



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

WP 2003-02
January 2003



Working Paper

Department of Applied Economics and Management
Cornell University, Ithaca, New York 14853-7801 USA

Major Ideas in the History of Agricultural Finance and Farm Management

Peter J. Barry and B.F. Stanton

It is the Policy of Cornell University actively to support equality of educational and employment opportunity. No person shall be denied admission to any educational program or activity or be denied employment on the basis of any legally prohibited discrimination involving, but not limited to, such factors as race, color, creed, religion, national or ethnic origin, sex, age or handicap. The University is committed to the maintenance of affirmative action programs which will assure the continuation of such equality of opportunity.

Forward

The Senior Section of the American Agricultural Economics Association is sponsoring a series of symposia on the “history of ideas” that undergird our profession. The intent is to provide perspective and allow discussion of the major ideas influencing the research and teaching in agricultural and resource economics. A typical symposium involves major presentations by active professionals, and discussion provided by a senior member of the profession. The 2002 symposium, held at the Long Beach meetings of AAEA, focused on major ideas in the history of agricultural finance and farm management. Peter Barry, University of Illinois, made the presentation on agricultural finance, and C. Robert Taylor, Auburn University, made the presentation on farm management. B. F. Stanton, Cornell University, provided a formal discussion, before the floor was opened to general discussion. Larry Connor, University of Florida, moderated the discussion.

The participants were encouraged to prepare formal papers based on their presentations, while taking account of the discussion. Regrettably, Bob Taylor felt that he did not have the time to write a formal paper, but Bud Stanton agreed to do so. Thus, this publication contains major papers written by Barry and Stanton, both derived from the 2002 AAEA symposium. We hope that readers find that they provide valuable insights into the history of ideas of our profession.

Bill Tomek
President (2002-2003), Senior Section

Contents

Major Ideas in the History of Agricultural Finance, Peter J. Barry.....	1
Major Ideas in the History of Farm Management and Production Economics, B. F. Stanton.....	20

Major Ideas in the History of Agricultural Finance

Peter J. Barry

Peter J. Barry is a professor of agricultural finance at the University of Illinois. This paper was presented at an Organized Symposium on Major Ideas in the History of Agricultural Economics, sponsored by the Seniors Section of the American Agricultural Economics Association, Long Beach, July 28-31, 2000.

Major Ideas in the History of Agricultural Finance

Contemporary finance has market, institutional, management, and policy dimensions just as it has had for many generations. Many of the issues and problems addressed across generations are strikingly similar, even though their context has greatly evolved. Awareness of these historic linkages is important for maintaining the intellectual maturity of a discipline, understanding conceptual and institutional change, and stimulating modern approaches to answering enduring questions. A little history can go a long way.

This article addresses “Major Ideas in the History of Agricultural Finance”. An appropriate qualification at the outset is to revise the title to read “‘Some’ Major Ideas . . .”. This will help to acknowledge potential errors of omission and co-mission in identifying past developments. The focus is on finance ideas that emerged prior to the 1960s and extends back to the 19th century. Quotations used later in the article express the early ideas in the words of the respective contributors. The next sections provide background and identify several eras of idea development.

Background

The early developments of agricultural economics and agricultural finance were largely parallel to one another.¹ Both areas reflect the eventual merging of agriculturalists interested in economics and economists interested in agriculture. The agriculturalists were generally employed by land grant universities or government agencies, while the economists came from Harvard, Princeton, Chicago and other peer institutions. The late 1800s and early 1900s saw economics and finance issues in agriculture addressed in such publications as the *American Economic Review* and the *Journal of Political Economy*, as well as in experiment station, extension, and USDA publications. The creation of the *Journal of Farm Economics* (now titled “The American Journal of Agricultural Economics”) in 1918 provided a more targeted outlet for scholarly discourse, although agricultural economics and finance articles continued to appear in general economics journals. In 1938, the first volume of the *Agricultural Finance Review* was published, thus providing a more specialized forum for finance issues.

General finance was emerging as a discipline in the 1930s and 1940s. The American Finance Association, for example, was established in 1945. Much of general finance focused on larger scale, corporate industries, as well as on public finance. Then, and now, a “small business” was often much larger than a farm business in terms of sales, assets, and employment.

The financing of agriculture has long attracted attention because of the country’s farming roots and the sector’s unique characteristics. Family-size operations have dominated the numbers of farms resulting in close linkages between the household and business. The ownership and control of land has been essential, and land ownership contributes significantly to the high capital intensity of most farm businesses. The non-depreciability of farm land introduces unique liquidity problems because current rates-of-return are relatively low, with unrealized capital gains comprising a major part of total economic returns. Crop and livestock production are lengthy, sequential, and variable due to biological and environmental factors.

Market risks are high as well. Finally, public policy initiatives have played a key role in stabilizing and improving the availability of credit and other financial services to agriculture.

Eras of Idea Development

The historic literature in agricultural finance suggests three overlapping eras in the development of finance ideas. The first was an action-oriented, problem-driven era with a major focus on institution building and filling financial market gaps. The second, arising in the early to mid 20th century placed a greater emphasis on the scientific framing of issues and ideas. The third era, following soon thereafter, and paralleling the evolution of agricultural economics more generally, has been characterized by greater emphasis on problem conceptualization and methodology. Mathematical modeling and quantitative analysis based on econometrics, optimization, simulation, or other approaches highlight this modern era. Such developments have greatly expanded the capacity of finance economists to address emerging issues and problems. In the discussion to follow, the focus is first on the action era and then, on the scientific framing era.

The Action Era

Mobilizing capital was a major concern during the colonization of North America. Providing food, shelter, clothing, and community infrastructure placed heavy demands on financial and labor resources. Accompanying the commercialization and trading for these enterprises were significant needs for capital and credit. Much of the early credit facilities were merchant-based or provided by wealthy individuals who may have received large land grants. The merchant-based financing, especially in the South, could originate with European traders who extended credit to urban-based companies in North America, who in turn extended credit to local merchants, who then extended it to farmers. While such arrangements served the credit functions of finance, they did not directly stimulate of savings in the form of financial assets, nor did they contribute to a widely accepted, stable form of currency.

Through the late 1700s and early 1800s, several “land bank” initiatives occurred in which local land owners pooled mortgages on their land, and issued notes which were accepted, locally at least, as a form of currency. A reasonably well-developed legal system of property rights in real estate helped to solidify such arrangements, with signs even then of modern day approaches to “securitization”. The enduring characteristics of land and its high collateral value for lenders were drivers of the “land bank” idea, and ultimately led to the formation of the Federal Land Banks in 1916.

Commercial banking cycled through periods of favor and disfavor in the 1800s. A strong preference in the U.S. for state-chartered banks assured that the control of banking was geographically concentrated, but it slowed the geographic mobilization of funding flows. Post Civil War developments and western frontier expansion favored larger banking systems in the South and West, although still concentrated under state controls. Country banks were notoriously unstable because of their dependence on the economic health of their local

communities, which were heavily farm dependent, and on the vulnerability of their correspondent relationships with city banks to swings in general economic conditions. Many of these banks created their own currency by issuing bank notes. Thus, the relative infancy of fiscal and monetary policy by the federal and state governments contributed to economic volatility.

The terms of loans from commercial banks and merchants did not match well the credit needs of farmers. An operating loan from a bank was typically one to three months long, while farmers needed annual operating loans for crops and livestock. Mechanization in farming also called for longer term financing. Especially burdensome were the three to five year maturities on farm mortgage loans. The absence of longer term, amortized loans left the farmland borrower with great uncertainty about renewal at loan maturity.

Towards the end of the 1800s, many states conducted surveys and studies to measure of farm debt, foreclosure rates by lenders, and interest rates on farm loans. These studies reflected wide-spread discontent about financing arrangements for farmers and laborers. Agitation for rural credit legislation mounted.

The studies continued during the first 15 years of the 20th century, and several commissions were formed to recommend an improved financial system for agriculture. Particular attention was given to cooperative farm credit systems in Europe. In his 1912 inaugural address, President Woodrow Wilson specifically commented that agriculture is not “afforded the facilities of credit best suited to its practical needs.”

These times were also characterized by major developments in the U.S. financial system. The creation of the Federal Reserve System in 1913, was a milestone that brought coherency and stability to U.S. banking and facilitated the role of federal monetary policy in the U.S. economy. Subsequent legislation in the 1920s and 1930s limited the geographic scope of banking, separated banking and securities functions, initiated various types of financial reporting requirements, and created federal deposit insurance for bank depositors.

