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Traditional Fields of Agricultural Economics,
1940s to 1970s

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This review covers the American literature of agricultural finance and capital markets since the end of World War II. It focuses on farm capital and financing needs, the financial structure of agriculture, rural financial intermediaries, and closely related topics. The first section of the review provides a perspective on the preceding research literature and an overview of postwar research trends and publications in the context of the historical events that helped to shape their content. A more detailed topical review constitutes the core of the paper. The concluding section presents a generalized evaluation and suggests some re-orientations and challenges for future work.

Undoubtedly much deserving literature has been overlooked in this review. In fact, we had expected far fewer than the over two thousand professionally oriented publications which we compiled with the aid of Harriet Holderness and Marian Sayre, and even that list is probably incomplete. (A sequel to it, the *Agricultural Finance Bibliography*, is available from Emanuel Melichar, Federal Reserve Board, Washington, D.C. 20551.)

The review reflects the literature known to us as of April 1975. The data cited, however, have been updated to reflect revisions available as of July 1976.

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J. R. B.
E. M.
In a field heavily influenced by historical events and public policies it seems a disservice to pick up the literature as of a certain date — say, January 1, 1946 — without briefly reviewing preceding work.

Agricultural finance specialists at that time — as demonstrated, for example, by Wall’s contribution to *The Story of Agricultural Economics* [288] and by several textbooks published during the next few years — perceived their field as being concerned primarily with the role and performance of institutional and noninstitutional farm lenders and with other financial developments including capital investments and movements in land prices. For three decades professionals in agricultural finance had participated in recognizing the deficiencies of existing arrangements and in creating and molding major institutions: the federal land banks in 1916, the federal intermediate credit banks in 1923, the production credit associations in 1933, and the Farm Security Administration (later the Farmers Home Administration) in 1938. The description and analysis of the development, impact, and problems of farm lending institutions received primary attention in agricultural finance literature.

The major institutional alterations were, of course, prompted by equally turbulent events. Within their lifetimes, and in many cases during their careers, most agricultural finance analysts working in 1946 had witnessed (1) the speculative farmland boom of World War I, spurred by high farm product prices and incomes and accompanied by rapid and large increases in farm
mortgage debt; (2) the collapse of the farm boom in 1920 followed by thirteen consecutive years of declining farmland prices, severe debt repayment difficulties, and widespread rural bank failures; (3) the great national depression, involving massive farm foreclosures followed by greatly increased governmental involvement in agriculture, including the provision of credit; and (4) a recovery in farm income and land prices, soon transformed into another wartime boom.

From the beginning of professional work in finance, shortly after the turn of the century, the research emphasis was on credit. At the United States Department of Agriculture (USDA), early examples are a 1914 publication by Carver [76] on how to use farm credit and a 1916 study by Thompson [267] on factors affecting interest rates on short-term farm loans. The 1924 Yearbook of Agriculture, which presented a comprehensive description of the credit, insurance, and tax situation of farmers [221], indicates the primary interests of USDA finance personnel during the 1920s. In addition, the USDA Division of Land Economics annually published *The Farm Real Estate Situation*.

During the farm debt difficulties of the 1920s three men—Garlock, Murray, and Wall—launched professional careers that guided and shaped much agricultural finance research well into the period to be covered by this paper. By the late 1920s Murray and Garlock [208] had collaborated on a study of farm mortgage debt in Iowa. From his base at Iowa State University Murray continued to focus on farm appraisals and financing, while Garlock joined the USDA, where he and Wall each undertook several studies of rural banking difficulties [111, 113, 289].

In the 1930s Wall and Garlock became the nucleus of the agricultural finance staff in the USDA. Their ideas and efforts provided the foundation for data collection and ongoing analyses continued to this date. In 1938 they and others in the USDA initiated the *Agricultural Finance Review*, a periodical specializing in finance data and articles. Earlier, in 1931, both were involved in another landmark effort, coordinated by J. D. Black [37], to outline a far-reaching research program in agricultural credit, delineating the problem areas and specifying appropriate research approaches to each problem.

With the outbreak of World War II policy and research shifted rapidly toward coping with the probability of another boom-bust sequence. In 1941 Governor A. G. Black of the Farm Credit Administration was instrumental in organizing the National Agricultural Credit Committee, in which representatives of the major farm lenders could exchange information on farm lending experience and strive to present a united front against speculative excesses. Within the USDA agricultural finance workers collaborated on an urgent and
major effort to measure and analyze the wartime changes in farm finances, in
the process compiling the account of assets and debts that became known as
the Balance Sheet of Agriculture. With some relief their report, Impact of the
War on the Financial Structure of Agriculture [270], noted that farm debt
had continued to decline rather than to rise as in World War I. But as the war
ended and commodity price ceilings were removed, many analysts feared that
a credit-financed boom might yet occur. Land prices were rising rapidly, and
pent-up demand for farm machinery and buildings far exceeded available sup­
plies.

In this setting agricultural finance work entered the period covered by this
paper. The content of several agricultural finance textbooks that appeared at
this time is indicative of the orientation and thinking of the principal workers
in the field.

Murray's Agricultural Finance [207] appeared in 1941, followed by a sec­
ond edition in 1947 and a third in 1953. After explaining the capital needs of
farming, it emphasized the need to use credit soundly and wisely to avoid the
possibility of repayment problems. A major portion of each edition was de­
voted to describing the alternative sources of credit, especially lending insti­
tutions.

A flurry of other textbooks that appeared during these years echoed this
theme and emphasis with only minor variations. Norton's undergraduate text
[219] featured rules for sound use of credit. Duggan, then governor of the
Farm Credit Administration, collaborated with Battles on a text [93] that
also emphasized lenders' procedures for effectively evaluating farm loan re­
quests. (In reviewing this book, which he thought aimed at students of voca­
tional agriculture, Butz [72] detected partiality toward the cooperative Farm
Credit System.) Troelston's text [272], considered to be written from a bor­
rower's point of view, presented more historical perspective and discussion of
individual farm credit problems and principles but again emphasized sources
of credit. In 1954 the American Institute of Banking [5] capped this prolific
period of text production with an institutionally oriented volume for use in
its educational programs for agricultural bankers. None of these efforts, how­
ever, enjoyed the success of Murray's work, which after its third edition in
1953 became the "standard" and virtually only college text employed in agri­
cultural finance courses during the next twenty years.

Clearly, judging from these works and from Wall's detailed story of prewar
agricultural finance research [288], the primary expertise of agricultural fi­
nance workers was regarded as knowledge of credit arrangements and sources,
and their primary research roles dealt with the performance of the lenders
and with the identification and management of credit problems.
Overview of the Postwar Literature

The first part of the postwar period was characterized by continuing concern about the possible aftermaths of the land and investment booms in progress and continuing examination of the performance and adequacy of farm lending institutions.

Lenders' apprehensions at the time are exemplified by Nowell's recitation [220] at the 1946 meeting of the American Farm Economic Association of the numerous factors responsible for what he feared to be the headlong rush of agriculture into financial disaster. That such fears were not confined to lenders was illustrated in 1945 by the North Central Regional Land Tenure Committee's bulletin, Preventing Farm Land Price Inflation in the Midwest [218]. As late as 1954, in introducing their comprehensive study of farm mortgage lending experience during the interwar period, Jones and Durand noted [170]: "In the past, such periods of high prices and incomes have been short-lived, and the ensuing periods of depression have been severe and characterized by widespread farm mortgage distress. Whether the rise associated with World War II will have a like sequel remains to be seen."

The evaluation of lending institutions continued with individual efforts such as Butz's study of production credit associations [73], organized projects such as the American Farm Economic Association committee report on Farm Credit System agencies in 1947 [30], and large-scale cooperative data collection efforts such as, in 1947, the Federal Reserve System's first national survey of farm loans and borrowers at commercial banks [39]. Subsequently, the development of detailed cross-section data using large samples of loans and borrowers at all major institutional farm lenders was undertaken in 1956 and again in 1966 as a coordinated effort of the USDA, the Farm Credit Administration, and the Federal Reserve System. Numerous publications resulted from each of these projects—at least forty, for example, were based on the 1956 surveys.

Monitoring of overall financial conditions and developments continued to be centered in the USDA, where it revolved around the annual Balance Sheet of Agriculture, surveys of farm real estate market developments, and additional surveys supporting a new annual publication, the Agricultural Finance Outlook. The Marshall Plan and Korean War years brought higher farm prices and, in contrast to World War II, sharp increases in outstanding debt. An equally rapid decline in farm output prices soon followed, accompanied by a drought in the Southwest, an upper turning point in the cattle cycle, and a national economic recession. Land prices and total farm debt fell in 1953; the next annual meeting of the American Farm Economic Association included a session on safe debt loads.
Disaster, however, did not follow as it had three decades earlier. Rather, there ensued a cost-price squeeze that could be attacked by increasing productivity and expanding the size of individual farms and enterprises. A resumed upward trend in land prices further rewarded those who employed credit boldly in such uses. Nelson's *Credit as a Tool for the Agricultural Producer* [212] exemplified the new order. This change in orientation was incorporated into the profession's standard text when Nelson joined Murray as coauthor of the 1960 edition [209]. The new text put more emphasis on differentiating among farm risks and on returns and repayment capacity as guides to credit use. Also, the perspective was broadened to include noncredit means of acquiring capital.

The farm credit problems that attracted research attention in the 1950s, as reflected in numerous publications and in sessions at meetings of the association, revolved around discrepancies between institutional lending practices and the financing terms sought by farmers desiring to enlarge their operations. Thus problems with land appraisal norms, the financing of beginning farmers, and the maturities on borrowing for intermediate-term investments were examined along with such approaches and solutions as land contracts, family partnerships and corporations, and budgeting methods.

When contrasted with prewar events, however, these represented relatively minor adjustments in financing arrangements. The institutional structure had essentially stabilized after the major innovations of the 1930s. Thus finance specialists were no longer in the front lines of formulating public farm policy. Their work involving the improvement of data collection and data quality, the suggestion and description of minor institutional adjustments, or, for example, the listing of factors influencing land prices suffered by comparison with the ongoing explosion of econometric supply-demand analyses and of linear programming applications to farm management. In some quarters professional regard for the theory, techniques, and research output of agricultural finance was at a low ebb in the late 1950s and early 1960s.

Several of the more ambitious basic research efforts of the 1950s were produced by USDA personnel on joint appointment with the National Bureau of Economic Research. In retrospect, these and other basic efforts at the time were severely limited by the unavailability of proper data, appropriate statistical techniques, and large-scale computational capability—all conditions later substantially alleviated through the passage of time, new data-collection efforts, and advances in the econometric and computer sciences.

For example, Tostlebe [268, 269] painstakingly constructed and examined the fund flows involved in capital formation and its financing. Although he succeeded in deriving useful insights, the same approach later produced much greater returns after being enhanced by the capability to estimate equations
explaining each of the flows and then to make simulations and projections involving the entire system. Such empirical projects were also initially hampered because key capital, credit, and land price and transfer series were measured only on an annual basis, so that postwar observations available in the 1950s were too few to support meaningful empirical analysis, while use of data from the preceding three decades was suspect because of the particularly large structural changes that had obviously occurred in agriculture. In contrast, empirical work in many other fields could proceed using the more ample postwar observations on a quarterly, monthly, or even daily basis.

As another example, Horton [155] in 1957 published extensive analyses relating various farm characteristics to farm financial structure, using county-average data from the 1940 Census of Agriculture for a national sample of 108 counties. Its applicability to conditions in the late 1950s was immediately questioned [211]. More importantly, its approach and results were effectively rendered obsolete within a few years when the Bureau of the Census obtained similar but more detailed data for a national sample of over eleven thousand farms, and the quantum advances in computational capabilities permitted multivariate analyses employing all of these individual observations.

Thus in the 1960s agricultural finance staged its own revolution through newly found uses of theoretical concepts and quantitative analysis. Initiation of the transition was marked by a symposium on capital and credit needs in a changing agriculture (1959). The papers presented there by many leading agricultural economists, published in 1961 [28], helped to revive and refocus research attention on the structure and financing of agriculture.

At the macro level econometric work began to flourish. The parade of publications began in 1959, when both Griliches [117] and Cromarty [86] completed studies of the demand for farm machinery. In 1963 Heady and Tweeten [132] published extensive work on numerous types of capital investments as well as on land prices. By 1966 Herdt and Cochrane [136], Reynolds [242] and Tweeten and colleagues [274, 275] had all constructed detailed models of farmland prices. Additional work on these key elements of uses of funds continued to appear, both as specialized projects and as parts of broader farm sector studies and models. In contrast, econometric work on farm credit within a supply-demand framework has until recently languished after initial reports by Hesser and Schuh in the early 1960s [144, 145].

More recently, comprehensive models of capital and credit flows have been developed to explain past changes and to project future changes in total farm debt and to serve other related uses. After Brake in 1966 [62] reported projections for 1980 based on a largely judgmental flows model, subsequent work reflected progressively greater degrees of detail and sophistication. Melichar and Doll in 1969 [198] constructed several alternative projections...
based mainly on the earlier work of others; then Melichar [192, 196] reported a comprehensive financial sector model which primarily estimated and extrapolated past trends and relationships. In 1973 Lins and Penson each completed large-scale sector models, with Lins [186] emphasizing disaggregation by sources of funds and Penson [225] by uses. The simultaneous equations model constructed by Penson and his colleagues—the Aggregative Income and Wealth Simulator—has been used in USDA studies of the impact of alternative policies and was used to obtain the projections of capital formation, real estate transfers, and increase in outstanding debt published in the Agricultural Finance Outlook for 1974 [278], the first such direct use of an econometric model in any of the USDA’s official outlook work.

In 1960 new possibilities for study of debt relationships among individual farms were opened up when the Bureau of the Census, with assistance from the USDA and the Federal Reserve System, conducted the first national sample survey of debts owed by individual farmers and farm landlords. These data enabled Allen [2], Atkinson [10], Garlock [112], and others [90, 141, 194, 204] to explore various disaggregations of outstanding debt, to compare indebted and debt-free farmers, and to relate debt to various characteristics of the borrowers and their farms. Several of these studies employed econometric multivariate techniques. Similar census surveys were conducted in 1965 and 1970, with the sample size of the latter expanded to permit analyses at the state level. A significant historical data base has been accumulated through these efforts.

Evaluation of the performance of farm lending institutions continued during the 1960s, first in the form of several papers prepared in 1963 for the Commission on Money and Credit [83, 84], then in numerous studies based on the 1966 surveys of farm loans outstanding at all major lenders. Among the latter were several multivariate analyses of factors affecting interest rates charged on different types of farm loans [264, 265].

Institutions also undertook self-examination of their practices. Melichar and Doll in 1969 [198] studied the farm lending problems of banks as part of the Federal Reserve Board’s reappraisal of its discount mechanism. The board subsequently implemented a seasonal borrowing privilege particularly useful to rural banks [199]. In 1968 and 1969 the cooperative Farm Credit System undertook a broad reexamination of the credit needs of farmers and rural residents [99, 100]. As a result, it changed several of its practices and in the Farm Credit Act of 1971 obtained various new and broadened lending authorities, including the authority to make some types of rural nonfarm loans. In the 1970s the Federal Reserve Board’s special Committee on Rural Banking Problems sponsored work on various mechanisms that could be used by rural banks to obtain nonlocal funds [42]. In all these and in other studies at-
tention began to turn to the process and efficiency of financial intermedia-
tion in agriculture and in rural areas in contrast to the previous narrower em-
phasis on lending agencies and farm financing.

