARD. In my present position I have applied this principle. In Canada we need to consider the impacts of provincial policy on our national agricultural sector, and the overlapping impacts into other sectors of the economy.

"The broad base of analysis at CARD taught me that agriculture is not domestic. You cannot deal with agriculture and think only of the United States or only of Canada. You have to think of it in the context of the world. You are always looking at the interrelationships, at the broad picture."

Nicol has served as an Associate Professor of Agricultural Management at the University of Lethbridge, President of Nicol Management Services, Ltd., and Director of the Centre for Aboriginal Management Education. He is married to Linda Nicol, and they have three children and four grandchildren. ♦

CARD Profile: Becky Olson and Karleen Gillen

In-house preparation of CARD publications has been a goal of the Communications and Information Division (CID) since at least 1987, according to division manager Judith Pim; but constantly changing computer hardware and software made the goal difficult to attain. In 1997, however, the right combination of computer technology and personnel was finally available, and CID has been desktop publishing an increasing number of CARD publications

Becky Olson has been with CARD for nearly nine years. She worked in the Computer Support Division before transferring to CID in 1997. Before that, she served as the associate director's secretary. Becky is responsible for the production of the *CARDreport*, *Iowa Ag Review*, and special publishing projects as they arise. Becky has been trained on many software packages including Adobe's PageMaker, PhotoShop, and Illustrator.

Becky and her husband, Ray, live on an acreage near Boone, Iowa. They have three children ages 12, 11, and 5. Her interests include mystery novels, painting, and manufacturing miniatures.

Karleen Gillen has been working at CARD since 1985. Karleen assists CID when an additional hand is needed. She has worked in Page-Maker, Illustrator, and PhotoShop. Karleen had some experience with the original Xerox desktop publishing unit CARD installed around 1987. Her main responsibility is working with Professor Helen Jensen in the Food and Nutrition Policy Division. While working with Dr. Jensen, Karleen has produced slides,

transparencies, a software user's guide, and an ICN project with PowerPoint and produced graphs using Harvard Graphics.

Karleen is also our unofficial CARD birthday card designer. She lives in Ames with her husband, Rich, and three daughters, Jessica, Stacy, and Melissa. In addition to her employment at Iowa State University, she is a local Girl Scout leader. ♦



Karleen Gillen (left) and Becky Olson.

CARD is a public policy research center founded in 1958 at Iowa State University. Research, educational, and outreach programs at CARD are conducted in four primary areas: trade and agricultural policy, food and nutrition policy, resource and environmental policy, and rural and economic development policy.

William H. Meyers
Interim Director

Judith Pim
Manager, Communications
and Information Division

Ellen Balm
Staff Writer

Charles Sauer
Contributing Writer

Becky Olson
Publication Design
and Production

Contact Betty Hempe for a free subscription to the *CARDreport*, publication information, and address changes: **CARD**, Iowa State University, 578 Heady Hall, Ames, IA 50011-1070; Phone: 515-294-7519; FAX: 515-294-6336; e-mail: card@card.iastate.edu. Back issues can be accessed on our Web site (www.card.iastate.edu)



Iowa State University
578 Heady Hall
Ames, IA 50011-1070