In agriculture, the long period of debate and study brought about the Federal Farm Loan Act of 1916 which created the Federal Land Bank System for farm mortgage lending (an alternative joint-stock land bank system was also authorized, but did not achieve long-term viability). Federal Land Banks (FLBs) were capitalized in twelve districts of the U.S. that were designed to have considerable intra-district diversity in farming conditions. Farmers in these districts were then to create local, farmer-owned and directed Federal Land Bank Associations (FLBAs) which would serve as agents of the district banks in dispersing mortgage loans to farmers. In turn, the land bank associations would become owners and directors of the district banks. The district banks would obtain their loan funds through the sale of agency bonds to financial market investors. Part of the loan proceeds to farm borrowers would be re-invested in the banks as equity capital to supplement and eventually replace the initial capital provided by the federal government. Regulation and oversight came from the federal government. Thus began the Cooperative Farm Credit System in the U.S.

Subsequent developments included the establishment of twelve Federal Intermediate Credit Banks (FICBs) in 1923 with the goals of discounting farm loans originated by country

banks and agricultural credit corporations, and providing a source of credit for agricultural cooperatives. Similar to the FLBs, the FICBs were to obtain loan funds from the sale of bonds to financial market investors. Because the FICBs received relatively little use, and in response to depression conditions, a system of Production Credit Associations (PCAs) was authorized in 1932 in order to better meet farmers' short and intermediate term credit needs. The idea was for local farmers to organize a credit cooperative, owned and patronized by its members. The local PCA, distinct from the local FLBA, was to obtain loan funds from its district FICB, and make short and intermediate term loans to eligible agricultural borrowers. (For a time, regional production credit corporations operated needlessly between the FICBs and the PCAs, so they were soon disbanded.) The borrowers would re-invest part of their loan proceeds as equity capital in the PCA, and the PCAs would become owners, directors, and patrons of the district FICB.

The third leg of the Farm Credit System was a Central Bank for Cooperatives and twelve district Banks for Cooperatives to give farmer-owned agricultural cooperatives a dedicated source of financing. Also emerging from the 1930s was the Farm Credit Administration to serve as the system's government regulator.

The general principles underlying the establishment of the Farm Credit System – specialization in agricultural finance, farmer/borrower owned, access to the national financial markets, government regulation – still characterize the system today. However, extensive restructuring and consolidations, joint funding of farm credit bonds by banks with joint and several liability, bond holder insurance, repayment of government capital, broader lending authorities, an arms-length regulator, and other changes have significantly altered the system's appearance.

The FCS today is called a government-sponsored enterprise (GSE). Due to the early success of the Federal Land Bank System, the GSE idea was extended to now include Fannie Mae, Freddie Mac, and the Federal Home Loan Bank System as financial service companies for residential housing; Farmer Mac for the securitization of farm mortgage loans; and Sallie Mae for university student loans. These GSEs are privately-owned and federally-chartered and regulated with several having their ownership stock public ally traded. Thus, the GSE concept has taken diverse forms as it extended from agriculture to other sectors of the economy.

Besides the commercial credit services provided to farmers through the Farm Credit System, the federal and state governments were periodically called upon to provide public credit to farmers. Public credit responded to crop disasters and other emergencies, poverty conditions, young farmers lacking access to commercial credit, and rural development needs. In 1938, these federal programs were consolidated into a newly formed Farm Security Administration. The result was a new public ally-owned and subsidized credit program for agriculture and rural areas. The Farm Security Administration was renamed the Farmers Home Administration in 1946, and then became part of the Farm Services Agency in 1996. The Farm Services Agency currently provides much of its credit assistance to farmers through guarantees of loans made by commercial lenders.

As the U.S. emerged from World War II, the scholarly and policy discussion began to further address the role of government in agricultural finance and the changing degree of competition in the farm credit markets. Consolidation of government-related credit programs was a recurring theme, as was the view that any subsidies should be conveyed through making credit readily available to farmers rather than through low interest rates. For small farms, improved income potential rather than more generous interest rates was the preferred approach. The unique risks of agriculture together with the agricultural orientation of many country banks and the FCS called for governmental or institutional backup to offset the effects of their concentrated and sustained lending programs.

At the same time, however, agricultural bankers in particular were expressing concerns about the Farm Credit System's tax exemptions, agency funding access, and government capitalization and support. Interestingly, the reforms of both the U.S. banking system and farmers' credit programs were having the desired effects of increasing the competitive availability of loan funds for farmers. Despite significant structural, statutory and regulatory changes affecting these financial institutions, the controversies and competitive disputes continue.

In summary, the action/problem-driven era of agricultural finance reflected the idea that farmers needed sources of credit dedicated to agriculture and available through good and bad economic times. A well-functioning system would provide competitively priced, reliable, versatile, and timely credit with repayment terms that generally matched farmers' cash flows. Institution building and the filling of market gaps characterized the action era. The deliberations and developments were fueled by experiences elsewhere, trial and error, measurement and survey, citizen outcries, and intuitively-based prescriptions. Finance economists seized opportunities to make major policy contributions. Despite turmoil and decades of toil, the results are enduring institutions that have largely achieved their public ally-mandated missions.

The Scientific Framing Era

The scientific framing era reflects the efforts of key contributors to base their ideas on conceptualized relationships among the parties (i.e., the lender and borrower) to a financial contract. The goals were to shed greater light on important policy issues and to motivate subsequent empirical work. The contributions of two agricultural economists are highlighted here – D. Gale Johnson of the University of Chicago and Earl Heady of Iowa State University. Neither of these scholars are considered finance economists, although their ideas about credit rationing, financial risk, and linkages of lender's preferences to the production, market, and investment practices of farmers were rigorous and highly insightful.

D. Gale Johnson

In 1947, D. Gale Johnson authored the book Forward Prices for Agriculture published by the University of Chicago Press. Chapter 16 of the book addresses "Tenure and Credit Rationing." Johnson's work in this chapter was motivated by the observation of the extraordinarily small scale of farms in the U.S., even with large size differences among farm

businesses. The major constraint in reaching an optimal size was capital rationing by lenders as a response to

“... uncertainty about borrower’s good faith behavior, management ability, and risks of agricultural production and market prices.”

Under capital rationing:

“Lenders restrict borrowing so that: 1) the ratio of borrowed capital to owned capital is kept below some prescribed minimum and 2) the rate-of-return on capital is kept at a high level.”

Regarding the second point, the contemporary observation likely is that restricted borrowing protects against potentially large losses in returns. Johnson considered the attitudinal characteristics of the borrower and lender as follows:

“Risk aversion and capital rationing are closely related, except the first is the reaction of the entrepreneur and the second represents the reaction of an outsider.”

Today we would say that both parties could be risk averse, more so for the borrower, with the degrees of risk aversion influencing the extent and terms of borrowed capital.

According to Johnson, capital rationing is important because of its potential effects on the borrower’s business:

“Capital rationing affects the efficiency of resource allocation in two ways: 1) by affecting the combination of factors used and 2) by affecting the scale of operations.”

“Of importance is the distortion of the relative employment due to the differential impacts of capital rationing. This differential is significant on individual farms as it affects production decisions and between farms as it influences the relative size of farms.”

In essence, Johnson was predating the modern approach to understanding lender-borrower relationships that now is often cast in terms of agency theory premised upon asymmetric information, misaligned incentives, and incomplete contracting. He was explaining that “financing matters.” Thus, the preferences of the lender, expressed primarily through the level of available credit, could directly influence the managerial choices and rates of growth of farm businesses. These observations have been tested and largely confirmed by extensive empirical analyses over the past 50 years.

Earl Heady

Earl Heady’s 1952 book Economics of Agricultural Production and Resource Use, published by Prentice Hall, was a classic in the field. It profoundly shaped the study of these

topics for years to come. The content was encyclopedic, and in places ventured into closely-related finance and risk considerations. Heady echoed some of Johnson's views about lender-borrower relationships and the effects of capital rationing, in a fashion that motivated substantial empirical testing.

Regarding the linkages among risk, financial obligations, and diversification, Heady observes:

“Since unfavorable outcomes in a single year may bankrupt the operator with little capital or a low equity, he may diversify in order to increase the chance that high incomes as well as low incomes may be realized.” (p. 518)

A production response to farm business risks may, thus, allow higher financial leverage in the farm's capital structure – a form of risk balancing.

He also recognized the linkages among farm size, financial structure, and adverse incentives (or moral hazard behavior):

“Two managers with identical expectations and viewing the future with similar degrees of uncertainty may rationally follow different courses of action because the framework in which decisions are made differs. The farmer with small capital may justifiably use his resources differently than the operator owning many assets. The pure manager who does not accept the full consequences of outcomes may select a different course of action than the owner-manager.” (p. 500)

Today, the moral hazard or adverse incentive effect in credit use may reflect a go-fo-broke attitude by highly leveraged borrowers who see the cost of failure mainly carried by lenders. It remains for the lender monitor borrower performance and to develop financial contracts that allow greater controls over borrowers as leverage increases in order to safeguard against the effects of adverse incentives by borrowers.