Theoretical and analytical developments with equally significant impact oc-
curred at the micro level. Following Baker and Irwin’s seminal work on lender
restrictions as a factor in farming adjustments [18, 19, 161], many studies
examined the means of acquiring control over capital resources, mainly in the
context of growth models of the farm firm. Baker and his colleagues at the
University of Illinois published a series of reports on the roles of liquidity and
leverage in farm financial management and on the effects of external lender
policies [12, 13, 23, 260, 286]. At Purdue University Patrick, Harshbarger,
Boehlje, Eisgruber, and White constructed several simulation models permit-
ting study of firm growth and estate transfers [44, 45, 128, 224]. Elsewhere,
S. R. Johnson [169] and Martin and Plaxico [189] also developed multi-
period growth models. These new approaches, along with the new emphasis
on financial intermediation and financial markets, were evident in the pro-
ceedings of a 1968 workshop at the University of Illinois that brought to-
gether many economists to discuss issues and problems in agricultural finance
[152].

Revisions in textbooks provide further evidence of the changing orienta-
did not fully reflect the ongoing developments and consequently was sharply
criticized on that account by John Lee [181]. Following the addition of War-
ren Lee as coauthor, the sixth edition in 1973 [213] took on a quite differ-
ent emphasis with the inclusion of discussion of capital budgeting, cash-flow
analysis, and financial markets and with less discussion of lending institutions.

In 1973 a new text by Hopkin, Barry, and Baker [153] also reflected the
new approaches. Cash-flow budgeting was presented as the analytical tool for
applying the concepts of liquidity and leverage to the problems of obtaining
control over farm resources. Lending institutions were treated only briefly in
the context of financial intermediation, with emphasis also given to leasing
and nonfarm equity capital as alternatives in acquiring resource control. In
neither of the 1973 texts does one find the cautious approach and warnings
about debt that characterized texts only twenty years earlier.

A reorientation in agricultural finance research in the late 1960s was also
evident in the Agricultural Finance Branch of the USDA Economic Research
Service. New emphasis was put on the financial structure of the farming sec-
tor, flow-of-funds social accounts, and conceptualization of farm financial
management. Examples of this new thrust were articles by Irwin, Lins, and
Penson [163, 227] and Bostwick [46, 47]. In 1973, however, a reorganiza-
tion of the Economic Research Service resulted in dissolution of the Agricultural Finance Branch. Researchers formerly in the branch were assigned to four different program areas, purportedly to consolidate similar areas of work. A useful review of the reorientation and subsequent reorganization, along with information on previous work and organization in the USDA, has recently been provided by Jones, Wiser, and Woods [172].

With the perspective provided by the foregoing overview, we now turn to a more detailed topical review of agricultural finance literature since 1945.

**Capital Formation and Accumulation**

Capital is not easily defined, in part because of continuing debate among economists. However, Solow [261] states that "the proper scope of capital theory is the elucidation of the causes and consequences of acts of saving and investment." As in most definitions of capital, the implication is that capital represents durable goods saved from consumption for the purpose of adding to future production. Belshaw [29] sees capital in a slightly different context, as the accumulated stock of real wealth, which covers land as well as produced goods. Saving and investment thus add to the stock of capital. Credit differs from capital in that it represents only one means of obtaining control over capital or assets.

At the micro level capital refers to the productive assets of a firm, including real estate, machinery, livestock, inventories, and cash balances. This concept is consistent with the general connotation of "capitalizing" a business, which refers to the acquisition of all its productive assets rather than just its plant and equipment. Over time, with capital becoming more important relative to labor inputs, increasing attention has been focused on the processes of capital formation and accumulation.

**Theory**

Economists in general have devoted considerable attention to the theory of capital formation and accumulation or growth. Agricultural finance workers have found this work generally applicable to their subject, if one may fairly judge from their limited attention to development of specialized formulations. However, Tuck [273] emphasized their need to employ theory applicable to individual proprietorships operating in a competitive environment. Thus, he contended, attempts to use generalized optimization models in studying the distribution of agricultural capital among individual farms must consider variation in management ability of farmers and must also recognize that price and production uncertainties tend to hamper ex ante optimization.
Some basic observations on aggregate farm capital formation have been summarized by G. L. Johnson [168]:

Farm capital formation takes place rapidly when farmers are in a position to gain directly from reinvesting part of their income and when they have major responsibility for investment in direct farm production. . . . Rapid capital formation occurs when the public makes substantial investments in both the general and technical education of farmers, in improved technology for farming, and in its extension to farmers. . . . Formation of farm capital is accelerated when the transfer of capital from the farm to the nonfarm sector is left to voluntary processes, including transfers in the form of inherited monetary capital as well as training received by farm children who migrate to nonfarm occupations. On the other hand, programs designed to force income out of agriculture make private agricultural investment unattractive . . . Lagging farm capital formation can be stimulated with favorable price programs and credit assistance to individual farmers. . . . Both publicly and privately managed systems of direct agricultural production tend to be characterized by underinvestment in public facilities for agricultural research and extension and in general education, roads, and other public facilities.

There are, no doubt, other factors that could be listed. Certainly tax laws affecting capital gains, new investment, and depreciation are thought by policy makers to influence capital formation.

Researchers have also sought a conceptual framework for studies of financial management at the firm level. Bostwick [46] envisioned farmers as dealing with three sets of resources — productive, financial, and human — requiring the exercise of five managerial functions: investment, ownership, management, labor, and entrepreneurship. Later Bostwick [47] proposed, for analytical purposes, the partitioning of financial returns among the investment, ownership, and entrepreneurship functions.

Sources of Capital

Farm firms acquire capital in a variety of ways. Equity capital is obtained through gifts and inheritances, savings from farm and off-farm income, and investment from relatives or others through establishment of partnerships or corporations. Borrowing provides control over outside funds that are then used to purchase assets or inputs. Leasing and contract production constitute means of obtaining control over assets owned by others.

Arrangements through which outside capital could enter agriculture attracted considerable attention throughout the postwar period. In some types of farming substantial capital is provided by agribusiness firms seeking, through
vertical coordination, to secure greater control over their production inputs or over the market for their output. Mighell and Jones [200] found large proportions of output being produced under integrated or contractual arrangements in the fluid milk, broiler, turkey, vegetable, seed corn, sugar, and citrus fruit industries. Financial arrangements associated with the rapid spread of vertical integration in the broiler industry during the 1950s were examined by a number of studies [123, 210].

Nonfarm venture capital was also attracted into certain farming enterprises that appeared to offer speculative or tax-shelter opportunities [127]. Scofield [249] studied agricultural ventures registered with the Securities and Exchange Commission during 1970-71. A majority were limited partnerships that intended to enter cattle feeding or to establish citrus groves, nut orchards, and vineyards. Most of the remaining registrations involved the direct sale of beef breeding herds. Only a few stock offerings were registered, and most of these had agribusiness as well as farming aspects.

Scofield [250] later estimated that as of 1973 large-scale cattle feedlots had raised between $200 and $300 million in equity capital from outside investors through the sale of limited partnership interests and other means. These funds provided from 15 to 20 percent of the total equity capital needed by the industry. A considerable portion of this capital was apparently lost during the financial reverses suffered by cattle feeders in 1974.

In 1967 the Secretary of Agriculture, in response to widespread concern about an apparent increase in corporate farming, directed the Economic Research Service to conduct a survey to determine the number, kinds, and general characteristics of corporations directly involved in farm production. In his analysis of these data Coffman [81] reported that the 13,300 corporations with farming operations accounted for 8 percent of annual sales of farm products. Four-fifths of the corporations, however, were controlled by individuals or families, and these accounted for 71 percent of the annual sales by corporations. Corporate farming was relatively most important in Hawaii, Florida, California, and the mountain states.

In 1969 the Census of Agriculture first provided for the identification of corporate farms. About 1,800 farms were found to be operated by corporations with more than ten stockholders. These nonfamily corporations operated 1.6 percent of all farmland and accounted for 2.8 percent of total production. Reimund [234], using 1969 data from the census and from Dun and Bradstreet, recently completed a report describing the activities of 410 large multiestablishment firms (including noncorporate firms) with farming operations. These firms accounted for 7 percent of total United States farm production, though their farming activities represented only 5 percent of their total annual sales.
Leasing of real estate and livestock owned by landlords is a common and traditional method of obtaining control over productive assets. The 1969 Census of Agriculture indicated that 13 percent of farm operators leased all of their land, and another 25 percent rented part of the land they operated. The decision to rent or to buy real estate is a major element in many "getting started," growth, and other studies that are reviewed later.

Leasing of farm machinery is a newer development. Irwin and Smith [165] found evidence that, as of 1970, such leasing was increasing rapidly but still involved only a minute proportion of the total machinery stock. Irwin and Penn [164] have reported that custom hiring, a more traditional practice, may enjoy new growth as a result of the rising capital flow required annually to maintain and add to the machinery stock, as well as because of the trend toward larger, more specialized machines. About 60 percent of commercial farmers reported expenditures for machine hire and custom work in 1969, with slightly over half of the custom work being performed by other farm operators.

As these studies of outside capital sources tend to indicate, the farming sector as a whole continues to acquire most of its capital through saving and borrowing. (In viewing the sector as a whole, most inheritances are merely intrasector transfers of title, and with the sector defined to include farm landlords, the same is true of shifts of ownership among operators and landlords.) A number of studies have therefore attempted to ascertain the relative importance of these two major sources. Because direct estimates of saving are not available, these studies have generally related borrowing to some measure of total capital flow.

Tostlebe [268] compared net borrowing (the change in outstanding debt) to the sum of the major elements of capital formation — purchases of machinery, buildings, and land improvements and the net increase in inventories of livestock and crops and in principal financial assets. He found that borrowing financed a relatively small proportion of capital formation during the first half of this century, except during World War I.

Tostlebe also estimated net capital formation by subtracting the depreciation of buildings and machinery from gross capital formation. Then, he noted, the difference between such net capital formation and net borrowing could be regarded as the net investment financed from farmers' net income. His estimates indicated that such net investment was negative during periods of agricultural depression before 1950.

A similar calculation has been published annually as the "farm business sector" of the national flow-of-funds accounts maintained by the Federal Reserve Board. Since the mid-1950s the annual net investment so calculated has
consistently been negative, which has surprised some analysts who are unaware of the basis for these values. Melichar [195] pointed out that whereas the full amount of net borrowing entered into the calculation, at least one major capital flow financed in large part by such borrowing did not. Upon adding in estimates of the capital required to purchase real estate from persons leaving the farming sector, he found positive net investment throughout 1950-69. During the 1960s net investment so defined averaged 9 percent of net farm income and 5 percent of total net income (farm and off-farm) and financed about two-thirds of the total flow of capital for gross capital formation and the real estate purchases. Net borrowing financed the remaining one-third — a much higher proportion than in earlier decades.

With the recent downward revision in the USDA estimates of total farm debt, net borrowing during the 1960s is now shown to have averaged about one-fourth rather than one-third of total capital flow — still more than in previous periods.

The USDA has since 1973 employed a similar concept in its analyses of the agricultural finance situation and outlook [278, 279]. Between 1970 and 1973, as the total cash flow of capital doubled, net borrowing rose even more rapidly, reaching 40 percent of the total capital flow in 1973 and 37 percent in 1974. Since the late 1950s, therefore, borrowing has constituted a relatively more important source of capital than in most preceding years of this century; however, well over half of each year's capital flow continued to be financed from noncredit sources, mainly savings.

Demand for Capital by the Firm

The demand for capital is a derived demand based on the potential net returns from investment opportunities. Using this proposition as a point of departure, several researchers have estimated the capital needs of individual farm firms. For example, Wise, Plato, and Saunders [298] used linear programming to determine the minimum investment in operating and long-term capital required to achieve given levels of net farm income.

For estimating the returns to capital, some studies employed the Cobb-Douglas production function or other econometric approaches relating the demand for capital to its costs and returns. Yotopoulos [300] demonstrated that such analyses are improved if capital inputs are specified as service flows rather than as capital stocks. He also suggested a methodology for estimating service flow inputs from the more readily available data on capital stocks.

Burkett [70] explored the ability of farm operators to accumulate equity on various sizes of representative farms. On the larger farms more than one generation was typically required to accumulate, develop, and maintain the
capital employed. Only on large farms did part-owners or tenants have sufficient farm earnings to make significant progress toward full ownership from this source alone.

Life Cycle of the Firm

Several studies have related the financial characteristics of farm firms to the life cycle of the firm or operator. Wirth [292] argued the need for more financial information specifically related to the establishment, expansion, and consolidation stages of the firm life cycle. Barry and Brake [24] suggested the life cycle as one important component of the conceptual framework for research on financial strategies of the firm.

The expansion stage of the firm life cycle has been found to be a particularly critical period, as farmers in this stage tend to have debt commitments that are high in relation to net incomes, cash flow, and assets [66]. Dorner and Sandretto [92] found that capital availability restricted firm growth during the early period of expansion, while later in the life cycle labor became the limiting resource and capital tended to be substituted for labor.

Some studies have concentrated on capital constraints facing beginning farmers. Kanel [173] estimated that farming opportunities could accommodate only one-third of maturing farm youth. Reiss [240] suggested that families beginning farming could minimize capital needs by shifting capital requirements to landlords through appropriate tenure arrangements, by substituting labor for capital, and by arranging for smaller annual cash payments when purchasing capital goods. In another study Shoemaker and Miller [257] attributed a successful start in farming to previous farm experience and training, substantial aid from relatives, and control of enough resources to employ the family labor force efficiently.

Rodewald, Larson, and Myrick [245], in their study of Montana dryland grain farms, described how the most common method of obtaining initial control over capital has changed since the years when land was obtained by homesteading. During the 1920s and 1930s land purchase was the most common method, but since 1940, and particularly after 1950, a large proportion of farmers were starting by renting all of their farmland. In Michigan Brake and Wirth [66] found that help from relatives had also become more important.

Problems of asset management also occur toward the end of the life cycle. A recent study by Lee and Brake [182] indicated that retiring farmers typically lost from 15 to 40 percent of the value of their farm assets in the course of liquidating them for retirement income. As noted later, Boehlje and Eisgruber [44] also found problems at this stage of the life cycle, and more analytical attention to it appears to be in order.
Management of Financial Resources

Various studies have examined the management of financial resources including liquidity management, effects of capital position and leverage on growth and adjustment, internal and external capital rationing, farm and family financial planning, firm-household relationships, and the effects of income, capital gains, and inheritance taxes on financial resources and income. In this literature considerations relating to capital and credit are often inexorably entwined, and the review has little choice but to reflect this condition.