Heady further distinguishes the role of liquidity, including unused borrowing capacity, in accommodating versus warding off risky, unfavorable outcomes:

“Selection of products with low variability, use of formal insurance plans and forward contracts, and selection of stable production processes (irrigation) become attempted methods of warding off uncertainty or unfavorable outcomes; flexibility and liquidity considerations become means of preparing for change and uncertainty.” (p. 508)

“Liquidity refers to the structure or form of the firm's assets. It is characterized by cash balances and unused borrowing power.” (p. 528)

This distinction between reductions in risk and improved capacity to bear risks continues as an important component of risk management.

Heady went on to highlight the important relationships between financial leverage and the borrower's risk of loss of equity capital. By drawing upon Kalecki's insights in the 1930s, Heady states:

“While uncertainty may be directly related to size and capital, the scale of the firm may be dampened even more through considerations of borrowed capital and equity. This phenomenon has been termed by Kalecki as the principle of increasing risk . . . the principle of increasing risk suggests that as a firm expands by use of borrowed capital, the chance of loss of its own capital increases.” (p. 543)

He was among the first to develop an algebraic relationship depicting the profits from leveraging, although the risk effects of leveraging were not modeled.

“The profits from leveraging are

$$p = \frac{I}{C}(e - r)$$

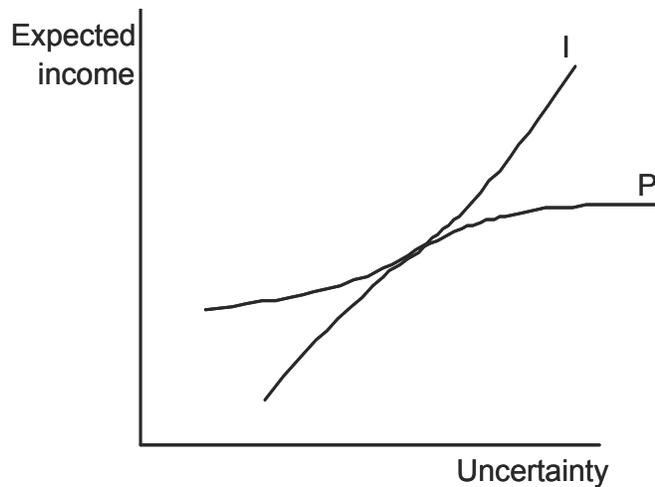
where p is the expected rate of profit on an entrepreneur's capital, e is the expected internal rate of return on the firm's capital, r is the market rate of interest, I is the total investment of the firm, and C is the entrepreneur's capital. A more refined version of Heady's model remains in use in agricultural finance texts today (Barry, et al.).

Finally, Heady addressed the risk-return equilibrium by introducing the borrower's level of risk aversion:

“The entrepreneur who can borrow funds must arrive at some subjective equilibrium selecting an acceptable combination of perspective profits and uncertainty (or possible losses).” (p. 544)

Risk aversion is depicted by the borrower's indifference curve with increasing marginal units of return needed to compensate for increases in risk to maintain a consistent level of utility.

In a footnote, Heady portrays this risk-return equilibrium graphically as a point of tangency between a producer's indifference curve and opportunity set:



This figure bears a remarkable resemblance to Markowitz’s mean-variance formulation of risky choice also published in 1952 which was later extended to include the concepts of risk premium certainty equivalents, and a theoretical distinction between the optimal investment and financing decisions. Heady, however, did not portray the risk efficient set concept in which a minimum risk portfolio is sought for different levels of returns. Thus, Heady came close to matching Markowitz, for which the latter received a Nobel Prize. Heady’s contributions, nonetheless, applied the optimal risky choice framework to agriculture, thus stimulating decades of empirical work on this topic.

Heady then shifted toward the lender side of the financial contract and extended the capital rationing concept to include both internal and external rationing.

“The farmer may refuse to use borrowed capital in a quantity to approximate equation of its marginal cost and marginal return . . . because of either of two reasons; one, risk aversion . . . ; the other, termed capital rationing . . . capital rationing is largely the response of lending firms to uncertainty” (p. 550).

“The lender’s uncertainty surrounding the physical production on a single farm may be even greater than that of the farmer; the operator is better acquainted with the particular situation and may view technical yields, if not price prospects with greater knowledge than the loaning firm” (p. 550).

Today, the second observation would be characterized as asymmetric information between the lender and borrower. Asymmetric information is the major driver in the theory of credit rationing developed by Stiglitz and Weiss. The information conditions in turn led to the influences of the lender’s preferences on the farm borrower’s resource allocation and production decisions:

“Because of the type of uncertainty involved, and since equity requirements are its main uncertainty precaution, the lending firm in agriculture makes greater amounts of capital available for some farm resources than for others.

Feeder cattle represent a type of resource well adapted to equity loans. While cattle feeding is a “risky enterprise” from the farmer’s standpoint, it is a “fairly certain” enterprise as security for a chattel mortgage. Fertilizer does not lend itself so readily as security while tractors and machines are better adapted for bank loans than are new seed varieties or terraces.

These differences in the security value of different resources have important impacts on the resources employed and the products produced in agriculture.” (p. 556)

Johnson and Heady independently framed the key attributes of the lender-borrower relationship in agricultural finance. Asymmetric information and misaligned incentives were implicitly recognized as determinants of the design and terms of financial contracts. Their contributions served as a springboard for many later empirical studies and conceptual refinements. Examples are the formalization of the relationships between credit, agricultural production, and financial risk by Baker (1968a) and Baker and Hopkin (1968b). These latter developments in turn stimulated a long series of empirical applications, often based on lender responses to case loan situations with optimization, simulation, or econometric methods used to determine the effects on the financial performance of agricultural firms (Barry). Baker’s approach utilized liquidity motivations and incentive misalignments between borrowers and lenders. More recent studies have drawn on agency relationships, transaction costs, and incomplete contracting theories to explain financing arrangements motivated by information and incentive alignments between lenders and borrowers.

Continuing with Heady, three additional observations highlight the breadth of his finance insights. On the length of planning horizons:

“From an investment standpoint, the entrepreneur’s economic horizon extends only so long as future net incomes have present value greater than zero.”

Modigliani (1951, 1955) is generally credited with the definition of an economically relevant planning horizon, although Heady’s observation coincides with Modigliani’s.

On variable amortization

“Variable interest and repayment plans may be used to lessen the pressure to ‘produce now’”

This perception of the role of financial markets and institutions in agricultural risk bearing has been periodically revisited by empirical studies and by similar policy proposals for the holdings of financial asset reserves (e.g., the recent tax deferred savings accounts for farmers) to buffer random fluctuations in farm income (also see the observations of J.K. Galbraith later in this article).

Finally, Heady recognized the role of farm real estate leasing as a form of financial leveraging in his statement.

“The fixed rent obligation has an effect akin to that of reducing the tenant’s equity in his capital” (p. 619).

Cash leasing in particular falls under Kalecki’s principle of increasing risk yielding risk effects similar to those from high levels of borrowing.

Vignettes

The following sample of short quotations from the historic literature further demonstrates early insight and ideas about the financing of agriculture in forms that largely remain relevant and under study today. In most cases, the author is recognizing important relationships among factors that may profoundly influence efficiency, public policy, market conditions, risk, and financial performance. The observations were primarily motivated by intuition, experience and judgement. Formal empirical analysis was left for later generations.

In a 1886 report, George E. Morrow of the University of Illinois clearly articulated the important role of both current returns and capital gains in determining the total economic return from farming

“We have two great sources of profit in farming: first, rise in the value of land; and second, profit on the production of farm crops.”

This proposition is still being tested today and the effect of non-depreciability of farmland on the nature of farmer’s economic returns (i.e., low current returns, high capital gains) is sometimes overlooked.

Morrow went on to recognize the high capital requirements for entering agriculture and strategically cited the partnering role of capital and management:

“Already it is difficult over much of the country, for young men to become land owners . . . the number and percentage of tenant farmers must certainly increase. There will probably be more of a partnership between capital and skill in farming than we have yet seen.”

Evolving methods of leasing practices for farm land and new contracting opportunities in agriculture are strongly consistent with his partnership observation.

In a 1912 article in the *American Economic Review*, Professor E. W. Kemmerer of Princeton University demonstrated his interest and insight about the linkages in agriculture among risk and market characteristics, technology, and access to financial capital.

“When seeking credit the farmer can offer better security than ever before. His markets are larger, better organized, more certain, and more accessible. The risk of crop failure is less thanks to the wonderful progress of scientific agriculture.”

Reading this observation today, without knowing its context, would be unlikely to suggest it was written nearly a century ago. History does record that the 1910 - 1914 time frame was one of farming’s strongest. But, would one make many changes in applying this statement to 21st century agriculture?

Regarding farmer’s credit risk, Kemmerer further observed

“The banker . . . should further cooperate with local businessmen in preparing financial ratings of farmers . . . as they do other businessmen of like capital.”