Over the postwar period the nature of these studies underwent distinct changes as events altered attitudes and needs and as new analytical techniques became available. In the 1950s discussions were frequently phrased in the context of capital rationing, which was often considered synonymous with credit rationing. Attention focused on the attitudes, institutions, arrangements, and policies that affected the capital (credit) that farmers would employ and that lenders would make available.

The advent of multiperiod programming techniques provided a powerful tool for quantification and analysis of the relationships between these factors and the ultimate goal of progress in a farmer's income or net worth. Thus after 1960 more of these discussions appeared in the context of firm growth models. Emphasis shifted toward consideration of strategies for maximizing growth within the observed or hypothesized external and internal constraints, in contrast to the previous emphasis on ascertaining desirable changes in these constraints.

CAPITAL RATIONING

A study reported in 1949 illustrates attitudes commonly held directly after the war, which were significantly influenced by two prewar decades of difficulties in repaying farm debt. McNall and Mitchell [191], after surveying all 139 farms in one Wisconsin township in 1939 and again in 1946, asked, "What is the basis of farm financial progress?" The most influential factors explaining variation in progress among these farmers appeared to be size of farm and relative managerial ability. But, for this review, perhaps the most interesting aspect is the frame of mind from which the role of debt was examined: "Another of the factors which might conceivably influence the farmer's financial progress is the debt load he assumes when he buys his farm. There has been considerable speculation concerning the wisdom of the federal government policy during the past years of increasing farm ownership through 100 percent loans. Is that too heavy a load for a farmer to overcome?" The answer from the survey data was duly reported: "Such heavy loans of themselves need not represent insurmountable handicaps to owner-operators. . . .
larger debts apparently do not slow up the process of asset accumulation to any extent when associated with large enough farms."

As noted earlier, these cautious attitudes born of prewar experience were widespread and were echoed in the agricultural finance textbooks of the time. Attention to the means of acquiring control over capital resources centered primarily on borrowing. Both lenders and borrowers were cautioned about the dangers of incurring debt in the face of uncertain prospects for farm income and land prices. Rules indicating the limits of "safe" debt loads were the order of the day. In other words, both external and internal capital rationing were advised to minimize the chances of debt repayment problems.

In contrast, some influential early postwar monographs on farm organization and policy took a rather different view of capital rationing. D. G. Johnson, in *Forward Prices for Agriculture* [167], asked why the bulk of American farms were relatively inefficient units of below-optimum size. His answer centered around external capital rationing — "the inability of the borrower to obtain all the capital funds desired at the going rates of interest." Given uncertainty about profit prospects, "lenders do not provide . . . loan funds in amounts which would equalize the rate of return and the interest rates. . . . In order to assure . . . the repayment of interest and principal . . . (1) the ratio of borrowed to owned capital is kept below some prescribed level . . . and (2) the rate of return on capital is kept at a high level." He therefore proposed policies designed to reduce uncertainty. When, as the postwar period progressed, actual governmental policies toward agriculture did have this effect, lender and borrower attitudes shifted toward increased use of capital as Johnson had anticipated.

Johnson also noted conditions which much later work would explore. The degree of external capital rationing, he observed, varied with the type and purpose of the credit request — cattle-feeding loans were favored over hog enterprises. The large down payments required on real estate loans were inducing beginning farmers to start with uneconomically small units or to lease their land. Loans to purchase farm machinery with a useful life of ten years had to be repaid within three years or less.

In *Production and Welfare of Agriculture* [247] Schultz took a similar tack: ". . . the customary practices of credit institutions are such that a farmer in the heart of the Corn Belt with less than $5,000 of assets is not permitted to establish a firm of optimum size except by renting. . . . It is necessary to go a step farther and examine why the practice of capital rationing has become established. . . . the tap root of this practice is grounded chiefly in economic uncertainty. . . . if it were only risk that was at stake in the gap which separates expectations and realizations . . . creditors and landlords would
merely add the necessary risk premium and allow farmers to obtain all the resources which they would care to hire."

Rationing by borrowers, Schultz noted, varies directly with the ebb and flow of the general outlook; though creditors have developed a set of rules to safeguard their interests from unexpected changes, these exhibit an elasticity over time that stems directly out of the general state of confidence. Thus, "after a run of years when returns to agriculture were distinctly favorable, such as prevailed from 1900 to 1910, the effective margins required by creditors were lowered. Hence, also, the effects of capital rationing were less pronounced. In contrast, after the decade of more or less chronic depression experienced by much of the Corn Belt agriculture following 1920, creditors in a number of ways increased the effective margin even though the traditional ratios of debt to property values were not altered." Appraisals were stiffened, more operating capital was insisted upon, and shorter-term contracts were introduced. Meanwhile, interest rates declined even as uncertainty rose, which "further focuses attention upon the overall fact that the supply of resources which the farmer is permitted to hire in the capital market is rationed by factors other than price."

Earlier, in Agriculture in an Unstable Economy [246], Schultz had put his argument more bluntly: "The main deterrents [to enlargement of small family farms] are lack of knowledge about modern farm technology and its requirements, price uncertainty, and, most serious, the vise of capital rationing which squeezes the small farmer. Credit institutions, private and public, are geared too much to an outmoded farm technology and are not prepared to serve many farm families in enlarging their units, especially in the South where the need for this adjustment is greatest."

The needs perceived in these works ranked high among the concerns of the agricultural finance literature of the 1950s, particularly in view of the farm price, income, and organizational developments of the period. Public policy toward agriculture cushioned the adjustment to new output and input price levels after the Korean War but stopped short of preventing a cost-price squeeze. To maintain individual farm incomes in the face of that event, farmers sought greater efficiency through new technology and farm enlargement. In response to felt needs agricultural finance research and discussions centered on such topics as the increasing problems of getting started in farming or in transferring the farm estate, the use of credit in making farm adjustments, and the need for lenders to provide credit terms more appropriate for financing adjustments, enlargement, and greater machinery investment [7, 9, 59, 95, 124, 146, 183].

By 1960 more of the onus for capital rationing was being placed on farmers.
After surveying Indiana farmers, Hesser and Janssen [142] reported that three out of four farmers exhibited capital rationing in that they farmed units of below-optimum size but had the management ability to support expansion. Of these, only 13 percent were currently at debt limits imposed by external rationing. The others were practicing internal rationing. However, studies also continued to indicate deficiencies in credit availability to small operations [33, 183].

The positive impact of credit use on farm financial progress became well established. For instance, Hamlin, Wirth, and Nielson [121] described and analyzed the sources and use of credit by a panel of Michigan farmers during 1954-58. They concluded that the use of credit was strongly associated with financial progress. Credit was found most effective when used in increments that substantially increased the scale of farm operations. Brake [59] budgeted several farms in one area of Michigan to see how income could be increased by additional capital investment. Somewhat larger incomes could be obtained by operators with "a willingness and ability to use fairly large amounts of credit."

GROWTH MODELS

In the 1960s growth models became the primary vehicle for investigations of farm financial management. Such models ranged from algebraic formulations to applications involving linear programming and simulation techniques [45, 94, 162, 169, 184, 189]. These new analytical tools could be used to analyze the impacts of external and internal capital constraints on measures of financial progress or even to optimize an objective function reflecting financial progress. Also, the nature of the growth process and the effects of various financial strategies could be observed over time [94]. As Bailey [11] later noted: "Without growth, financial management of the farm is a one-time budgeting of debt and of income flows; with growth, debt becomes a powerful management strategy. Thus the concept of growth of the firm puts meaning into the term 'financial management.'"

Baker and Irwin pioneered research emphasizing liquidity and lender decisions. In 1959, at the symposium on capital and credit needs in a changing agriculture [19], they discussed the collection of data on production functions and lending limits of Illinois farms and a model for evaluating the impact of these variables on farm organization. Using this model, they later quantified some effects of differences in lender attitudes toward different loan purposes [161]. Thus the purchase of cattle, an enterprise favored by lenders, could displace the purchase of fertilizer in an optimal solution despite a higher marginal value product for fertilizer.

A series of studies at the University of Illinois, summarized by Baker [13],
pursued this line of inquiry. Neuman (1962) found that an optimal farm plan called for a certain sequence of resource acquisitions during the production year, depending on lender reactions to the kinds and amounts of debt outstanding. Total credit obtained within a year could, for instance, be increased by purchasing cattle before, rather than after, purchasing machinery. Rogers (1963) reported that an optimum solution might include the use of merchant credit, in spite of its higher price, because more total credit could thereby be obtained. Vandeputte (1968) found that the level of annual repayment commitments on real estate debt influenced lenders’ limits on non-real estate credit extensions, with consequent implications for the credit strategy that would optimize growth. According to Smith (1968), this reaction by non-real estate lenders to land contract debt tended to offset the growth rate advantage that land contract purchases would otherwise offer.

As these studies progressed, Baker [12, 13] evolved a conceptual framework for study of the behavior and growth of farm firms in an environment of external and internal constraints. A farmer’s unused borrowing capacity ("credit" in Baker’s terminology) represents a valuable liquidity resource. As debt is increased, "credit" is absorbed and liquidity is correspondingly reduced. Borrowing, therefore, entails a cost in reduced liquidity in addition to the direct interest charge. Internal capital rationing is thus a manifestation of the value placed on remaining liquidity. Pursuant to this concept, Barry and Baker [23] suggested a procedure for quantifying the liquidity value provided by unused credit ("credit reservation prices") and through case studies confirmed that it was inversely related to use of debt and to the rate of growth.

In the late 1960s another sequence of growth studies was carried out at Purdue University. Patrick and Eisgruber [224] developed a dynamic model to simulate the process of firm growth over a twenty-year period under various levels of managerial ability and capital market structures – the latter represented by variations in interest rates and in limits on loans of different maturities. For one thing, they found that the sooner a farmer was able to buy land, the greater was his net worth progress. Also, stringent limits on intermediate-term loans could be circumvented by refinancing long-term loans. But if low limits were imposed on both of these debt maturities, there was an impact on the management practices applied to crop rotations and the crop-livestock balance. (Baker and Hopkin [16] noted the macroeconomic implications of such effects for aggregate organizational structure and resource efficiency.) Harshbarger [128] extended this model by utilizing a random number generator to simulate weather variability while studying the impact of alternative land procurement policies and equity-ratio limits on borrowing.
In 1964 Baker and Holcomb [14] listed estate transfer and lender behavior as areas where modeling might yield attractive payoffs. Subsequently, Boehlje and Eisgruber [44] constructed a simulation model in which the impact of alternative estate transfer strategies could be studied. They found a need for joint consideration of growth and transfer strategies due to uncertainty concerning the timing of death. Thus estate transfer plans should be continually reviewed as various growth phases are entered or completed. They were further impressed with the need to coordinate the simultaneous process of exit and entry — exit of parents and entry of the operating heir. Their assessment: “Currently, little is known about the processes and the problems of either disinvesting from or getting established in farming, let alone how to coordinate these processes.” Among the many variables involved and remaining to be considered in future work, they listed the retirement requirements of farmers, the equity capital outflow to nonfarm heirs, and changes in tax and transfer laws.

As research proceeded, additional considerations were suggested for inclusion in growth models. Brake [60] in 1968 pointed out that growth models then extant might be seriously incomplete because of their neglect of important cash withdrawals occurring through social security taxes, income taxes, and current family consumption. Vandeputte and Baker [287] subsequently discussed how income allocation to these uses might be specified in linear programming models. In another refinement Barry [22] evaluated the impact of asset indivisibility on firm growth. Other work examined problems of asset replacement in a decision-making context. Chisholm [78] and Perrin [231] offered criteria for determining optimum replacement patterns and demonstrated methodology useful in making such decisions. In an award-winning article Boussard [53] demonstrated that three major problems in using multi-period linear programming models — the choice of objective function, excessive matrix size, and the introduction of uncertainty — are related and can therefore be managed through coordinated choices and procedures exemplified by the model he presented.

Several papers have reviewed and assessed developments in this research area in greater scope and detail than has been possible here. One contribution in this vein, by Baker, Scott, and Reiss [20], included considerable discussion of the implications for future research and applications. In addition, Bostwick [46] presented a nonmathematical outline of the theoretical framework, Irwin [159] provided a similar review of the principal growth models, and Harrison [126] compiled a bibliography of publications, ongoing work, and names of current researchers and teachers.

FARM AND FAMILY FINANCIAL PLANNING

Numerous extension publications have been devoted to farm and family financial planning, but not many research publications have addressed this
subject. Attention has been given, however, to the use of cash-flow data and projections in financial planning and control, as in examining the need for and the ability to repay debt [26, 205, 293].

Because of the unique firm-household relationship in agriculture comprehensive financial planning requires information on factors such as family consumption functions, savings rates, income taxes, personal goals, and nonfarm investments. The importance of off-farm income as a source of capital, for instance, was demonstrated by Wirth and Nielson [295]. Research in these areas may employ data from the record-keeping projects conducted in several states, but typically such data are based on small samples that may preclude generalizations.

Several aspects of the role of federal income taxes in the firm-household relationship have been studied. In exploring income tax compliance by Wisconsin farmers Gardner [110] found that farm expenses were underreported in the aggregate, as were some kinds of farm income. Noncompliance generally occurred through omission or incomplete listing of both receipts and deductions.

Dean and Carter [88] illustrated how tax considerations, the form of business organization, and the optimum scale of the firm are interrelated. In the Imperial Valley of California individual proprietorships were the advantageous form of organization for farms up to five hundred acres whereas the corporate form provided tax advantages for larger farms. Their work also suggested that, given the current tax treatment of capital gains, a progressive tax rate structure stimulates investment in high-risk ventures.

Assets and Debts in the Farm Sector

There has been continual interest in the financial structure of the farm sector. Many studies have analyzed farmers' assets and debts. These include attempts to describe the credit situation in a locality, a larger area, an entire state, or the entire United States [10, 112, 156, 297].

Special surveys have provided extensive information on farmers' debts and assets. The 1960 Census Sample Survey of Agriculture obtained data on the debts of a large national sample of operators and landlords. Around December 1, 1960, debt was found on 62 percent of all farms [10, 40]. Lending institutions held two-thirds of the total debt reported by farm operators, individuals held one-fourth, and merchants and dealers held 8 percent. Borrowers typically operated larger farms, produced more, were younger, owned more farm real estate, and rented a higher proportion of the land they farmed than nonborrowers. Farmers with debt thus appeared to be more aggressive and more willing to take risks than debt-free farmers [112].

Similar sample surveys were made in 1965 and 1970 [282, 283]. Outstanding operator and/or landlord debt was found on 56 percent of all farms
as of December 31, 1970. The proportion of indebted operators averaged 53 percent and ranged from 81 percent on farms with annual sales of $100,000 or more to 37 percent on farms with sales under $2,500. Among the indebted operators those with larger farms (measured by value of sales) exhibited higher average ratios of debt to real estate assets and to total (farm and off-farm) net income but lower ratios of debt to annual sales, expenses, and net farm income. Of the 1.9 million landlords 16 percent had outstanding debt, and among these the debt averaged 23 percent of the value of the farm real estate they rented out.

The 1970 survey embodied two new features that are permitting expanded analyses in work now planned or in progress (the data first became available late in 1973). Both operators and landlords reported the amount of credit obtained during 1970 in connection with each major type of capital purchase and operating expense, classified further by two maturity categories. Also, the sample size was substantially expanded to permit results to be tabulated and analyzed separately within most states [109]. In the previous surveys geographical disaggregation had been limited to three large regions—the North, the South, and the West.

The Balance Sheet of the Farming Sector, issued annually since 1945 by the USDA, is the standard source of aggregate information on farm assets and debt. After its introduction as an annual sequel to a study of the impact of World War II on farm finances [270], it rapidly became a popular and widely quoted USDA publication. The availability of Balance Sheet data for successive years has clearly facilitated the presentation of a comprehensive and organized discussion of aggregate changes in the value of farm assets and the amount of farm debt. As Burroughs noted in 1950 [71], the Balance Sheet represented "one of the first products of social accounting," covering agriculture for several years before similar data were compiled for most other sectors of the economy.

Over the years Balance Sheet data have sometimes been misinterpreted or misused. At first, Burroughs noted, social accounting was so new that only a few specialists were fully aware of the associated conceptual problems or the popular confusions that might result from applying the terminology of accounting for private enterprise to given sectors or to the whole of the national economy. He pointed out various conceptual limitations and valid and invalid uses. However, incautious or misinformed use continued, as noted more recently by Irwin [160]. For one thing, the Balance Sheet does not reflect the assets and debts of either farm operators or owners alone but rather assets and debts of farm operators, tenants, and landlords combined. Second, assets are valued at current prices, whereas data on assets of other economic sectors are generally available only as book values (cost less depreciation). Hence, Ir-
win noted, debt/asset ratios computed from the Balance Sheet are not directly comparable to those available for other sectors.

Subsequently the USDA also presented data on agricultural book values [281]. However, analysts were not warned that agriculture/business comparisons based on book values may also be misleading for some purposes because many business assets (accounts receivable, inventories, goods in process of production, and recently purchased plant and equipment) have book values close to their market values whereas a large part of agricultural assets consists of infrequently transferred real estate, for which the book value now averages far below market value.

**Trends in Capital and Resource Organization**

Capital Formation and Land Prices

"Agriculture is a heavily capitalized industry. . . . The capital requirements of agriculture have increased enormously since the middle of the last century. . . . increasing land values, together with more intensive methods of farming and the development of cooperative marketing, have made it necessary for the farm to acquire larger working capital. . . . As the capital requirements of farming have expanded, credit has become increasingly important in the operation of the farm. . . . Now that the capital requirements of farming are so great, farmers use credit facilities extensively . . ." [221]. These familiar observations have been repeated, justifiably, many times during the past three decades. The quotation, however, is from the 1924 Yearbook of Agriculture! The trends described have indeed been long-term phenomena.

The general trends are familiar, but interruptions and significant variations in their pace over time are less widely known and appreciated. Ironically, when the quoted passage was written, agriculture had already entered a lengthy period of depressed income, with severe consequences for land prices, capital formation, and outstanding debt. After 1920 the national index of farmland prices fell for thirteen consecutive years, dropping a total of 59 percent from its postwar peak. Net capital formation for two decades was low and in many years negative. Outstanding real estate debt peaked in 1923 and then declined almost continuously to 1946; the total decrease amounted to 56 percent of the volume outstanding in 1923.

During World War II farm income rose and the ongoing recovery in farmland prices accelerated to annual rates exceeding 10 percent (as noted, however, real estate debt continued to be reduced). With new machinery and building materials largely unavailable, farmers added substantially to their holdings of bank deposits and United States savings bonds. These helped to finance a capital expenditures boom that got under way in 1946. Annual
gross spending trended upward through 1951, although net capital formation peaked earlier, in 1948. The boom was of very significant proportions. The stock of farm machinery measured in constant prices, for example, more than doubled between 1946 and 1951 and continued a slower rate of increase to 1956. Land prices, after softening in the late 1940s, rose by 27 percent during the first two years of the Korean War.

As Jones and Durand [170] noted, these events resembled four previous war-related capital spending and land price booms, each of which had been followed by agricultural depression. During the 1950s, however, farm income was supported by government programs while a more orderly adjustment in output capability took place. Crop acreage, for instance, was reduced by about 15 percent over the ten years following 1952. The machinery stock in real terms was reduced by 5 percent between 1956 and 1963. Except for a brief flurry in the mid-1960s net capital formation remained relatively low through 1972, which is consistent with Tostlebe's observations for previous periods in which net farm income was under pressure [268]. This time, however, the farm income squeeze was not severe enough to cause the widespread debt-repayment distress that had followed previous wartime booms.

In 1973 total net farm income nearly doubled that of 1972, again triggering the typical response — expansion of crop acreage and livestock production and increases in capital spending and land prices. Building and machinery purchases rose sharply, the latter being in effect limited by what manufacturers could produce. In the year ending March 1, 1974, the national index of farm real estate prices rose by 25 percent. On November 1, 1975, the index stood 81 percent higher than four years earlier — an average annual rise of 16 percent compared with an average annual gain of 6 percent over the ten years ending in November 1971. Net farm income in 1974 and 1975 receded from the 1973 peak but remained substantially above earlier levels; consequently, the sixth major boom in United States farm investment and land prices was still continuing in mid-1976.

The composition of physical capital underwent some significant changes during the postwar period. However, analysts unfamiliar with the USDA estimates of assets valued at their 1967 prices are often surprised when first shown the rather small shifts since the mid-1950s. The largest postwar changes were the increase in machinery and the decrease in liquid financial assets that occurred directly after the close of World War II. Machinery rose from 4.2 percent of total assets in 1945 to 10.3 percent in 1954. The ratio then fell off slightly before climbing again to 10.3 percent in 1967 and further to 11.2 percent by 1975. Holdings of currency, bank deposits, and United States savings bonds fell rapidly from 10.4 percent of assets in 1946 to 6.8 percent in 1952, and then continued a downward drift to 3.9 percent by 1975. Through-
out the period the proportion represented by livestock fluctuated only be­
tween 6.4 and 8.1 percent—the latter also being the 1975 value. For the last
twenty years the proportion in real estate has stayed at about two-thirds of
the total.

Because prices of the various assets have moved very differently during the
postwar period, the composition of assets valued at market exhibits som­
what different changes. Of greatest significance, the proportion represented
by real estate has risen persistently from 56.8 percent in 1949 to 71.4 percent
in 1975. The proportion in machinery rose from 4.6 percent in 1947 to 11.4
percent in 1954, but the latter percentage has not been exceeded. Liquid fi­
nancial assets declined in importance rather steadily, from 13.1 percent in
1946 to 3.7 percent in 1975. The relative proportion represented by live­
stock fluctuated violently as a result of swings in livestock prices. The first
peak of 11.7 percent in 1952 was followed by a drop to 6.2 percent by 1957.
Another peak of 8.9 percent was reached in 1974, but a plunge in prices re­
duced the ratio to 4.7 percent only a year later.

Average assets per farm may also be computed from the Balance Sheet
data; these are, of course, affected by changes in the number of farms. After
increasing to an all-time high of 6.8 million farms in 1935, the number had
already fallen to 5.9 million by 1946 and continued to decline each year to
2.8 million in 1975. Valued at market, total assets per farm rose from $17,500
in 1946 to $184,500 in 1975, real estate assets from $10,300 to $131,700,
and machinery from $900 to $19,800.

Such comparisons, though commonly used to indicate the changes on
typical farms, can be misleading because the farms that have been disappear­
ing are, on average, much smaller than the remaining farms. Reinsel [237]
pointed out the nature of this misconception in his estimates of the factors
contributing to the change in average farm size from 1959 to 1964. The
average size of farm increased from 302 acres to 351 acres over this five-year
period. The forty-nine-acre average change came from four factors: (1) twenty­
five acres from loss of farms through nonagricultural use or census redefini­
tion; (2) eight acres from loss of farm numbers where land remained in agri­
culture; (3) thirteen acres from purchase or rental of additional farmland by
operators of remaining farms; and (4) three acres from purchase or rental of
land not previously in farming use by operators of remaining farms. Thus,
those farms included in both the 1959 and 1964 censuses increased in size by
only sixteen acres on average rather than by the forty-nine acres implied
by the overall census averages.

Nevertheless, major structural changes occurred on individual farms. Capi­
tal was substituted for labor, new technology and larger-scale machinery were
adopted, and increasing proportions of inputs were purchased rather than
produced on the farm. Among the many studies of such resource adjustments and capital formation Dorner and Sandretto [92] examined those on a sample of Wisconsin dairy farms from 1950 to 1960. Labor input declined on these farms even though a greater volume of output was produced. Capital improvements made this possible, and 70 percent of them were financed from current income or accumulated savings. More of the farmers had supplemental nonfarm jobs in 1960. Operators who began as tenants or in family partnerships made more progress in enlarging their farms than did those who started as owners.

Farm Input Prices

After price ceilings were removed following World War II, farm input prices rose sharply, paused in 1949, and again rose rapidly in the first few months of the Korean War. By 1951 prices of production inputs averaged 55 percent above those of 1945, and prices of family living items had risen 47 percent. Except for 1949 these were also years of relatively high net farm income; furthermore, the rise in input prices was broadly based. Altogether, the emphasis was on expanding output rather than on adjusting to differentials or increases in input prices.

This experience was followed by a lengthy period, dating roughly from 1953 to 1967, characterized by stagnant total net farm income and "creeping" general price inflation. Prices of farm family living items, for instance, rose at an average annual rate of 1.3 percent. There was pressure, therefore, to improve individual farm incomes through resource efficiencies and adjustments.

The drive for higher income usually entailed farm or enterprise enlargement, and this in turn often required purchase of new or improved machinery. Also, farm wage rates were rising at an average annual rate of 3.7 percent, providing additional incentive for making labor-saving adjustments. Unfortunately, prices of farm machinery and motor vehicles advanced by 2.7 percent annually during this period, considerably faster than the rise of prices in general. This unfavorable relative price trend of an input basic to the adjustment process had major implications for capital decisions and financing needs.

On the other hand, some other major categories of farm inputs became relatively less expensive during this fourteen-year period. Prices of building materials and of motor supplies, including fuel, rose at annual rates near 1 percent. Prices of fertilizer and feed remained virtually unchanged. Thus a particularly dramatic rise in fertilizer use occurred, while the stability of feed prices removed one element of uncertainty from the highly cyclical livestock sector.

This experience was followed by a period, dating roughly from 1967 to
1972, characterized by accelerated rates of price rise but with little change in the differentials among the rates of increase for major input groups. Average annual increases rose to 7.3 percent for farm wage rates and 5.4 percent for farm machinery and motor vehicles. However, the price of motor supplies increased only 2.6 percent annually, and feed and fertilizer prices rose relatively little. Thus, insofar as price relationships were concerned, the appropriate resource adjustments continued to resemble those of the preceding period. The principal exception was that prices of building materials rose sharply. Pressure for expansion of individual farm incomes continued as prices of family living items rose at an average annual rate of 4.5 percent.

From 1972 to 1974 the pace of general price inflation rose sharply and, significantly, the previous input price relationships were violently altered. Over this two-year period the high rate of general price inflation was illustrated by the average annual rise of 14 percent in prices of family living items. In contrast to previous experience, wage rates and machinery prices rose less rapidly—wages by 10 percent annually and farm machinery and motor vehicles by 11 percent. But motor supplies, including fuel, rose at an annual rate of 19 percent, as did building materials. Finally, prices of feed and fertilizer—previously relatively stable—nearly doubled, exhibiting average annual increases of 33 percent and 38 percent, respectively.

Farm output prices initially led this period of rapid price inflation, and during this phase expansion of output took precedence over adjustment to changing input price relationships. But when livestock prices moved sharply downward after August 1973 while prices of feed continued upward, a brutal adjustment with severe financial implications rapidly ensued among livestock farmers. Cotton producers were next affected as cotton prices fell during 1974 while prices of fuel, fertilizer, and other inputs rose. By early 1975 farm income was being severely squeezed by a general decline in output prices; however, these prices soon staged significant recoveries and remained at generally profitable levels into 1976.

The financial implications of swings in farm input and output prices have seldom been more vividly demonstrated than by the experience of cattle feeders during 1973-74, and this should prove a fertile field for future studies. Over the entire postwar period feeder livestock prices were by far the most volatile and cyclical of major farm input prices. With feed prices relatively stable the swings of feeder livestock prices were magnifications of the fluctuations in slaughter livestock prices. Thus, as fat cattle prices rose strongly in the spring and summer of 1973, feeder cattle prices were bid up to extraordinary levels. In a final display of speculative euphoria, many feeders filled their lots in anticipation of still higher prices after the expiration of retail price controls in September, despite USDA analyses questioning such expectations.
The bubble burst as fat cattle prices began a prolonged decline, and these cattle feeders took large capital losses on the initial weight of the animals they had purchased earlier. To compound their dilemma, feed prices rose and they experienced operating losses as well. Scofield (250) estimated that cumulative losses of $1.7 billion were experienced by year-end 1974 in an industry that had started the year with an investment of $6.5 billion in livestock and feed. Some foreclosures and bankruptcies have occurred. Most outside investors have reportedly lost their investment and retired from the field. Many livestock producers are refinancing their short-term loans into long-term mortgage debt. The Congress in July 1974 passed the Emergency Livestock Credit Act of 1974, providing for loan guarantees by the Farmers Home Administration. Numerous popular descriptions of these events were published, but they are not as yet reflected in the analytical literature.

Earlier in the postwar period, when government programs attempted to maintain farm income, several studies examined their impact on returns to resource owners. For example, Seagraves (254) found that during the period 1953 to 1962 over 40 percent of the total revenue received from tobacco production was attributable to the tobacco allotment. Government programs that reduced the risk of farm ownership were found to increase the value of—and thereby reduce the rate of return on—the land resource.

Farm Consolidation

The trend toward increasing farm size and consolidation resulted in considerable research on financing implications. On the micro level one innovative approach was tried by Lindsey, who selected three representative low-income farm situations and then worked intensively with the operators and their credit institutions to develop viable commercial farms (183). He concluded that with adequate credit and farm management assistance these families could receive personal income comparable to their potential earnings in nonfarm work. However, the families were faced with continual reorganization of their farms due to a persistent cost-price squeeze and new technological developments. He found that the amount of credit which existing agencies were prepared to extend to typical low-income families of North Carolina fell far short of that required to provide those families with adequate reorganizational capacity.

In a more recent study Benson and Brake (33) examined some of the problems dairy farmers faced in expanding their operations. The study concluded that debt maturities were often too short. Again, many lenders were not prepared to make sufficiently large loans to complete expansion plans. Real estate lending limits were unreasonably low. Still, the trend toward larger farms became well established in spite of such obstacles.
Other implications of this trend have been noted. Wirth and Rogers [296] concluded that significantly fewer, but larger, farms could meet United States food and fiber needs rather effectively. Brake [56], after calculating the equity that farmers might hope to accumulate over a working lifetime, hypothesized that the larger units among future farms would necessarily tend to involve partnership and corporate forms of organization. At the American Agricultural Economics Association meeting in 1970 Krause and Kyle [175] raised a number of questions concerning research needs and public policy in an agriculture increasingly dominated by large farms. And the association's Committee on Economic Statistics [3] concluded thus: "Technological change has led to a major reorganization of the production and marketing processes for food and fiber . . . processing and marketing functions formerly performed on farms [have] been spun off . . . inputs previously produced on farms . . . are now produced off farm. This has blurred the boundary and meaning of the farm sector and leaves behind some myths which we honor through continued statistical use." In short, recent literature has suggested that changes in the size and scope of farms have numerous implications that research in finance needs to recognize and examine.