Credit risk ratings of agricultural borrowers are now common in the US, although much interest remains in refining and standardizing the risk rating process, and linking the outcomes to rates of default, severity, and loss for purposes of institutional capital management. While it may have taken 60 or 70 years, Kemmerer’s call for farmer’s credit ratings eventually was answered.

Concerns about regional differences in interest rates on farm loans and the related efficiency of rural credit markets have a long history. In a 1925 article in the *Journal of Land and Public Utility Economics*, C. F. Wiger attributed rate differences to risk factors associated with diversified versus specialized agriculture and to other risk factors as follows

“In one place the interest rate is low because of the diversified agriculture; in another it is high because of the risk involved in raising a specialized crop; in still another the interest rate is high due to . . . insufficient rainfall and high altitude, or to distance from markets . . .”

Such questions about interest rate differences continue to persist, even in light of the substantial integration of rural, urban, national and international financial markets.

In a 1925 *Journal of Farm Economics* article, Claude Benner of the Institute of Economics addressed the age old question of farming as a way of life versus a business. His observations came down on the business side:

“The man without capital would not be expected to start a retail store or manufacturing plant; why should we expect him to be able to start farming without first securing capital of his own?”

Farming in this country is a business . . .”

Nowadays we would characterize the business side as the industrialization of agriculture, contract agriculture, supply chain management, agribusiness, or something similar. Still, there are hundreds of thousands of small farmers in the U.S., who may view farming as something other than a business.

On the institution building side, W. I. Myers from Cornell University and the Farm Credit Administration was instrumental in leading a revamped Farm Credit System out of the 1930's. He particularly oversaw the establishment of the Production Credit Association component of the system, thus providing a complete program of commercial credit for agriculture. In a 1934 *Journal of Farm Economics* article, he observed:

“Agricultural for the first time on a national scale would be able to provide itself with both long and short-term credit especially suited to the farmer’s needs at the lowest possible cost.

Credit must be extended only on a business basis if funds from investors continue to be available. Charity and credit must be divorced.”

Myers’ distinction between charity and credit has needed numerous reminders over the years. It now seems well understood that intended subsidies for farmers should be conveyed primarily through means other than credit markets, although the relative ease with which public credit programs can arise makes these markets vulnerable to welfare initiatives.

Continuing on public credit programs, John D. Black of Harvard University was refreshingly candid in his 1945 *Journal of Farm Economics* article in which he summarized the functions of public credit as

“The most important function of public credit is to develop improved types of loans and methods which private agencies will later adopt.

The second . . . is to provide needed capital for groups that cannot be supplied it on a strictly banking basis.

The third . . . is to bail farmers out when they get into trouble . . . the need for such rescue work will diminish greatly when adequate credit facilities have been developed, the terms of agricultural loans . . . fit agriculture, and insurance has assumed its full role in farming.”

He was especially forward-looking in his view that credit bail-out programs would recede as commercial credit and crop insurance gained maturity. Currently, government credit programs for farmers largely play a selective, targeted role and crop insurance programs are being widely adopted as a management response to income risk in agriculture.

Early in his career, John Kenneth Galbraith of Harvard University contributed to the development of agricultural finance, with a particular focus on the relationship between financial markets and risk bearing in agriculture. His out-spoken, assertive style which (along with considerable talent) elevated his career sometimes backfired. To some degree, Galbraith was ahead of his times in trying to formalize institutional capacities to participate in farmer’s risk bearing. The theme of his 1937 Annual American Farm Economics Association presentation on

this topic (and subsequently published in the *Journal of Farm Economics*) is illustrated by these comments

“ . . . my purpose is . . . to appraise the policies of federal land banks as they . . . promote the stability or instability of agricultural enterprise. . . . clashes between fluctuating farm income and fixed capital structure are of first importance. It is by minimizing or intensifying this clash that land banks affect stability.

I doubt if hard-pressed debtors will ever again be instructed to telegram their troubles to the White House.”

Perhaps Galbraith has regretted his assertion about hard-pressed debtors telegraphing the White House given the tractor rallies in the mid-1980s and other political forums, but he certainly would stand firm on the substantive relationship between financial markets and risk bearing. He likely had a quick opportunity to respond, because F. F. (Frosty) Hill, then Governor of the Farm Credit Administration served as the discussant to Galbraith’s presentation. Hill went on at length to say why this “Ivory Towered (not a direct quote)” economist’s ideas were impractical, finally concluding that it was

“ . . . extremely doubtful whether the measures suggested by Mr. Galbraith would be affective in bringing about a greater degree of stability in the real income of farmers . . . ”

Perhaps the problems did not rest with Galbraith’s ideas, but with the stubbornness of the lending community. It is now well acknowledged that financial markets participate significantly in agricultural risk bearing.

Concluding Comments

As this brief historical journey has shown, new ideas often have historical origins. This is not a parallel to the adage that “old wine comes in new bottles”. However, “improved wine . . .” might be a more apt analogy. Clearly, history can provide valuable insights. In this case, history is more than a literature review for a particular project. Rather, historic ideas become part of the basic fabric of our knowledge base.

The evolution of agricultural finance has largely paralleled that of general finance. In a 1994 article in *Financial Management*, J.F. Weston characterized the latter in terms of five points. First, new ideas generally respond to pressing economic, financial, and socio-policy problems; second, such responses also reflect the motivation, internationalization, and competition of financial markets. Third, ideas are facilitated by new tools, models, and methodologies. Fourth, finance practices employed by lenders, analysts, and others stimulated learning and theory development. And fifth, new ideas built upon previous knowledge. Weston’s characterization applies just as well to agricultural finance.

The experiences of institution building and policy contributions of finance economists to the financial problems of agriculture were revisited during the farm stresses of the 1980s. Major lessons were learned by farmers and their lenders about financial planning, inflationary effects, collateral and cash flow relationships, safe levels of indebtedness, conservative lending terms, and management of credit risk and interest rate risk. If not already, the lessons of the 1980s will soon become “historic”, and agriculture may need to re-experience them again if or when major financial adversity returns.

Footnotes

1. General references utilized in this paper include Wall; Sparks; and Brake and Melichar.

References

- Baker, C.B. "Credit in the Production Organization of the Firm," American Journal of Agricultural Economics, 50(1968): 507-521.
- Baker, C.B. and J.A. Hopkin "Concepts of Finance Capital for a Capital-Using Agriculture," American Journal of Agricultural Economics 51(December 1969): 1055-1064.
- Barry, P.J., P.N. Ellinger, J.A. Hopkin and C.B. Baker. Financial Management in Agriculture, 6th ed. Prentice Hall, Englewood Cliffs, 2000.
- Barry, P.J. and L.J. Robison "Agricultural Finance: Credit, Credit Constraints, and Consequences" in Handbook of Agricultural Economics, B.L. Gardner and G.C. Rausser eds., Amsterdam, Elsevier, 2001.
- Benner, C.L. "Has Rural Credit Legislation Gone Farm Enough and in the Right Direction?" Journal of Farm Economics, 7(1925): 84-101.
- Black, J.D. "Agricultural Credit Policy in the United States, 1945," Journal of Farm Economics, 27(1945): 591-614.
- Brake, J.R. and E. Melichar "Agricultural Finance and Capital Markets," A Survey of Agricultural Economics Literature, L.R. Martin, ed., University of Minnesota Press, Minneapolis, 1977.
- Galbraith, J.K. "The Federal Land Banks and Agricultural Stability," Journal of Farm Economics, 19(1937): 48-58.
- Heady, E.O. Economics of Agricultural Production and Resource Use, Prentice Hall, Englewood Cliffs, 1952.
- Hill, F.F. "Discussion," Journal of Farm Economics, 19(1937): 58-65.
- Johnson, D.G. Forward Prices for Agriculture, University of Chicago Press, Chicago, 1947.
- Kemmerer, E.W. "Agricultural Credit in the United States," American Economic Review, 2(1912): 852-872.
- Markowitz, H. "Portfolio Selection," Journal of Finance 7 (1942): 77-91
- Modigliani, F. "The Measurement of Expectations," paper presented at the American meeting of the Econometric Society in Boston, December 1951 (abstract in Econometrica 20 (July 1952):481-482.
- Morrow, G.E. "Our Farming, It's Changing Condition and Outlook," in Wisconsin State Agricultural Society, Transactions, 24(1886): 223-232.

Myers, W.I. "The Program of the Farm Credit Administration," Journal of Farm Economics, 16(1934): 30-40.

Sparks, E.S. History and Theory of Agricultural Credit in the U.S. New York, T.Y. Crowell Co., 1932.

Stiglitz, J. and Weiss, "Credit Rationing in Markets with Imperfect Information," American Economic Review 71(1981): 393-411.