Analysis of Land Prices

LAND PRICE TRENDS

Considerable research has been devoted to analysis of rising land values over the postwar period. Much of this research has been done by USDA personnel responsible for Farm Real Estate Market Developments, periodically published by the USDA. The real estate market group has continuously gathered and analyzed data on trends in farm real estate prices and related factors and is the source of the land price data used by most other workers.

At the close of World War II and again during the Marshall Plan and Korean War years, many agricultural economists feared the future consequences of ongoing land price increases. Typical was the alarm expressed by Nowell [220] that land prices were rising too fast relative to probable postwar income. Wall [290] and Larsen [180] also expressed concern over the ongoing increases but pointed out that prices were not yet very far out of line.

Land prices continued upward in the early 1950s but fell in 1953 as farm income declined. In 1954 they resumed an upward climb which has continued to date. Renshaw in 1957 [241] published regression results demonstrating that variations in prices of farmland between 1920 and 1953 could be explained largely by gross income, interest rates, and a time trend. He noted, however, that the rise in land prices between 1954 and 1956 was significantly above his projections and suggested that some structural changes had occurred in factors affecting prices.
Scofield in 1957 [251] reported that the resumed upward trend in 1954 was so unexpected, in view of the decline in net farm income, that USDA researchers had actually reviewed their survey procedures for possible bias. His explanation of the upward land price trend, which became the basic model for subsequent work, included the strong demand for land for nonagricultural uses, the technological changes resulting in strong demands for land to enlarge existing farms, the capitalization of farm program benefits into land prices, the ample supply of credit available to finance land purchases, and expectations of continued future appreciation of farmland. Later Scofield [248] reported that his estimates of imputed returns to land had continued to increase through the late 1950s and early 1960s.

Nevertheless, the divergence between farm income and farmland prices continued to be regarded as a paradox, which stimulated considerable research in the mid-1960s. Chryst [80] in 1965 hypothesized that the joint effect of technological advance and price and income supports decreases unit costs without comparable decreases in product prices, thereby raising the income that accrues to fixed factors. Herdt and Cochrane [136] also argued for the importance of the joint impact of technological change and price supports. Utilizing a simultaneous equations supply-demand model, they found a productivity index to be most important in explaining land prices.

Heady and Tweeten [132] found that farmland prices were related to size of farm (the primary influence), income, and the yield on common stocks. Their negative time-trend coefficient suggested that technological advance in and of itself decreased the value of farmland, thus supporting the hypothesis that price supports were a vital joint factor in its influence.

In 1966 Tweeten and his colleagues [274, 275] examined influences on farmland prices from 1950 to 1963. They concluded that 52 percent of the demand pressures were due to the combined factors of farm enlargement and government programs, 20 percent resulted from nonfarm demand, and 17 percent were related to expectations of further gains in real estate prices. The remainder was attributed to the reduction in the quantity of farmland. In 1969 Reynolds and Timmons [243] explained much of the variation in farmland prices between 1933 and 1965 with these variables: number of voluntary transfers, government payments for land diversion, conservation payments, expected capital gains, farm enlargement, the inverse of the rate of return on common stock, and expected net farm income.

Montgomery and Tarbet [203] presented data from the northwestern wheat-pea region supporting Scofield's hypothesis [248] that the effective demand for land came from successful farmers with above-average rates of return that allowed them to outbid the average operator. They also found that most of the successful buyers in their survey planned to operate their newly
added acreage with their existing equipment—an interesting insight into the nature of the pressure for farm enlargement.

In some cases the effects of government programs were dominant. Hedrick [133] and Seagraves [254] found that peanut and tobacco allotments greatly increased the value of farmland. After a broader review of the capitalization of farm program benefits Reinsel and Krenz [239] estimated that in 1970 the capitalized value represented 8 percent of the market value of farm real estate nationally and as much as 33 percent in North Carolina and 19 percent in Kentucky and North Dakota.

The impact of federal income tax policies was also studied. Dean and Carter [88] observed that farmland in some areas could be priced above its agricultural value because investors in high tax brackets could afford to pay a higher price per acre. After budgeting financial flows and returns for cattle ranches, however, Martin and Gatz [190] concluded that ranches could not typically provide tax shelters large enough to affect greatly the general level of ranch prices. In contrast, they noted, typical investors in land development projects such as young citrus orchards would obtain tax savings, and this fact would tend to affect the general price level of such real estate.

Cross-sectional analyses have also been used in attempts to explain variation in land prices among states or within a given state. Using state data Reynolds and Timmons [243] found that positive effects on land values were exerted by expected net farm income, government payments for land diversion, conservation payments, expected capital gains, farm enlargement, non-farm population density, technological advance, and the ratio of debt to equity. Negative effects were exerted by voluntary transfers of farmland, the capitalization rate, and the expected ratio of farm to nonfarm earnings.

Hammill [122] explained 90 percent of the variation in land prices among Minnesota counties by using the percentage of cropland, a crop productivity index, and the distance from urban centers as the main explanatory variables. Blase and Hesemann [38] found productivity to be most important in explaining variation in farmland prices within Missouri.

These studies and others have contributed much to the understanding of land price trends and variations. Recent work and events, however, continue to raise new issues.

In a time-series study Klinefelter [174] examined changes in the value of Illinois farmland from 1951 to 1970. Net returns, average farm size, number of transfers, and expected capital gains explained 97 percent of variation, with enlargement and expected capital gains exerting the more significant effects. This result suggests that expected capital gains are becoming a more important influence and illustrates the need for continual updating of such studies.
Reinsel [238] recently reported that the relationship between land values and rents (that is, the capitalization rate) had been relatively constant since 1940 in two relatively stable farming areas—Illinois and North Dakota—whereas it had increased markedly in two other states—Mississippi and New Jersey—in which dramatic structural changes in land use and tenure had occurred. These data imply a need for regional disaggregation in studies of the factors shaping land price trends.

Previously, Reinsel [236] had more generally questioned the ability of the national land price series to support the complex models that others had constructed, in view of its high correlation with fundamental economic factors. He dramatized his point by showing that the money supply and population—hypothesized as the basic forces behind general price inflation and the demand for farm products and land—explain 99 percent of the variation between 1947 and 1970 in the United States index of farm real estate prices.

Although some economists have speculated that liberalized credit arrangements tend to increase land prices, Engberg [96] in 1947 argued that the effect of the federal credit agencies had been to keep prices more nearly in line with long-run earning capacity of farms and to minimize the effects of short-term fluctuations in farm income. Perhaps Engberg's comments are outdated now that federal land banks may lend up to 85 percent of appraised market value. Secondly, the variable interest rate charged by the federal land banks lags when market rates of interest are rising, making their farm mortgage loans a relative bargain at such times. These new influences need to be studied. The impact of increased seller financing also warrants more attention.

As a result of the continued trend toward higher values per acre of farmland, Hill and Staniforth [148] suggested the need to experiment with adjustments in livestock-share leases to better reflect earnings and resources. They argued that 30-70 or 40-60 share leases might be more appropriate than the traditional 50-50 livestock-share lease.

Perhaps the only attention to supply of and demand for new land development was by Hoover [150]. He noted that policy errors could result from assuming, incorrectly, that the supply of farmland cannot be increased through development. With the level of demand for new land readily observed as the current market price for farmland, he suggested that a single-equation model could focus on the supply factors. Empirical work on these relationships would appear useful.

**IMPLICATIONS FOR FINANCE**

The persistent rise in farm real estate values had significant implications for virtually the entire spectrum of topics covered in this review—getting started in farming, financial progress of the farm firm, real wealth position of
operators, aggregate capital and credit flows, and performance and adequacy of financing institutions, to name but a few.

At this point it is worth noting, however, that increases in farmland prices affect capital flows and the demand for credit mainly at the time land is transferred. The annual transfer rate of farm real estate, though basically determined by the productive life-span of farm operators, has fluctuated markedly with changes in agricultural income and credit conditions. In the year ending March 1, 1971, for instance, voluntary and estate sales of ten or more acres totaled 19.9 million acres valued at $5.1 billion, with credit financing of $3.2 billion. In contrast, three years later such transfers involved 41.8 million acres, a market value of $14.2 billion, and loans totaling $9.3 billion. Reynolds and Timmons [243] found that the annual number of farmland transfers during the period 1933-65 was affected by the debt-equity ratio, farm-to-nonfarm-earnings ratio, farm enlargement, expected capital gains, and technological advances.

The trend to higher land prices has been accompanied by a trend toward greater use of credit in land transfers. Annual surveys by the USDA, reported in Farm Real Estate Market Developments, show that the proportion of transfers on which debt was incurred rose from 43 percent in 1945 to 87 percent in 1975. Furthermore, among the credit-financed transfers the average ratio of the debt to the purchase price rose from 56 percent to 76 percent over the same time span. In fact, a Michigan study [85] found that over 40 percent of the farmers purchasing real estate had used 100 percent credit. Many had mortgaged part of their existing farms to avoid cash down payments.

Real Wealth Effects of Price Changes

With relative changes over time in farm production resource prices and other prices, writers began to ask how farmers were affected. Grove [119] pointed out that capital gains are important in assessing the welfare of farmers. He estimated nominal capital gains to be about 43 percent as large as average annual income during the period 1940-59.

Hoover [151] followed with a discussion of the importance, in many analytical uses, of adjusting the nominal capital gains for changes in the purchasing power of both investments in farm assets and holdings of financial assets and liabilities. His empirical analysis suggested that real capital gains on all farmer-owned assets were equal to about 2 percent of farmers’ total income from all sources during the 1940s and to about 10 percent of such income in the 1950s. The relative importance of real gains was thus far below that of the nominal gains during this period of general price inflation.

Boyne [54] at about the same time undertook a detailed study of capital
gains of farm operators between 1940 and 1959. He found that while farmers had experienced real capital losses on their financial assets and liabilities because of their net creditor position from 1943 to 1958, their per-capita losses were substantially less than those of nonfarmers, who as a group held a relatively larger net creditor position (the federal government held the net debtor position vis-à-vis these two private sectors). However, farmers gained substantially on their nonfinancial assets, resulting in total real capital gains over the period equal to 7.5 percent of operators’ net farm income. The real wealth gain varied substantially within this time period — from a real loss equal to 7.0 percent of income in 1945-49 to a real gain equal to 27.3 percent of income in 1955-59 — and also by geographic region.

Huff and MacAulay [157] in a follow-up pointed out the importance of examining capital gains on a regional or individual component basis, not only to improve the results but to make the data more usable for policy purposes. The estimates of real gains were updated through 1968 by Bhatia [34]. Between 1947 and 1968 total real capital gains in the farming sector were estimated at $99 billion, of which $88 billion came from farm real estate. Significantly, with financial liabilities becoming substantially greater than financial assets during the 1960s, net real capital gains of $4.5 billion were derived from this source, in contrast to the loss found by Boyne between 1940 and 1959. Also during the 1960s real estate began to yield more substantial and stable capital gains than it had from year to year in the preceding two decades. Consequently, real capital gains were obtained annually during the period 1961-68 in amounts that had previously been seen in only a few scattered years — 1950, 1956, and 1958.

No research publications have yet computed and analyzed the real capital gains of the early 1970s, a period in which the nominal gains considerably exceeded net farm income. The results should be interesting, if only for the sheer magnitude of the numbers involved. In 1973 — apparently the year of greatest gains — Balance Sheet asset increases less net capital formation indicate nominal capital gains on the order of $82.5 billion, or about $29,000 per farm! However, the price index for farm family living expenditures rose by 16.2 percent, resulting in a purchasing power loss of $58.5 billion on total investment in farm assets. The same price inflation, however, yielded $10.6 billion in real capital gains on the outstanding farm debt. Summing these results, total real capital gains were $34.6 billion, equal to 89 percent of total net farm income (including landlord rentals) of $38.8 billion. In contrast, nominal capital gains were 213 percent of such income. Then in 1974 nominal capital gains of $41.8 billion were not large enough to offset the purchasing power loss resulting from continued inflation, so that the sector experienced a real capital loss of $17.3 billion. These fascinating figures are the product of
A period of rapid price inflation. The effects of such "paper" gains and losses on farmers' financial behavior — on money illusion, attitudes toward debt, and so forth — may be interesting and important.

In a slightly different context Carlin and Reinsel [74] combined income and wealth when analyzing family well-being in 1966. On this basis the distribution of farm families by well-being was substantially improved in comparison with that of all United States families, since farm families had about double the net worth of the national average. The authors pointed out, however, that older farm families with low incomes and substantial net worths face serious problems in transforming their wealth into cash flows.

**Capital Flows and Their Financing**

Studies of capital needs of farm units have for the most part dealt with the amount of assets required — the value of the machinery, real estate, and working capital. These are particularly useful in examining problems related to transfer, such as capital gains and inheritance taxes, and problems that beginning farmers have in acquiring control over a viable farming unit. However, in studying the growth of a farm firm and the acquisition and financing of capital investments one turns to cash-flow budgeting. Analogously, in studying aggregate investment and its financing, the flows of funds rather than the stocks of goods are the appropriate variables to measure and analyze.

**Flow-of-Funds Accounts**

In discussing the uses and limitations of the relatively new Balance Sheet of Agriculture, Burroughs [71] in 1950 wrote: "Thus a bridge is needed to articulate the BSA and the income statements for agriculture. This bridge is an accounting for money flows and other capital transactions. Some work has been done . . . but much pioneer work remains."

As in many investigations much of the initial work consisted of developing the concepts and constructing appropriate data series. Tostlebe [268] performed this monumental job for five-year intervals from 1900 to 1949, defining and measuring the categories of capital formation (uses of funds) and the sources supplying the funds to finance that total flow. Then, having measured the total uses of funds, the amount financed by increase in debt, and — as a residual — the amount financed internally, he was able to make interesting observations about the levels of, and trends and cycles in, such analytical ratios as the ratio of capital formation to farm income and the proportion of capital formation financed by debt. Diesslin's book review [89] highlighted the flow-of-funds segment of Tostlebe's work (which was somewhat buried in the last chapter) and its implications:
The source of gross funds for replacement and additions to physical capital and working cash is one of the interesting and important findings of the study. "Internal" financing, largely from gross farm income, was the major source and exceeded 70 per cent in every decade except one since 1900. More importantly, a trend toward more internal financing continues, totaling over 90 per cent for the 1940-49 decade. The great bulk of our teaching, research, and extension activities in the field of farm finance is directed to sources, procedures, and techniques of agricultural credit and lending institutions. Our activity has been concentrated on the external sources which provide only 10-20 per cent of the total funds for maintaining and increasing the capital plant in agriculture. The findings of this study are sufficiently significant that we could well afford to re-evaluate our emphasis in the farm capital picture. Certainly, greatly increased emphasis needs to be given to the internal financing of the agricultural plant.