Wall, N. "Agricultural Credit," Ch. 33 in Taylor, H.C. and A.D. Taylor, The Story of Agricultural Economics. Iowa State University Press, Ames, 1952.

Wedger, C.F. "Farm-Mortgage Interest Rates," The Journal of Land & Public Utility Economics, 1(January 1925): 102-117.

Major Ideas in the History of Farm Management And Production Economic

B. F. Stanton

Cornell University

The author gratefully acknowledges the helpful criticisms and suggestions for this manuscript provided by Peter Barry, Loren Tauer, and William Tomek. Errors of omission and judgment rest with the author.

Major Ideas in the History of Farm Management and Production Economics

About 100 years ago, a number of professors of agriculture were concerned about depressed farm prices and the difficult conditions farmers and their families were facing. They set about visiting farmers and gaining information concerning their businesses in a variety of ways. Henry C. and Anne D. Taylor documented the early efforts by these agriculturists in their landmark book, *The Story of Agricultural Economics*, published in 1952. Anyone interested in understanding more about the early days of the profession and its pioneers will find this a truly fine reference. It provides a comprehensive picture of early work in what became known as **agricultural economics** in the twentieth century.

The early work centered on understanding costs and returns for crops and livestock products and why some farmers were doing so much better financially than their neighbors. Out of these early efforts came the research and teaching that is called **farm management**. Those doing this pioneering work were agriculturists with backgrounds in the agricultural sciences and husbandry and a somewhat smaller group trained in political economy. Their common bond was a concern for improving the welfare of farmers and their families by studying the business side of farming. A comprehensive review of the work in these early years is provided by H. C. M. Case and D. B. Williams in *Fifty Years of Farm Management*, (1957). This major effort looks primarily at developments in the United States before 1950. Williams, from Australia, provided perspective and insights in the final chapter about the development of research and extension before World War II.

Some of the early pioneers met and taught at the Graduate School of Agriculture, a 4-week summer school, conducted by the American Association of Agricultural Colleges and Experiment Stations at different colleges in the summer every two years. In 1908 a course had been included on economic aspects of the farm business. A similar course was offered in 1910 with four professors each giving a week of lectures on rural economics. At the close of the Graduate School a group gathered and organized the *American Farm Management Association*. Naturally they argued about what farm management included and how to define the term. A committee on "Scope and Cleavage" was appointed and gradually some consensus evolved. In their newly created annual *Journal* they reported: "The field of Farm Management is:

1. The organization of the farm, in which we deal with such questions as types of farming, equipment, labor, etc.
2. Farm operation, in which we deal with the various types of farming as they are conducted in the various regions where they occur.

Farm management deals with the rural problem from the individual or private point of view. It differs from agricultural economics or rural economy or rural sociology in that these subjects view the rural problem from the national or public point of view."

For a period of time one group of agricultural economists, who were members of the American Economics Association, met annually as a group and were the *Association of Agricultural Economists*. In December 1917 the *AFMA* adopted an historic resolution: “in view of the fact that the American Farm Management Association, since its organization, has dealt with problems in the field of economics as related to agricultural production, the committee (on resolutions) recommends that the word, ‘management’, be changed to the word, ‘economics’, so as to read, American Farm Economics Association.” Those who had been members of both of those groups took the lead in uniting them into one group in 1919 with one journal, the *Journal of Farm Economics*.

Early Methodology and the Pioneers

A variety of methodologies were used by the pioneers in farm management to collect information and data about farming, prices and costs, and farm operations. Individual studies of costs for crops were published by experiment stations in the 1890s (Case & Williams, 1957, 26-33.) More comprehensive research began in the next decade.

Agricultural Tours - Thomas Nixon Carver (1865-1958) was one of the early teachers of agricultural economics at Harvard. Following in the tradition of Arthur Young in England, Carver in the summer of 1903 made a 1000 mile agricultural tour of the Corn Belt on horseback studying the way in which enterprises were combined on farms to provide continuous employment and interviewing farmers and their families. Reports of his tour, “The Corn-Growers” and “Life in the Corn Belt”, appeared in *World’s Work*, in November and December 1903. In 1904 he made a similar 500-mile tour of New England on horseback reporting his observations on part-time farming and the ways families had adapted to their conditions in rural areas. This was published as “What Awaits Rural New England” in *World’s Work*, January 1905. Carver followed this in 1906-07 on sabbatical from Harvard with a bicycle tour of farms in Western Europe. His book, *Principles of Rural Economics*, (1911), reflected some of the ideas gained on these tours and was one of the standard texts used throughout the country. (Taylor and Taylor, 1952, 327-353)

Model Farms – One of the ideas pursued by agriculturists was to discover and study some of the most successful farm operations. The *USDA Yearbook of Agriculture* in 1902 included an article by W. J. Spillman, “Systems of Farm Management in the United States”. He argued that learning how the most successful farms were operated was the most fruitful approach to farm management. *USDA Farmers Bulletin 272, A Successful Hog and Seed-Corn Farm*, by Spillman is a good example of the approach followed by some workers at USDA in its early years (Case and Williams, 1957, 22-27). In Missouri, D. H. Doane, and in Wisconsin, D. H. Otis, were among the early leaders in studying and publicizing successful farm operations, but also pointing out both the good features of organization and the problems observed (Case and Williams, 1957, 65-66).

Cost Routes and Cost Accounting Projects - A cooperative cost of production study between the University of Minnesota and the Bureau of Statistics was initiated in 1902. Cooperating farmers agreed to keep records of all costs including time spent by human labor, horses, and equipment in the production of crops and all cash outlays. A field man collected records regularly and helped participants with making entries and understanding the system. Andrew Boss was the central figure in adapting the initial work in Minnesota into a double entry system of accounts for the whole farm business. With supervision, this program continued on two different sets of farms in the southern part of the state, until after World War II.

At Cornell, Carl E. Ladd worked with a group of cooperating farmers on a cost accounting system for his Ph.D. thesis and wrote USDA Farmers' Bulletin 572, *A System of Farm Accounting* in 1914. Farmer interest in this program in New York State was strong and the College continued the project and published annual cost of production reports annually well into the second half of the century.

Farm Business Surveys – Initial work on collecting data from farmers at Cornell was initiated by L. H. Bailey and Thomas F. Hunt. Hunt had been Dean of Agriculture at Ohio State before Dean Bailey was lucky enough to bring him to Cornell for four years (1903-7). Hunt, educated in Illinois, was one of the major figures in agricultural education nationally in the first two decades of the twentieth century. He was Dean at Penn State (1907-12) and then moved to UC, Berkeley to build its College into a major educational center. Bailey had assigned G. F. Warren to develop a survey record to collect data from fruit farms for his Ph.D. thesis in 1904-5. Warren then carried on Hunt's work and further developed a successful methodology to collect farm business records from all the farmers in four townships in Tompkins County.

Warren and Livermore's Bulletin. 295, *An Agricultural Survey*, published in 1911 had wide distribution. Subsequently, Warren published Bulletin 344, *Agricultural Surveys*, in 1914 which detailed the methods used in his surveys of farm businesses. The USDA adopted this basic methodology in completing a number of labor income studies across the country from 1910-22 (Taylor and Taylor, 1952, 366-75).

Farm Accounting Projects – Double-entry bookkeeping and accounting procedures were the standard methods taught in schools and colleges at the turn of the century, but these detailed accounts were too complex to gain acceptance by most farm families. Extension faculty in state colleges developed single-entry account books to help farmers keep track of receipts and expenses and learn more about their businesses. Farm accounting projects were developed in many states as demonstration projects with assistance provided by extension staff in completing and analyzing individual records. Excellent single-entry books were developed in Illinois and Minnesota in 1915 and 1916.

Extension programs with groups of farmers provided comparisons of individual account records against group averages, which helped in making management decisions. Farmers found these programs so valuable that they organized cooperatively to maintain these services by paying part or much of the cost of the fieldmen and staff needed to

make them run effectively. Programs in Illinois, Kansas, Minnesota and other states that continue in the 21st century, go back to these beginnings (Case and Williams, 1957, 169-74).

Teaching – “Farm management” began to appear in lists of course offerings of Colleges of Agriculture in the first decade of the 20th century, commonly in the Department of Agronomy. The *AFMA*’s committee on teaching reported at the annual meeting in 1913 that such a course was offered in 48 colleges. Most reported one or more faculty working part-time on farm management. Five had established separate departments of farm management. The major books used, in preparing lectures and cited in the report, were T. F. Hunt, *How to Choose A Farm* (1906), T. N. Carver, *Principles of Rural Economics* (1911), H. C. Taylor, *An Introduction to the Study of Agricultural Economics* (1905), and G. F. Warren, *Farm Management* (1913). In a number of courses students had to obtain a record of a farm business from a farmer and make suggestions about possible ways to reorganize the business to improve its profitability (Case and Williams, 1957, 104-116).