Diesslin's last comment overstates the case, in that the large gross flows of credit extended and repaid during the year are not represented in the ratios that he quotes. On the other hand, as D. G. Johnson [166] noted later, some of the net increases in debt were employed to make purchases of real estate that are not included in capital formation and so, on the net basis shown, the indicated relative importance of debt might actually have been biased upward.


In 1960 the Commission on Money and Credit, sponsored by the Committee for Economic Development to undertake a wide-ranging review of United States monetary policies and institutions, obtained a detailed study from D. G. Johnson on "Agricultural Credit, Capital and Credit Policy in the United States" [166]. Johnson found he could readily update Tostlebe's accounts from data published annually in The Farm Income Situation and The Balance Sheet of Agriculture and did so through 1958. He discovered that the downward trend in relative use of credit in financing capital formation had been broken during the 1950s and that by the period 1955-58 the sum of depreciation allowances and the increase in debt had in fact exceeded capital formation. In the first half century this situation had occurred only during farm depressions. Johnson, worried about the adequacy of his data, took a cautious approach toward this finding. However, Melichar [195] later noted, "it is now evident that Johnson's data for 1955-58 were reflecting an ongoing
major change in farmers' financial behavior, toward a lower savings rate and more use of credit."

The USDA did not incorporate the new flow-of-funds accounts into its ongoing work. Had this approach been taken, perhaps the financial outlook work of the USDA would soon have been cast in this useful analytical framework. In that event a systematic effort to develop estimators for all flow-of-funds components might have been made by the mid-1960s, when substantial but uncoordinated econometric work on individual components was being undertaken elsewhere. The USDA eventually took both steps, which were first reflected in its outlook literature for 1974 [278].

The interest of the USDA was not kindled until Bobst [43] and Irwin, Lins, and Penson [163] proposed that a flow-of-funds social account for the farm sector could serve as a framework within which to examine financial aspects of policy questions. They noted that the Federal Reserve Board was already maintaining a highly aggregated account showing capital and net credit flows. If disaggregated by various classes of farms, for example, such an account could indicate the distributional impact of changes in credit policies or availability.

Penson, Lins, and Irwin initiated a USDA project to construct a flow-of-funds account and model. In 1971 [227] they noted that the definitions of several components of the Federal Reserve farm sector account differed from those of similar components of USDA asset and income accounts and that the Federal Reserve account also ignored internal noncash flows such as capital appreciation. They therefore proposed an alternative account that would include, for example, appreciation as both a source and use of funds and that would be consistent with the USDA Balance Sheet and farm income accounts. While in basic agreement with their goals, Brake and Barry [65] suggested that several additional flows should be entered, that flows should be entered on a gross basis, and that uses of funds should be limited to actual purchases. A reply [228] defended the inclusion of noncash items as consistent with social accounts for other sectors. In another reaction Melichar [195] also argued that real estate flows should be represented by actual purchases rather than by capital appreciation, and in addition he pointed out the close relationship of the new work to the previous analyses by Tostlebe and Johnson. The account eventually published by the USDA [278] reflected several elements of these discussions.

Flow-of-Funds Models

In 1966 Brake [62] used flow-of-funds concepts and the internal-external financing dichotomy as a means of obtaining a projection of increases in farm debt to 1980. In the real estate area Brake made a judgmental projection of
funds to be required by farm transfers and then subtracted a judgmental projection of internal financing to estimate the required increase in mortgage debt. In the non-real estate area, he emphasized that the turnover (flow) of capital had to be considered in projecting future debt, but he did not specify the derivation of his estimate. His dramatic projection of an even $100 billion in outstanding debt in 1980 was widely publicized and served to alert lenders and others to the logical case for continued large increases in farm loan demands over a protracted period. As it turns out, the $100 billion debt level that startled many observers in 1966 (when farm debt totaled $39 billion) will be reached somewhat earlier, probably in 1977, largely because asset and input prices have recently risen faster than Brake assumed.

Melichar and Doll in 1969 [198] revived the Tostlebe flows account as the appropriate vehicle to employ in measuring past capital requirements and seeking insight into credit trends. They updated the capital formation series through 1968 and incorporated the new USDA series showing the annual value of farm real estate transfers. Debt was found to have provided 37 percent of total sources of funds between 1965 and 1968, compared with 13 percent in the early 1950s. The proportion of cash flow that farmers devoted to financing the capital flow had fallen during the 1950s and in the next decade fluctuated around its new lower level.

Melichar and Doll also exploited the flow-of-funds framework more fully as a vehicle for projecting increases in debt. Using three projections of 1980 capital stocks made, respectively, by Heady and Tweeten [132], Heady and Mayer [131], and Brake [62], they estimated the capital formation and value of farm transfers that were implied (making additional assumptions as necessary). They next projected the amount of internal financing by estimating future cash flow—the sum of net income and depreciation allowances—and then assuming that the proportion of this flow devoted to meeting capital needs would remain at recent levels. The projected increase in debt was thus obtained as the residual difference between these projections of capital flow and internal financing. The debt implied for 1980 by the three alternative models ranged from $91 billion to $137 billion.

In a continuation of this approach Melichar in 1973 [196] estimated structural or trend equations for each of the uses of funds, based mostly on the 1950-71 experience, and used the results to make long-term projections of capital flows and debt. The capital flow to be financed, which had averaged $7 billion in the 1950s, rose to around $11 billion in the late 1960s and was projected to rise further to $17 billion by 1980. Outstanding debt in 1980 was projected at $110 billion, assuming general price inflation of 2.5 percent annually during the 1970s. Melichar also demonstrated the use of the model
to simulate the impact of different assumptions about variables such as price inflation.

In the early 1970s the USDA flow-of-funds project turned to the development of estimators for each of the components of a national flow-of-funds account, to be used to simulate hypothetical events or policy changes and to project capital and credit flows. Penson [226] and Lins [185] reported on segments of the work as it progressed, and in 1973 Lins [186] reported a simulation model in which the credit flows were highly disaggregated by lender groups. Also in 1973 Penson [225] completed the Aggregative Income and Wealth (AIW) Simulator, a model emphasizing the simultaneous determination of the year-end portfolio balance and corresponding flows for capital formation and other uses. With subsequent modifications, such as adoption of the real estate transfer approach urged by Melichar [195], the AIW Simulator was employed in making the USDA capital and credit outlook projections for 1974 and again for 1975 [278, 279]. The outlook statement also took on a flow-of-funds orientation useful in arriving at and conveying insights into farm financial developments and projections.

Much further work and many challenges remain in this area of macro-finance studies. The AIW Simulator could be enhanced by disaggregating the flow of loan funds by source. Linkage with a national econometric model is also being considered. To maintain the usefulness of the AIW Simulator over time, continual attention must be given to the validity of its estimators in the light of ongoing theoretical developments or structural changes. Importantly, the major estimators should also be reworked by analysts with varying viewpoints or approaches. The current situation is analogous to that existing when the first national econometric model was constructed. As in that field, the development of alternative equations and models will improve insights and projections and should stimulate lively discussions in the literature.

Demand for Non-Real Estate Assets

Studies investigating the aggregate demand for one or more farm assets began to appear in the late 1950s. In 1959 Cromarty [86] estimated demand for tractors, for trucks, and for all farm machinery. Machinery purchases during the period 1923-54 were found to have been influenced mainly by changes in machinery prices, farm output prices, total farm assets, and net farm income, all deflated by a general price index. In the separate tractor and truck equations, replacement-rate variables were also significant. Also in 1959 Griliches [117] employed a stock-adjustment model in studying the demand for tractors, which was found to be affected by the real price of tractors and the rate of interest. The short-run response elasticities were relatively low, but
long-run elasticities were high. In 1966 Fox [107] used tractor horsepower as a more refined measure of purchases and found it to be related to the number of farms, the average age of existing tractors, and the ratio of tractor prices to farm output prices.

In 1968 Rayner and Cowling [233] reviewed the studies of United States demand and noted that the dominant variable was the ratio of tractor to crop prices, whereas the ratio of tractor prices to wage rates was relatively unimportant or did not have the hypothesized sign. In contrast, their work in the United Kingdom had indicated that the latter ratio was the dominant influence in that country and, further, that changes in farm size were not influential whereas they had been found to be significant in the United States.

Heady and Tweeten in 1963 [132] published a comprehensive set of demand functions. For machinery and tractors their results and elasticities paralleled those of Cromarty and Griliches. They also estimated the demand for all production assets, which was found to be related to net income, farm output, weather, and a time trend. Using these results and incorporating assumptions about future trends in the explanatory variables, farm sizes, numbers, assets, and total production were projected to 1980. The relative success of these projections to date is mixed. Some remain on target at this point while others, such as the machinery projection, are obviously far off the mark.

Demand for other farm assets was also studied. Penson [226] produced simultaneous-equations estimates of the demand for financial assets in a portfolio balance setting. Scott and Heady [252] found investment in buildings most strongly related to changes in physical output and also influenced by net income, interest rates, the equity ratio, and size of farms. In an interesting exchange with implications for all quantitative studies, Grove [118] questioned the ability of the USDA building investment series to support such investigations, as the series was not based on measures of current expenditures but rather was estimated annually using a hypothesized relationship to past net income. In response, Scott and Heady [253] pointed out the responsibility of the USDA to publish complete and updated information on its estimation procedures. Implicitly, this exchange also dramatized the need for independent annual measurement of the components of capital formation and debt to support further analytical studies.

Demand for Credit

One significant point that emerged from the flow-of-funds and asset demand studies is that, perhaps contrary to popular impression, the rate of real capital formation in agriculture had been relatively low since the early 1950s. Over the postwar period growth in real estate stock had slowed to virtually
zero, real cash balances were falling, and physical stocks of livestock and ma­
chinery, while highly cyclical, on balance showed only moderate growth. Thus the observed rapid growth in farm loan demands could not be ascribed to a high rate of physical expansion. Rather, as noted by Brimmer [68], the important factors were inflation in land and machinery prices plus the impact of farm reorganization and enlargement. In the latter process, existing farmers were raising funds to buy out nonfarm heirs and other farmers who were leaving the farm sector. More recently, in 1973, 1974, and 1975, demand for loans was also stimulated by unusually large increases in the prices of annual operating inputs.

Early supply-demand studies of farm mortgage loans were performed by Hesser and Schuh [144, 145]. Over the period 1921-59 both supply and de­
mand were elastic with respect to mortgage interest rates. Demand also varied inversely with technological advance and the availability of internal funds and directly with changes in farm wage rates — the latter effect presumably reflect­
ing the substitution of capital for labor.

Lins [185] extended such work by estimating separate supply-demand relationships for each of five major lender groups during 1947-69. The net change in real estate debt, especially from federal land banks and life insurance companies, was found to be more sensitive to changes in farm income than to changes in the value of capital assets. Debt changes were also related to changes in repayment ability, as measured by the ratio of money balances to production expenses.

Herr [140] formulated a model relating change in non-real estate debt to changes in farm cash expenditures and to the availability of internal funds, with the latter variable measured as the ratio of cash expenditures to cash re­
cipts. Debt changes during the period 1949-65 were rather successfully ex­
plained by these factors, both by regions and in the United States as a whole. Lins [186] extended this work by separately examining debt changes at pro­
duction credit associations and at commercial banks and by examining the in­
fluence of other factors, including the interest rates charged. However, the most significant factors — especially in the demand for bank loans — continued to be those proposed by Herr.

The flow-of-funds models discussed earlier [62, 196, 225] also incorporat­
ed procedures for estimating credit demand. These reflect two alternative ap­
proaches to projecting the relative contributions of credit and other sources to the total funds raised. Penson [225] employed estimators for credit de­
mand, and thus internal financing constituted the residual supplier of funds. Melichar [196] projected internal financing, with the amount of credit derived residually. If the respective equations were "correctly" specified, the two ap­
proaches would yield the same result. However, so many diverse influences
appear likely to be affecting the multiple sources of funds that future work may find a simultaneous subsystem desirable. In fact, the AIW Simulator already incorporates elements of a simultaneous system. To support such work, additional data series based on direct measurements of noncredit sources of funds are needed. This need was particularly demonstrated in Brake's fund-flows model of Canadian agriculture [61], which went further than any of the United States studies in attempting to measure and project various components of noncredit fund inflows. Improved data on credit from noninstitutional sources are also needed to support meaningful disaggregated analyses of total credit flows.

The flow-of-funds context is helping to focus attention on factors in credit demand and use which were not so easily visualized in the past. For example, Benjamin [31], after calculating that scheduled principal and interest payments on farm debt might approach $65 billion in 1974 and perhaps exceed $70 billion in 1975, noted that these debt service requirements seemed large relative to cash receipts from sales of farm products, which were under $100 billion in 1974. The apparent aggregate exposure to risk in the event of a significant decline in farm output prices may be a limiting factor in future credit demand or may even be indicative of future problems; however, adequate historical and other evaluations of these data have not been made. Working along similar lines, Robison, Barry, and Hopkin [244] found increasing ratios of debt repayments to gross farm income in Texas agriculture. In many years since 1962 repayments appeared to exceed gross income, necessarily implying significant loan carryovers and a build-up in outstanding debt.

A substantial amount of research has examined the credit demands of special groups such as low-equity farmers, young or beginning farmers, and rural nonfarm borrowers. For example, surveys made in 1956 indicated that borrowers from the Farmers Home Administration formed one such group, being generally younger and less wealthy than borrowers from commercial banks and production credit associations [36]. Hathaway [129] concluded that their Farmers Home Administration loans, with terms more favorable than those offered by other lenders, were responsive to their special credit needs. Herr [139] came to similar conclusions after studying data for 1966.

Throughout the postwar period there has been concern for the credit needs of young and beginning farmers. Some research indicated that lack of credit was not a major problem for this group [257], but more papers argued otherwise. Typically the latter felt that lenders' loan offerings had not kept pace with the rapidly increasing amounts of capital required to begin farming. In general, such research did not deal with the explicit question of whether more or less credit should be available to beginning farmers. Similarly, studies that examined rural nonfarm credit needs also generally focused on the ade-
quacy and fairness of lenders' response to felt needs, rather than on the measurement and evaluation of the effective credit demands.

**Credit Institutions and Policies**

Sources and Operating Procedures

Many studies have described the institutions comprising the credit system in the United States. Typically these studies have been concerned with telling farmers about the organization, operating procedures, and lending criteria of financial institutions in their state. For example, in a bulletin addressed to farmers in Montana, Bostwick, Esmay, and Rodewald [48] discussed the nature of credit, the sources of credit, lender attitudes, and factors affecting the use of credit. Similar publications have been issued in many other states.

Some credit publications were more narrowly focused. For instance, Spitze and Bevins [262] described the agricultural representative program in commercial banks in Tennessee. The functions of agricultural representatives included public relations as well as farm lending, at a cost to individual banks ranging from $4,000 to $10,000 in 1957. Other studies examined specific farm lending institutions. For example, numerous studies have summarized lending procedures and loan volume of production credit associations, commercial banks, the Farmers Home Administration, and other lending agencies. Pursell [232], as one example, described the nature and extent of rural credit unions state by state and throughout the United States.

Some information is frequently updated as credit conditions change. For instance, researchers in the Federal Reserve System continually analyze the farm lending operations of commercial banks — particularly through quarterly surveys in the Chicago [103] and Minneapolis [104] Federal Reserve districts. Since 1962 the American Bankers Association has also conducted and published annual national surveys of various aspects of farm lending by banks [4].

Another large group of studies analyzed national surveys of the characteristics of borrowers and outstanding loans at the major farm lending institutions. Loans at commercial banks were surveyed in 1947 [39], 1956 [41], and 1966 [193]. In 1956 and 1966 coordinated surveys also covered loans outstanding at life insurance companies [77, 230], federal land banks [35, 229], and the Farmers Home Administration [36, 137, 139]. Production credit associations were surveyed in those years and also in 1962 and 1971 [101]. Recently, new analytical possibilities were opened when the federal land banks consolidated information on their loans at the Farmbank Research and Information Service in Omaha. Ongoing analytical programs have already been enhanced [201].
In one of the studies utilizing the survey data Herr [137] found that new farm-ownership borrowers at the Farmers Home Administration were more likely to have been tenants, to be younger, and to have smaller businesses and lower equities than farmers as a whole. Although most borrowers ranked below average in such important features as assets, cash farm sales, and equity ratios, they did not comprise the weakest strata of the farm population or those least likely to develop viable farms. Refinancing of existing debts or buying farms constituted the most important purposes of farm-ownership loans in the North and West. Loans in the South went mainly for farm enlargement, but refinancing was also important.

The first comprehensive information on the role of merchant and dealer credit in agriculture was obtained in the 1960 Sample Survey of Agriculture and analyzed by Morelle, Hesser, and Melichar [204]. Three characteristics exhibited the more significant relationships to farmers' use of merchant-dealer credit: type of farm, size of farm, and age of operator. Dairy farmers, young operators, and operators of medium-sized or larger farms were most likely to be users of merchant-dealer credit, but among indebted operators the cotton and tobacco farmers and the older farmers tended to employ higher proportions of such credit. Among the users, small farms and farms in the South were least likely to use credit from other sources as well.

There are similar studies available describing credit institutions and operations in many other areas of the world. For example, Tablante [266] described the rural agricultural credit system in the Philippines. Among the characteristics and problems he stressed were the importance of the noninstitutional credit market, high rates of interest, the use of loans for consumption purposes, and the lack of savings in rural areas. He concluded that more extensive use of supervised credit might be the answer to some of the credit problems in the rural Philippines. Oluwasanmi and Alao [222] described the rural agricultural credit system in Nigeria in much the same vein. After describing the agricultural credit institutions in the country, the authors stressed that non-repayment of loans and misdirection of many loans to nonfarmers were major difficulties with Nigerian credit arrangements. Hendry [135] described credit and savings among a hundred households in a rural area in Vietnam. He found that informal sources of credit were very important and that much of the credit was used to cover farm operating expenses. He also reported that informal rotating credit associations were providing credit to households. Ardener [8] discussed how local rotating credit associations are important in mobilizing savings to provide credit to rural inhabitants in much of the world.

Many studies of credit institutions of various countries have been published, but perhaps the most extensive assembly of materials came from the Agency for International Development in its Spring Review of Small Farmer Credit...
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[284, 285], which resulted in twenty-one volumes describing and analyzing credit institutions and programs throughout the world. In addition, a recent Organisation for Economic Co-operation and Development report [223] provides such information for many member nations.

Interest Rates

Interest rates, credit terms, and factors affecting interest rates have been the subject of considerable study. Such studies fall into several categories. One type of publication typically presents interest rate concepts and formulas for calculating interest rates in different situations. Examples include Botts [52], Brake [63], and Gilson [114]. Numerous informational publications have also dealt with the calculation of interest rates including rates on installment loans. However, as Brake pointed out, typically the terminology in these publications has not been consistent with the terminology used in mathematics of finance, with some confusion resulting.

Another line of inquiry has dealt with factors affecting interest rates. Long [187] tested the hypothesis that high interest rates were evidence of monopoly forces at work. He concluded that, rather than evidence of monopoly influences, high interest rates can often be adequately explained by competitive factors such as scarce capital, high administrative costs, risk, production uncertainties, and seasonal credit demand.

Dahl [87] found the size of the loan to be the most important factor affecting interest rates paid by farmers on loans outstanding at fifteen Minnesota banks around 1960, as it had been in the Federal Reserve's national survey in 1956. But in examining rates on loans within each bank—an area which the Federal Reserve analyses had not explored—he also found evidence of rate discrimination among borrowers. He attributed this to a combination of factors, among them the tendency of bankers to lend to farmers they knew and the farmers' lack of information on alternative sources of credit. If, in addition, farmers do not discuss production loan terms with each other, he reasoned, bankers may be inclined to charge what the traffic will bear.

Bottomley [51] stated that the components of the rate of interest in underdeveloped rural areas are (1) the opportunity cost of the lender's loan funds, (2) the administration charge, (3) the premium for risk, and (4) any monopoly profit. The key to lowering rates charged by rural moneylenders, he therefore reasoned, is to build up the value of farmers' collateral. In general, the greater a farmer's collateral the greater his borrowing and the lower the risk to the lender. Thus both the unit administration cost on loans and the lender's premium for risk are reduced. The reduction in risk also gives farmers access to the low-interest urban money market, which tends to elimi-
nate whatever monopoly profit the rural moneylenders had been able to obtain.

Following up on the policy implications of this reasoning, Bottomley [49] suggested that the opportunity cost of seasonal lending by village moneylenders could be reduced by providing short-term government securities in which they could profitably invest their funds during the off-season. In addition, this cost might be lowered by making the discounting facilities of the organized credit market more accessible through improvements in collateral instruments and associated institutional arrangements. He also argued [50] that a significant part of the interest rate is the charge for the risk of nonrepayment, which is best reduced by increasing the overall productivity of farmers. Though Bottomley's model and policy conclusions were presented in the context of underdeveloped nations, they appear more generally useful to those who seek to increase the amount and reduce the cost of loan funds in rural areas.

Adams [1] discussed the pricing of funds channeled into agricultural credit by aid agencies in Latin America. He argued that such credit had been priced too low, leading to misallocation of these funds, and that interest rates should therefore be raised to levels that reflect the opportunity costs of capital in rural areas. This step, he felt, would encourage the development of local financial markets, raise the yield on rural savings, and increase the proportion of agricultural loans made from such savings. Realistic prices on agricultural credit would also bring into sharper focus the major constraints slowing agricultural development, which he believed to be obscured by low-priced credit policies.

In a study of factors affecting farm loan interest rates in the United States during the period 1940-53, Jones and Garlock [171] found that the interest rate decreased as the size of loan increased and also as the term of loan increased. They concluded that the interest rates charged farmers paralleled the movement of interest rates in the nation's money markets.

More recently, Penson [225] found a statistically significant link between interest rates charged on new farm loans and interest yields on money-market securities. The specification of his model, which was patterned after the financial sector of the FRB-MIT national econometric model, permits analysis of the effects that changes in money market conditions have on the term structure of interest rates charged farm borrowers and subsequent demand for loan funds.

Relatively little research has focused on noninterest loan terms and conditions such as compensating balances, "points," and stock purchase requirements. A description of the extent of such practices and an analysis of their effects on credit costs would be useful.
Legal Aspects

Several studies examined legal aspects of credit institutions and policies. One important concern was farm-debtor relief policies. Munger and Feder [206] analyzed the impact of the Frazier-Lemke Act on farmers and lenders in the northern Great Plains. This act included farmer-debtor relief legislation (Section 75 of the federal bankruptcy laws), which was first proposed in 1933. They drew three main conclusions: (1) relatively few farmer-debtors availed themselves of the provisions of Section 75; (2) those who did were farmers who thought they had assets worth saving; (3) use of the act increased as general economic conditions began to improve in the late 1930s. Most farmers who petitioned under the act were in need of debt adjustment. In 82 percent of the cases debtors had an excess of liabilities over assets and could not meet their obligations. The direct use of Section 75 was not numerically significant, however. In only three states did the total number of petitions exceed one thousand between 1937 and 1949.

Even where Section 75 was used, there was little evidence that it reduced the chances of foreclosure. The original Section 75 provided only for voluntary conciliation. Hence, few settlements were reached. Many petitions were dismissed by unsympathetic district courts. Other debtors undoubtedly refrained from petitioning because they had scant hope of obtaining relief.

On the basis of his study Feder [102] offered several proposals to improve the effectiveness of relief programs: (1) a special credit fund for petitioners, which could be administered by an existing credit agency or preferably by an agency especially designed for that purpose; (2) redemption appraisals based on long-run farm earnings; (3) tenant-relief provisions that would freeze rental agreements; and (4) administration of the act by a federal conciliation office.

A great deal of attention was devoted to tenure and legal aspects of finance by members of the North Central Land Tenure Research Committee. For example, in 1950 they examined how land credit arrangements could be better adapted to variability in farm income [217]. After reviewing experiences in the 1930s with respect to credit problems, adjustments, and mortgage relief legislation, the committee suggested changes in contractual arrangements, new mortgage guarantees, and various adaptations of the credit structure to farming needs. It stated that, from the viewpoint of efficiency in production and general agricultural welfare, temporary delinquency in debt payments should not result in immediate foreclosure. Delinquency caused by forces clearly beyond the borrower's control should be handled differently from delinquency due to neglect or managerial incompetence of the borrower. Thus the committee believed that variable payment plans, deferments, exten-
ations, and similar measures could have alleviated some of the problems in the 1930s with far less economic and social disruption than was experienced.

Primarily from interest generated by the North Central Land Economics Research Committee, a number of studies in the early to mid-1960s dealt with low-equity transfers of farmland—particularly transfer by installment contracts [95, 125, 147, 177, 188]. These publications stressed that both buyers and sellers must fully understand their legal rights and responsibilities under a land purchase contract and also urged both parties to obtain competent legal advice in drawing up contracts tailored to their individual needs. Land contracts often provided low down payments for buyers while sellers minimized capital gains taxes, and thus their use increased.

Knowledge and Attitudes of Farmers

Farmers were generally found to lack knowledge of credit sources and terms [7, 87, 105, 263]. Studies in the early 1960s revealed that farmers often could not indicate the names, locations, and types of existing credit sources. Nor could they describe the types of loans these sources made or the interest rates that would be charged. In general, the better-educated and larger-volume farmers had a better knowledge of credit institutions than the poorly-educated or small-volume farmers had.

In addition, some studies noted overly conservative attitudes toward credit use. Hesser and Janssen [143] found that Indiana farmers in 1958 hesitated to use credit in instances where it would have been profitable to do so. In fact, such internal credit rationing was more important than external credit rationing. Yet, as reported by Anderson and Coulter [7], a substantial number of North Dakota farmers at about the same time could not obtain sufficient credit for their farming operations. Nearly half indicated they would substantially adjust their farming operations if additional credit were made available to them.

Evaluation of Institutions and Policies

Farm surveys have often provided assessments of financing practices. According to Wittwer [299], farmers in the 1950s commonly complained that both real estate and intermediate-term loans were typically written with too short a maturity. Also, Wirth and Brake [294] determined that many capital investments were being financed with short-term loans.

Neuman's study of financing practices in southern agriculture [215] found a need for reorganization into larger farming units, with the adjustment potential dependent upon managerial ability and financial position. He concluded that financing practices and lender attitudes in many areas impeded the rate of transition. Specific practices of concern were (1) obsolete rules of
thumb for determining loan limits, (2) unwillingness to finance enterprises new to the area, (3) capital loans with short maturities, and (4) piecemeal lending without attention to the total financial needs of the farm.

Another line of inquiry, already discussed in the section on firm growth models, was that taken by Baker and his colleagues at the University of Illinois. Credit terms and loan programs were evaluated not only from the standpoint of borrowers' demand but also in terms of lender preferences with regard to profit opportunities, risk, liquidity objectives, and other factors related to their economic environment. This approach provides considerable insight into the processes of financial intermediation.

Other studies have evaluated specific lending institutions or practices as opposed to financing practices of lenders in general. Many of these studies have focused on the Farmers Home Administration. Hendrix [134] noted that, in general, younger farm operators achieved greater increases in income and net worth than older operators while under the Farmers Home Administration program. The level of resources which borrowers commanded while in the program, rather than the amount they initially owned or used, was the crucial determinant of their income and financial progress. A sociological study by Hoffer, Boek, and Boek [149] revealed that families in the program had greater increases in level of living, organizational participation, and informal participation—but not in income—than similar families not in the program. Families who borrowed from the Farmers Home Administration did not lose status by doing so.

Typically, the studies concluded that the program was successful. In North Dakota Kristjanson and Brown [178] stated that the program reached thousands of qualified farm operators who were unable to obtain as much credit elsewhere, but the North Dakota borrowers were critical of some aspects of the program. Problems arose from (1) lack of understanding of the philosophy of the program, (2) the large case load of the supervisors, and (3) restrictions on the borrower's freedom to make capital purchases. The borrowers in Tennessee studied by Monhollon [202] had made significant progress in raising their income and level of living in the short run but less progress in the long-run resource adjustments required to turn their farms into viable units able to attract private sources of credit. And Herr [138] pointed out that it would take a very long time to eradicate farm poverty generally if special governmental credit programs of the size operated by the Farmers Home Administration in fiscal 1966 constituted the sole remedial measure.

Banfield [21] concluded that the tenant purchase program of the Farmers Home Administration was not suited to the postwar needs of the South. It was evident, he argued, that the eventual resolution of rural poverty and insecurity rested on adequate urban and industrial development. Thus the long-
term farm credit program needed was not one that would create the maximum number of minimum-size farms, but rather one that would assist boldly and creatively in the reorganization of southern agriculture.

The supervised credit aspect of Farmers Home Administration lending has to be listed as one of the real contributions of the program. Various forms of supervised credit have been adopted by credit agencies in many underdeveloped countries. Colyer and Jimenez [82] reviewed the supervised credit programs of several public agencies in Colombia and concluded that they had induced changes in desirable directions.

Other studies have examined lenders' performance in servicing rural nonfarm credit needs, particularly in the area of housing. They generally indicated that the availability of housing credit in rural areas was not on a par with that in urban areas. For example, Hamlin [120] showed that in 1960 a smaller proportion of rural properties was mortgaged, the total first-mortgage debt was relatively smaller, and proportionately less financing was insured by the Federal Housing Administration or the Veterans Administration. Also, first-mortgage repayment terms were shorter, interest rates on conventional loans were higher, and debt-to-value ratios were much lower on both conventional and insured loans.

Similar findings came from a study by Hurst, Rose, and Yeager [158]. They concluded that government agencies and programs designed to aid the flow of mortgage funds into rural areas appeared to have had little effect in providing more mortgage funds at favorable terms to rural residents. Housing needs were not being met. The spread between appraised values and current prices of rural houses required down payments so large that rural people with limited equity could not utilize conventional loans. Relatively high down payment requirements prevented rural residents from obtaining home loans that could be economically justified by their repayment ability.