Production Economics and Farm Management

From the beginning, farm management faculty, whose training had been largely in the agricultural sciences, were influenced by economists in their colleges. H. C. Taylor was a leader in the *American Farm Management Association* from its beginnings. Carver at Harvard was an enthusiastic member and supporter. The merger of the “economists” and the “agriculturists” into the *AFEA* was to the benefit of both groups. Taylor and Taylor summarize:

“The controversy over cleavage and terminology did not disappear overnight but lost its force, and the full attention of all the men in the field was turned over to the development of the *subject* of agricultural economics in its varied aspects. In 1919 The American Farm Management Association and the Association of Agricultural Economists were consolidated under the title of the American Farm Economics Association. In the same year the Office of Farm Management in the U.S. Department of Agriculture was reorganized along lines agreed upon by Boss, Warren, and Taylor. And in 1920 the departments of farm management and of rural economy at Cornell were consolidated under Warren’s leadership as a Department of Agricultural Economics. All this indicates that agricultural economics was finding itself.” (Taylor and Taylor, 1952, 97-8).

Recognition of **production economics**, as a sub-discipline in the field of economics and agricultural economics, came in the 1920s. John D. Black brought together the materials and concepts he had been teaching at the University of Minnesota in an important new book. Many of the topics, of course, were not new to agricultural economists. The factors of production, the law of diminishing returns, and the principles of marginal cost and revenue were discussed as parts of the books by Taylor (1905) and Carver (1911). Substantial emphasis, in Black’s 1926 book, was given to input-output relationships and their analysis and the marginal analysis made familiar by Alfred Marshall.

Harald Jensen in his survey article (1977, 7), provides a concise statement about the beginnings in the 1920s. "Production economics as an integrated field began to develop at this time. The works of W. J. Spillman and E. Lang were particularly noteworthy in spearheading a development relating to the quantification of production functions in forms for use in economic analysis. The 1920s was the period wherein H. R. Tolley, J. D. Black and M. Ezekiel pioneered in the use of statistical analysis of input-output relationships derived from farm sample survey data. J. D. Black integrated the numerous developments of the period into the framework of classical and neoclassical theory of the firm and producing area. *His Introduction to Production Economics* (1926, Henry Holt & Co.) was the first full and formal synthesis of the field of production economics."

Integration of work among those trained in production economics and those oriented to data collection from farmers, farm accounts and budgeting was modest at first. At Minnesota, for example, Black and Boss tended to go their separate ways, each productive and highly regarded by their respective colleagues nationally. The 'traditional' farm managers using budgeting to study the impact of new technology on farms were among those who helped to build the necessary bridges in research as well as teaching.

By the middle of the 1920s courses in statistics and mathematics were incorporated into most undergraduate programs in agricultural economics. Graduate students and researchers were caught up in correlation analysis and statistical relationships in the years before World War II. As Jensen points out in his review, the Bankhead-Jones Act in the 1930s provided funding for additional experimental work in agricultural production in which agricultural economists were increasingly involved.

Postwar Integration of Production Economics and Farm Management

New funds, increases in faculty, and more graduate students, often funded by the GI Bill, led to something of an explosion of research and teaching in agricultural economics after the war. T. W. Schultz had set the stage with his 1939 article, "Theory of the Firm and Farm Management Research", calling for the needed integration. Black, Clawson, Sayre and Wilcox in their textbook, *Farm Management* (1947), also sought this integration.

At the center of this integration, however, was the teaching and research led by Earl Heady at Iowa State. *Economics of Agricultural Production and Resource Use* (1952) quickly became a key book for study by graduate students and researchers in the field around the world. Concepts were illustrated with the research published by Heady and his students with colleagues in the production sciences. As Jensen (1977) states in the prologue to his review article: "Early O. Heady, more than anyone else, influenced the course of farm management and production economics after World War II. It is fitting therefore that the guiding concept for this chapter be based on a quotation for of his articles: 'The thesis behind [the article] is that the advancement in a scientific field

grows not out of unqualified acceptance of the status quo but of frequent appraisal of the road ahead.” Many other leaders at Experiment Stations across the country were involved in this creative process (Jensen, 1977), but Heady and his students were clearly at the center of the process.

A substantial number of relatively new statistical and mathematical techniques of analysis were introduced by production economists. Mathematical programming, simulation, gaming and new adaptations in regression analysis came into use as access to computing facilities became available. A path breaking paper by Fred V. Waugh, (“The Minimum Cost Dairy Feed”, 1951), introduced linear programming to agricultural economists. Connections between budgeting and mathematical programming, helped users understand the assumptions they were making and the resource restrictions they accepted. Applications of mathematical programming to more and more agricultural problems were explored as computing power grew. In many respects it was the production economists of this period who were attracting many of the bright young students to the field of agricultural economics.

Farm Production Data and Its Analysis

Increasingly in the postwar years, the cost of collecting farm survey data by personal interview and the complexity of financial records essentially made this methodology, so widely used earlier, inappropriate for most research efforts.¹ Farm accounting systems provided solid and reliable data on farm practices, costs and returns. Increasingly farmers paid for much of this management service, necessary for their own tax records. Universities, cooperatives, and the Farm Credit System continue to summarize these records because they provide important sources of information both in working with these cooperators and in their teaching and research programs. Over time, the annual summaries of these records have provided benchmarks against which alternative proposals for new legislation or changes in federal regulations can be compared.

With increased computing power, mathematical models of farms, and then production systems for groups of products, such as corn-soybeans-hogs in a region were developed from the 1960s onward. Egbert and Heady (1961) and co-workers at Iowa State and King and Logan (1964) at UC, Davis and Berkeley, were among the first to publish their work on interregional competition models. Data for these larger models came from many sources including the agricultural census, farm account data, NASS, ERS and the results of controlled experiments.

*Endnote: An important exception to this statement is the Farm Costs and Returns Survey, jointly operated by USDA’s Economic Research Service and the National Agricultural Statistics Service. This annual effort, based on a probability survey, is the nation’s basic source of farm business and household data for policy and economic analysis. It was developed in its current form over the last quarter of the 20th century and is a critical national asset.

Size Economies and the Structure of Agriculture

From its beginnings, farm management has had a central interest in the economies and diseconomies associated with the size of a farm business. With the advent of production economics, short- and long-run cost curves were fitted showing the substantial initial economies to increased size of most crop and livestock operations. Bressler (1945) and Bachman and Barton (1954) were among the leaders in showing the nature of cost economies and the gains in efficiency and income per worker with increases in size. A number of studies found that cost economies slowed dramatically after a certain point with existing technologies. For example, Ottoson and Epp (1956) found that there were no cost advantages for farms above 160 acres. Carter and Dean (1961) found substantial economies up to \$150,000 of output, but also concluded that a wide range of farms will continue to exist because unit costs are approximately constant over a wide range.

Jensen (1977), in summarizing these studies, noted that most of them showed that important economies to size were exhausted within the scope of a family farm operation. He further commented (p.44), “ These analyses, however, were not able to take into account the economies of buying and selling and common ownership of related farm and non-farm activities.” During the period 1950-70, when size economies were being studied across the country for all sorts of businesses, farm numbers in the United States were cut in half, dropping from 5.4 million to 2.7 million. A growing industrialized economy absorbed much of the displaced farm labor while land in farms decreased by less than 10 percent. (Hallam, 1993, 44)

The remarkable changes in the structure of agriculture over a span of two decades was a reflection of many forces at work simultaneously, not least among them efforts by extension workers in farm management such as the “Balanced Farming” program in Missouri. New technology made possible increased efficiencies; financing was available; management skills were increased.

Vertical Integration became an item of increasing interest for study and comment. Castle (1958) and Mighell (1957) explored relationships with integrators and what this meant for the management of individual farms. These were forerunners of study and research during the remainder of the century.

The Interstate Management Study

Glenn Johnson (1952) posed a number of questions about management strategies and how decisions were made with respect to risk and uncertainty, incorporating time as a variable in the analysis. The Interstate Management Study was funded, with Johnson as its intellectual leader. Studies of decision processes on farms were made in different parts of the country. A book by Johnson and his co-workers, *A Study of Managerial Processes of Midwestern Farmers* (1961), summarized the types and sources of information used by farmers, the analytical processes used, and their decisions to take action and responsibility for them. It was a time of intellectual ferment about what “farm management” should include, and Johnson argued that the field had an “identity crisis”.

Jensen (1977, 51) in the summary section of his review commented, “The Interstate Managerial Study, which was conceived as a means of obtaining knowledge of managerial processes, provided first hand empirical support to the widely held view of farm management as a broad interdisciplinary problem-solving study. The farm operator’s performance of the functions of (1) observing and gathering information on prices, production, institutions, and people, (2) analyzing the information, (3) making decisions, and (4) acting and accepting consequences for action taken revealed the interdisciplinary nature of the study.” After all the searching and exploration, there was gradual acceptance that economics was only one key source of decision rules used by farm managers. Many others, not easily modeled, were often used and crucial in final decisions.

The Golden Age – Viewed from the perspective of the early years of the 21st century, the years between 1950 and 1975 provided the prime time for work in farm management and production economics. State and federal funding expanded and then held steady for extension, teaching and research. New faculty and staff came on stream. Classes were large; regional research flourished. International students came from many parts of the world and expanded our understanding of world agriculture and its problems. Partnerships were established with universities in Western Europe and all the continents. Joint work with crop and animal scientists became more common. Agricultural economists gained stature with their colleagues in the applied sciences with our universities. It was a time when creative interchange within the field was strong and active.

The Last Quarter of the 20th Century

Work in farm management and production economics in the last quarter of the 20th century built on its rich tradition and strong base in agriculture. But there were fewer undergraduate students in farm management classes and a shrinking number of extension workers in counties and regional positions concerned with farm management (Blank 1998). Increasingly, the larger farms were hiring specialists, such as nutritionists and veterinarians, to provide them with technical advice whenever they needed it. The days of generalized farm management programs in extension were disappearing and being replaced by specialized programs such as income tax and estate planning sessions. Not surprisingly the academic resource base in this field began to shrink (Zepeda & Marchant, 1998).

The International Dimension - One of the important places, where expertise in farm management and production economics remains central to research and extension, has been work in international development. In projects throughout the developing world, the farm household has remained a central unit of inquiry. Most teams working at sites overseas have included one or more agricultural economists with a strong background and interest in production economics and farm management. Many of the articles in the *AJAE* and *RAE* in recent decades demonstrate the importance of the analytic base from this field, in seeking solutions to basic problems in the development

process. In a similar manner, the economic evaluation of new agricultural technology developed by the International Centers rests on work with economists, with strong backgrounds in this field.

Size and Structure of Agriculture – Farm size and vertical coordination are issues of increasing interest to workers not only in farm management and production economics, but also in marketing, industrial organization, and policy. Books summarizing research by members of three interregional research committees suggest the continuing priority given nationally:

Hayenga, et al, editors, *The U.S. Pork Sector: Changing Structure and Organization*, 1985, (NC-117).

Hallam, Arne, editor, *Size, Structure, and the Changing Face of American Agriculture*, 1993, (NC-181).

Burton, R. O. and D. L. Watt, editors, *Future Priorities and Agenda for Farm Management Research*, 1994, (NC-113).

Royer, J. S. & R. T. Rogers, editors, *The Industrialization of Agriculture: Vertical Coordination in the U.S. Food System*, 1998, (NE-165).

It seems likely that the economic questions associated with smaller and smaller numbers of producers of farm output, such as broilers, eggs, hogs, and beef, when faced by a small number of processors and distributors will continue to be items of study and concern by the profession.

The future roles of small and part-time farms in an economy, where a shrinking number of larger farms provide much of the food supply, has captured public interest as is also true in Western Europe. Even the largest farms in the United States remain modest in size compared to most corporations that farmers buy from or to whom they sell their output. The structure of the various components of the international food industry, as it develops, will be a major focus of study in the years ahead.

Important Work with Production Scientists – Economists have worked successfully with agricultural scientists on a variety of projects. They have had notable success in building IPM programs and studying ways to reduce the amount of agricultural pollutants moving into the water supply. The ability of many pests in agriculture to build up resistance to the agricultural chemicals, applied to control them, has brought plant breeders, entomologists, pathologists and economists together. Both in the developed world and at the International Centers these problems are real and difficult to solve. Carlson (1977,1980), Taylor (1980), and Miranowski (1980) were among the early leaders working effectively on IPM projects in this country. Sessions on the “Economics of Integrated Pest Management” and “Evaluation of Technologies with Implications for Resource Use and Environmental Quality” were held at the annual meetings of AAEA in 1980 and 1984. Resource economists and farm management workers joined in studying

economic ways to reduce environmental pollution from production agriculture. Studies on the management of animal waste from all sizes of livestock units have gained priority. The importance, priority, and need for continued interaction with production scientists is reflected in three recent articles which reflect work on the economics of pesticides for cotton (Hubbell et al, 2000), potatoes (Marsh et al, 2000) and apples (Saphores, 2000).

Risk Management and Investment Analysis – Whatever lines were once drawn between agriculture and business are being broken. The appearance of the International Food and Agribusiness Management Association is one sign. Most farmers are businessmen and a key part of the food industry. Management principles apply across the domain of the interrelated parts of the food industry whether in operating a supermarket, a grain elevator or a fruit farm.

Dealing with risk and uncertainty are standard topics in current farm management texts (e.g. Boehlje and Eidman (1984) and Castle, Becker and Nelson (1987)). Just and Pope (1979) and Pope and Chavas (1994) were among the leaders who incorporated risk and/or uncertainty in the estimation of production and cost functions. Perrin (1972) brought greater attention to asset replacement principles. Portfolio analysis became a component in analyses using mathematical programming.

In the final decades of the 20th century workers in farm management and production economics responded to their challenges in teaching, research and extension but in quite different ways from their colleagues of 75 years ago or even 25 years earlier. Computer-assisted decision aids became a regular part of extension programming. Making decisions on production contracts and markets for output were built-in as a focus in the management process. Personal interview surveys for sample sizes of 30 or more were more likely done by telephone, except for NASS at USDA. The number of women professionals in farm management and production economics has increased, especially in the past 25 years. The academic backgrounds of the men and women in this field are highly diverse in terms of such things as undergraduate colleges and farm experience. Graduate training in economics, statistics, and other tools of applied economics has become much more similar for Ph.D. students in various sub-disciplines.. This combination of diversity in background and experience, and commonality in basic graduate study is one of the strengths of this professional group.

Challenges in the 21st Century

Perspective has been sought in looking at the many changes observed in farm management and production economics over the past 100 years. A new century has arrived with many issues and problems that have not been resolved and demand attention. The public seeks new ways to maintain or improve our environment and natural resource base while still providing a plentiful supply of food. As a major user of land and water, and still an employer of many people, agriculture continues to be a sector about which the public has a strong interest.

Items that may well affect professionals in farm management and production economics:

1. How many Colleges of Agriculture will there be in 50 years? Just as some Departments within Colleges of Agriculture have dropped “agriculture” from their names during the past 25 years, so reorganization of some of our colleges may be in the offing. This issue may not be immediate for everyone, but is something to ponder in building academic and professional linkages in coming decades.

2. Relationships of farm management specialists with farmers and rural people over the past century have usually been maintained on a state and county basis. These old ties, based on political boundaries, seem likely to become less important as individual farmers, farm leaders, and organizations seek information and support wherever they can find it. Sources of funding for research, teaching, and extension programs may well need to be different.

3. The evaluation of new technology for use in agriculture will continue to be a central concern of society. There is an important role for economists to work with applied biologists, engineers, agricultural scientists, and farmers in understanding both the short-run and longer-term implications of adoption and use of these new technologies.

4. Agricultural land is now owned by many people across the country, some with a family connection or heritage to that acreage, others as an investment, all rented and farmed regularly by a producer with a base in the area. A new structure and set of institutions reflecting this phenomenon may well need to evolve.

5. Human resource management will attract more attention from both employers and the public. The food industry is a major user of migrant labor and undocumented workers on its farms, assembly points, and processing lines.

6. The economic dimensions of contracts between buyers and sellers in the food industry will require more study as the number of key players diminishes and the role of public open markets becomes smaller. Efforts to further identify products and commodities from specific farms and locations is becoming more common.

7. Contact and interaction with farmers of all sizes and interests by university faculty is just as crucial in the 21st century as it was in the 20th. That role continues for those in farm management and production economics, by whatever name this group is known in the years ahead.

In the 21st century, new problems in agriculture will arise as the structures of agriculture and the food industry evolve. Likewise new tools of analysis will emerge in applied economics that build on the theory and analytical base of the past century. No doubt, new institutions will also be created and linkages with state and federal governments will change. The need for creative work by professionals in farm

management and production economics to make contributions as they did in the past century will remain just as important.

BIBLIOGRAPHY

- Bachman & G. Barton, "Farm Cost Structure and Opportunities for Cost Reduction", *J. Farm Econ.* 36(Dec. 1954):991-99.
- Black, John D., *Introduction to Production Economics*. New York: Henry Holt & Co., 1926.
- Black, J. M., Clawson, C. Sayre, & W. Wilcox, *Farm Management*. New York: Macmillan Co., 1947.
- Blank, Steven C., "A Decade of Decline and Evolution in Agricultural Economics Enrollments and Programs, 1985-96", *Rev. Agr. Econ.* 20(1998):155-167.
- Boehlje, M. D. & V. R. Eidman, *Farm Management*, 2nd Ed., New York: John Wiley & Sons, 1984.
- Bressler, R. G., "Research Determination of Economies of Scale", *J. Farm Econ.* 27(Aug. 1945): 526-39.
- Carlson, G. A., "Long-Run Productivity of Insecticides", *Amer. J. Agr. Econ.* 59(Aug. 1977):543-8.
- Carlson, G. A., "Economic and Biological Variables Affecting Demand for Publicly and Privately Provided Pest Information", *Amer. J. Agr. Econ.* 62(Dec. 1980): 1001-6.
- Carter, H. & G. Dean, "Cost-Size Relationships for Cash Crops in a Highly Commercialized Agriculture", *J. Farm Econ.* 43(May 1961): 264-77.
- Carver, T. N., "Life in the Corn Belt", *World's Work*, December 1903.
- Carver, T. N., "The Corn Growers", *World's Work*, November 1903.
- Carver, T. N., "What Awaits New England", *World's Work*, January 1905.
- Carver, T. N., *Principles of Rural Economics*. Boston: Ginn & Co., 1911.
- Case, H.C.M. & D. B. Williams, *Fifty Years of Farm Management*. Urbana: University of Illinois Press, 1957.
- Castle, Emery, "Vertical Integration and Farm Management Research", *J. Farm Econ.* 40(May 1958): 434-39.
- Castle, E., M. Becker, & A. G. Nelson, *Farm Business Management*, 3rd Ed., New York: Macmillan Publ. Co., 1987.

- Egbert, A. C., & E. O. Heady, *Regional Adjustment in Grain Production – A Linear Programming Analysis*, USDA Tech. Bull. 1241, June 1961.
- Hall, D. C. & G. M. Duncan, “Econometric Evaluation of New Technology with an Application to Integrated Pest Management”, *Amer. J. Agr. Econ.* 66(Dec. 1984): 624-33.
- Hall, B. F. & E. P. Leveen, “Farm Size and Economic Efficiency: The Case of California”, *Amer. J. Agr. Econ.* 64(Aug. 1978): 589-600.
- Hallam, Arne, editor, *Size, Structure, and the Changing Face of American Agriculture*. Boulder: Westview Press, 1993.
- Hayenga, M., V. J. Rhodes, J. Brandt, & R. Dieter, editors, *The U.S. Pork Sector: Changing Structure and Organization*. Ames: Iowa State University Press, 1985.
- Heady, E. O., “Application of Recent Economic Theory in Agricultural Production Economics”, *J. Farm Econ.* 32(Nov. 1950): 1125-39.
- Heady, Earl O., *Economics of Agricultural Production and Resource Use*. New York: Prentice-Hall, Inc., 1952.
- Heady, E. O. & W. Candler, *Linear Programming Methods*. Ames: Iowa State College Press, 1958.
- Heady, E. O. & J. Dillon, *Agricultural Production Functions*. Ames: Iowa State University Press, 1961.
- Heady, E. O. H. Madsen, K. Nicol, & S. Hargrove, “National and Interregional Models of Water Demand, Land Use, and Agricultural Policies”, *Water Resources Res.* 9: (Aug. 1973): 777-91.
- Heady, Eo. & N. K. Whittlesey, “A Programming Analysis of Interregional Competition and Surplus Capacity of American Agriculture”, *Iowa Agr. Exp. Sta. Bull.* 538, 1965.
- Hubbell, B., M. Marra, & G. Carlson, “Bt Cotton Demands and Insecticide Policies”, *Amer. J. Agr. Econ.* 82(Feb.2000): 118-132.
- Hunt, Thomas F., *How to Choose A Farm*. The Macmillan Company, 1906.
- Jensen, Harald, “Farm Management and Production Economics, 1946-70”, in Martin, Lee R., editor, *A Survey of Agricultural Economics Literature, Vol.1*,:1-89 Minneapolis: University of Minnesota Press, 1977.

- Johnson, Glenn L., "Handling Problems of Risk and Uncertainty in Farm Management Analysis", *J. Farm Econ.* 34(Dec.1952): 807-17.
- Johnson, G., A. Halter, H. Jensen, & D. Thomas, editors, *A Study of Managerial Processes of Midwestern Farmers*. Ames: Iowa State University Press, 1961.
- Just, R. E. & R. D. Pope, "Production Function Estimation and Related Risk Considerations", *Amer. J. Agr. Econ.* 61 (May 1979): 276-84.
- King, G. A., "A Framework for Studies on Location of Agricultural Production and Processing", Dept. of Agr. Econ., Univ. of California, Davis, 1970.
- King, G. A. & S. Logan, "Optimum Location, Number, and Size of Processing Plants with Raw Product and Final Shipments", *J. Farm Econ.* 46 (Feb. 1964): 94-108.
- Ladd, Carl. E., "A System of Farm Accounting", USDA Farmers' Bulletin 572, 1914.
- Logan, S. H. "A Conceptual Framework for Analyzing Economies of Vertical Integration", *Amer. J. Agr. Econ.* 51(Nov. 1969): 834-57.
- Marsh, T., R. Huffaker, & G. Long, "Optimal Control of Vector – Virus – Plant Interactions: The Case of Potato Leafroll Virus Net Necrosis", *Amer. J. Agr. Econ.* 82(Aug. 2000): 556-69.
- Mighell, R. "Vertical Integration and Farm Management Research", *J. Farm Econ.* 39(Dec. 1957): 1666-9.
- Mighell, R. & L. Jones, "Vertical Coordination in Agriculture", USDA, ERS, Agr, Econ. Rpt. 19, 1963.
- Miranowski, John A., "Estimating the Relationship Between Pest Management and Energy Prices and the Implications of Environmental Damage", *Amer. J. Agr. Econ.* 62(Dec. 1980): 995-1000.
- Ottoson, H. & A. Epp, "Size of Farm and Farming Efficiency in Northeast Nebraska", *J. Farm Econ.* 38(Aug. 1956): 803-12.
- Perrin, R. K., "Asset Replacement Principles", *Amer. J. Agr. Econ.* 54: (Feb. 1972): 60-67.
- Pope, R. D. & J. P. Chavas, "On Defining Cost Functions Under Uncertainty", *Amer. J. Agr. Econ.* 76: (May 1994): 196-204.
- Rasmussen Wayne E., *Taking the University to the People: Seventy-Five Years of Cooperative Extension*. Ames: Iowa State University Press, 1989.

- Royer, J. S. & R. T. Rogers, editors, *The Industrialization of Agriculture: Vertical Coordination in the U.S. Food System*. Brookfield, VT: Ashgate Publishing Company, 1998.
- Saphores, Jean Daniel M., “The Economic Threshold with a Stochastic Pest Population – A Real Options Approach”, *Amer J. Agr. Econ.* 82(Aug. 2000): 541-55.
- Schultz, T. W., “Theory of the Firm and Farm Management Research”, *J. Farm Econ.* 21(Aug. 1939): 570-86.
- Spillman, W. J., “Systems of Farm Management in the United States” in USDA *Yearbook of Agriculture 1902*. Washington, Govt. Printing Office, 1903.
- Spillman, W. J., “A Successful Hog and Seed Farm”, USDA Farmers’ Bulletin 272, 1906.
- Spillman, W. J. & E. Lang. *The Law of Diminishing Returns*, New York: The World Book Company, 1924.
- Taylor, C. Robert, “The Nature of Benefits and Costs of Use of Pest Control Methods”, *Amer. J. Agr. Econ.* 62(Dec.1980): 1007-11.
- Taylor, C. R. & Klaus Frohberg, “The Welfare Effects of Erosion Controls, Banning Pesticides and Limiting Fertilizer Application in the Corn Belt”, *Amer. J. Agr. Econ.* 59(Feb. 1977): 25-36.
- Taylor, Henry C. *An Introduction to the Study of Agricultural Economics*. New York: The Macmillan Company, 1905.
- Taylor, H. C. & A. D. Taylor. *The Story of Agricultural Economics*, Ames, Iowa State College Press, 1952.
- Warren, George F. *Farm Management*. New York: The Macmillan Company, 1913.
- Warren, G. F. “Agricultural Surveys”, Cornell Univ. Agr. Exp. Sta. Bull. 344, 1914.
- Warren, G. F. & K. C. Livermore, “An Agricultural Survey”, Cornell Univ. Agr. Exp. Sta. Bull. 295, 1911.
- Waugh, Fred W., “The Minimum Cost Dairy Feed”, *J. Farm Econ.* 33(Aug.1951): 299-310.
- Zepeda, L. & M. Marchant, “Bigger, Smaller, Richer, Poorer: Trends in Agricultural Economics” *Rev Agr. Econ.* 20:2(1998): 155-67.

Zilberman, David, "Technological Change, Government Policies, and Exhaustible Resources in Agriculture", *Amer. J. Agr. Econ.* 66(Dec. 1984): 634-40.