These findings were supported by Williams, Jones, and Miller [291], who concluded that rural areas had access to relatively few sources of home mortgage financing. Amounts and terms of housing credit were less favorable in rural areas than in larger towns and cities. Rural facilities for tapping the credit resources of larger institutions and metropolitan areas were found to be inadequate. Also, lending risks did not explain the inadequate credit and credit facilities in rural areas where, in general, loan repayment experience had been good.

Data used in these studies predated the enactment, beginning in 1961, of a series of laws and amendments authorizing the Farmers Home Administration to make and insure nonfarm residential mortgage loans in small towns and rural areas. The outstanding rural housing debt insured by the Farmers Home Administration rose rapidly to $9.9 billion on January 1, 1976, clearly indi-
cating the large latent demand that had existed for such financing. The non-farm elements of Farmers Home Administration financing now comprise the greater share of its activity. In addition to the nonfarm housing, there is $2.1 billion outstanding in financing of community facilities and nonfarm commercial property. In contrast, the Farmers Home Administration held only $3.3 billion in outstanding farm mortgage debt and $1.9 billion in farm non-real estate debt.

The Farm Credit Act of 1971 also gave the federal land banks and production credit associations authority to make rural home and farm-related business loans. Outstanding loans under these programs had reached $551 million and $28 million, respectively, by January 1, 1976.

Clearly, new studies are needed to evaluate the impact of the Farmers Home Administration and other programs in relieving the rural housing credit deficiencies documented by earlier work. Also, studies of the credit situation facing rural business and industry are needed to permit evaluation of banking performance and of the need for the federally sponsored rural development credit banks that are frequently proposed; unfortunately, data deficiencies appear to present formidable obstacles to empirical work in this area.

Few studies have examined the efficiency of lender operations or lending decisions. Lenders themselves could well undertake or sponsor more such work. One line of inquiry that was pursued in a series of studies examined the ability of lenders to discriminate between loan applicants who were good versus poor credit risks. Brinegar and Fettig [69] found that the quality grade assigned to loan collateral by the federal land banks was not correlated with the final disposition of the loan. However, the ratio of the loan to the "normal agricultural value" of the property—the capitalized value of expected future net cash returns—was significantly correlated. Also, the credit rating placed on a loan by production credit associations, and in particular the change in that rating over the life of the loan, was closely related to the ultimate disposition of the loan.

Reinsel and Brake [235] estimated discriminant functions that indicated which borrower characteristics on loan applications were related to future repayment on schedule. Interestingly, the list of significant characteristics differed for Farmers Home Administration and production credit association borrowers. Evans [97] also found that certain borrower and financial characteristics in South Dakota were related to whether or not a borrower was in financial difficulty. In this case, however, a discriminant function using values for these variables as of the first loan application could not differentiate between the borrowers who were later financially successful or unsuccessful—the significant differences developed after the credit was extended.

Krause and Williams [176] examined whether behavioral personality vari-
ables were related to net worth progress—or the lack thereof—of South Dakota borrowers during the period 1960-64. Several significant variables were found, and the best relationships were obtained by employing personality variables for both husband and wife.

**Capital Markets and Financial Intermediaries**

**Rural Credit Markets**

Credit markets and institutions—historically among the first concerns of agricultural finance—continue to receive much research attention. Numerous publications present information on the farm lending activity of various institutions. Reports on outstanding farm loan volume by the major farm lenders are regularly assembled by the USDA, supplemented with estimates for non-reporting lenders, and published in *Agricultural Finance Statistics* [280] and other outlets. These data have been the major source of information on changes in the relative role of various lenders operating in the agricultural credit market.

The proportion of farm debt held by the banking system rose from 15 percent in 1940 to a peak of 29 percent in 1952, eased to 26 percent with the turn in the cattle cycle, and then held near this level through the next decade before rising to another peak at 31 percent in 1974 (all data cited in this section are as of January 1 and exclude Commodity Credit Corporation loans). Rapid growth in time and savings deposits of rural banks helped their lending resources to stay abreast of rapidly rising total farm loan demands, as did their willingness to move to higher loan/deposit ratios.

Conversely, the proportion of total debt held by the cooperative Farm Credit System declined from 31 percent in 1940 to 12 percent in 1952 before beginning a steady climb that reached 29 percent by 1975. Federal land bank loans (plus those of the Federal Farm Mortgage Corporation and joint-stock land banks) accounted for the pronounced swing, falling from 29 percent of total farm debt in 1940 to a low of 7 percent in 1952. Thereafter, the federal land banks increased their share of farm debt, reaching 16 percent in 1975. Production credit associations, on the other hand, exhibited relatively steady growth in their share, increasing it from less than 2 percent in 1940 to 12 percent in 1975. By employing national money markets as their primary source of funds, the cooperative agencies were generally able to obtain the volume of loanable funds desired even during years when restrictive monetary policy was holding down growth in lending resources of commercial banks and life insurance companies, their major farm lending competitors. In addition, surveys have indicated that the production credit associations have been attracting the larger, more successful farmers as loan customers [141].
Obviously, the proportion of farm debt held by some other sources has declined since the early 1950s. One of these was the life insurance companies, whose share hit a postwar high of 14 percent in 1957, decreased to 12 percent in the 1960s, and then fell rapidly to 8 percent by 1975. During the years of relative decline the farm mortgage departments of life insurance companies faced strong internal competition for funds from policy loans and from higher-yielding nonfarm investments—the latter especially during periods when usury laws placed effective below-market ceilings on their farm mortgage interest rates in some states or when widespread financial optimism resulted in euphoric projections of potential total yields from investments in common stocks or in bonds or commercial and multifamily residential mortgages with "equity kickers" attached.

Another declining source has been the mixed group generally labeled "individuals and others," composed of sellers of farms, landlords, merchants, dealers, machinery and farm supply corporations, and finance companies—that is, all lenders other than the major financial institutions that regularly report their farm loan volume. The share of total farm debt held by this group peaked at 44 percent in 1953 and has since dropped in almost every year, reaching 29 percent in 1975. Virtually all of the relative decline occurred in the non-real estate component of this debt, which decreased from 24 percent of the total farm debt in 1952 to 7 percent in 1975. The drop was especially rapid in the late 1960s, according to data from the Census Bureau sample surveys of agricultural finance in 1965 and 1970 [282, 283]. (After publication of the 1970 survey, the USDA series on outstanding farm debt was revised downward sharply, rendering obsolete portions of numerous earlier analyses and discussions.) In contrast, real estate debt held by "individuals and others"—mainly sellers of farms—has remained at about one-fifth of total farm debt for the past twenty-five years.

Contrary to reports appearing in some of the agricultural finance literature of recent years, the proportion of total farm debt accounted for by the Farmers Home Administration has remained at about 5 percent for the past twenty years, rather than falling sharply as these reports indicated. The mistaken impression occurred because the series published by the USDA did not include the insured loans which were made by the Farmers Home Administration and then sold to investors under repurchase agreements. The USDA series has now been redefined to credit the Farmers Home Administration with these loans.

Over the years, insights into factors reflected by these aggregate data have been provided by numerous surveys, on both large and small scales, covering specific aspects of rural credit markets. These have added to our knowledge; still, at any given point in time, it is plain that only a partial picture and understanding of rural credit markets were achieved.
John R. Brake and Emanuel Melichar

Carson [75] described farmer use of merchant credit in Indiana after surveying both farmers and merchants. About two-fifths of production item purchases involved merchant credit, but most farmers could have obtained all of the credit they needed for such purchases from institutional lenders. In other words, the use of merchant credit did not result from unavailability of credit from other sources. Some farmers said they used merchant credit because it was free of cost; another group was not aware of its potentially high cost.

A study by Christiansen, Hartwig, and Staniforth [79] covering the 1950s found banks in Wisconsin decreasing their real estate financing in favor of financing farm machinery and livestock. Three situations were described. One set of banks was expanding its farm loan volume and specializing in such lending, a second group had little change in its farm loans, and a third set was reorienting toward more emphasis on nonagricultural lending.

A relatively detailed analysis of a rural credit market was undertaken by Nisbet [216]. He discovered two credit markets operating in Chile; one was serviced by banks and the other by informal sources. Wealthy farmers were more closely tied to bank credit, whereas poor farmers tended to be served by the informal market.

Rural Financial Intermediation

As Baker, Hopkin, and Brinegar [17] have pointed out, analyses of rural financial intermediation may examine the efficiency of an individual intermediary or may consider the efficiency of part or all of the financial intermediation system. Empirical models, they suggested, could be useful in pursuing either line of inquiry. So far, however, most attention has focused on the first approach.

Frey [108] conceptualized a multiperiod linear programming model which could be used to examine the asset and liability management options of a rural bank. The model included a feedback mechanism in which deposit growth was affected by the bank's local lending activity. Barry and Hopkin [25] further described how this approach allows the full range of returns, feedback, and constraints to be specified in a systematic manner. Without such a model analytical attempts might overlook some of these important relationships.

Fisher, Boehlje, and Roush [106] constructed a computerized rural bank management game. This gaming and simulation model uses credit and banking market equations estimated from data for rural Oklahoma counties in 1972. The game provides players with insight into the many ramifications of bank management decisions.

Rural financial intermediation systems as a whole, however, have yet to be modeled. But many aspects of these systems have been examined, especially by Federal Reserve economists. Swackhamer and Doll [264] studied how the
flow and price of bank credit were affected by economic and institutional factors. Their data on interest rate differentials and trends suggested the presence of considerable restrictions on credit flows among regions and over time. In general, interest rates charged by banks on similar farm loans were significantly higher in the South and West than in the East and Midwest. Farm loan rates did not respond quickly to changes in the prime rate posted by large urban banks. Many small banks paid lower rates on savings deposits than larger banks which tended to pay the maximum allowed; yet both groups charged about the same average rate on farm loans.

Melichar [193] noted that the volume of farm loan participations—loans on which two or more banks collaborated—had increased sevenfold during the decade ending in 1966. Most of these arrangements arose because relatively small banks had received loan requests exceeding their legal limit on the amount of loans outstanding to any one borrower. While past growth in this area had been rapid, Melichar questioned whether urban banks would continue to increase such lending rapidly in their new environment characterized by reduced liquidity and more frequent periods of restrictive monetary policy. Subsequently, Benjamin [32] studied the correspondent banking arrangements of small banks in Illinois during 1968 and 1969—the latter a year of tight monetary policy. He found that while correspondent credit from Chicago banks fell that year, substantially increased credit was provided by banks in smaller Illinois cities which served as the primary correspondents of many of the rural banks.

A number of studies pointed out that correspondent banking arrangements were relatively costly to rural banks and their communities because the outflow of funds through balances maintained in urban correspondent banks far exceeded the return flow of funds through participations in rural loans. Melichar and Doll [198] estimated that at heavily agricultural banks in 1966 the return flow through farm loan participations averaged only 22 percent of correspondent balances at member banks and 16 percent at nonmember banks. Shane [255], in one of a series of studies of rural-urban fund flows in the banking system, found a substantial net flow of funds from banks in rural Minnesota and North Dakota to banks in the Minneapolis-St. Paul area. Benjamin [32] noted that one factor responsible for these results might be lack of knowledge among rural bankers about the amount of correspondent balances required to reimburse urban banks adequately for noncredit correspondent banking services rendered. Using data supplied by urban banks, he calculated that a typical rural bank in Illinois could pay for noncredit correspondent services by maintaining balances equal to between 3 and 4 percent of its deposits. In contrast, such rural banks in 1969 on average maintained correspondent balances exceeding 6 percent of deposits. Others have suggested
that rural areas would benefit if correspondent services were paid for by fees rather than through balances [42, 198].

Since 1970 production credit associations have been authorized to participate with commercial banks in making farm loans to customers of the banks. This arrangement obviously gives banks an alternative to seeking participations from correspondent banks. As yet, however, no research studies appear to have investigated the use and relative merits of this program.

Brake [58] studied the intermediary function that federal intermediate credit banks (FICBs) could provide for commercial banks. After surveying banks that were both current and potential users of this credit service, he concluded that with several changes in FICB policies this little-used mechanism could develop into a more important source of funds for rural banks. However, a survey of FICB officials raised doubts that such changes would be made, although a reexamination of the policies was under way at the time.

The discount mechanism of the Federal Reserve banks was also reexamined by Federal Reserve researchers during the 1960s [198]. As a result of this reappraisal a seasonal borrowing privilege for member banks was proposed and implemented in 1973. In a study of eligibility for and use of the privilege Melichar and Holderness [199] found it constituted a potentially significant source of funds for many rural banks. However, relatively few banks used it in 1973. The reappraisal in addition recommended a basic borrowing privilege that would also be useful to rural banks but which has not yet been implemented.

Baughman [27] described the basic economic function of financial intermediaries as linking suppliers and users of funds, with a variety of instruments and institutions linking the national financial market to local markets for farm securities. He argued that the rapid growth in investment and output per worker and the low rate of return on farm capital all suggested that capital and credit had been readily available in agriculture, implying that financial intermediaries had performed their roles reasonably well.

Sloan [259] agreed with this view but at the same time pointed out imperfections in financial markets—the relative inflexibility in the price of agricultural credit compared with the price of credit in other sectors of the economy and the significant geographical variation in interest rates on agricultural loans. He also noted legal restrictions that often interfere with the flow of capital, among them prohibition of certain forms of banking structure, usury laws, and ceilings on interest rates paid by banks and other thrift institutions.

In a later study for the Federal Reserve Board’s Committee on Rural Banking Problems Sloan [258] urged that a new intermediary be interposed between small banks and the national money markets, since small banks are un-
able to raise funds in such markets directly. He proposed that the Federal Reserve System provide this function by establishing a pool of special time deposit certificates issued by small banks and then periodically auctioning participations in this pool to money-market investors, thereby effectively linking small banks to national money markets. The committee’s report [42] advised the Federal Reserve System to consider establishing such a mechanism if other private or governmental initiatives were not undertaken to improve the ability of small and rural banks to raise money-market funds.

Rural financial disadvantages are not limited to credit markets. Brake [64] suggested that rural savers also operate in inadequate markets, in that their investment alternatives are limited and often provide only relatively low returns. He felt that investment information is less readily available, and its quality lower, in rural areas than in urban areas.

In another work on rural financial markets Hayenga and Brake [130] analyzed the effects of rural bank mergers on the banking services offered to citizens of rural communities. As a result of bank mergers customers had access to a wider variety of banking services, including new services not previously offered by independent banks. Markets for loans and savings became more closely tied to money-market conditions. Loan eligibility requirements were liberalized, making a wider range of people eligible for loans.

Other research concentrated more specifically on the relationship between banking structure and the ability of commercial banks to fulfill adequately their role as farm credit intermediaries. These studies have produced varied opinions and results. For example, Brake [55] concluded that without new institutions or changes in existing institutional arrangements rural banks would be unable to maintain their share of the farm credit business. Similarly, Hopkin and Frey [154] concluded that branch banking was needed to permit banks in Illinois to meet more readily the increased lines of credit demanded by Illinois farmers.

Melichar [197] found little support for these views in the aggregate relationships between state banking structures and the relative problems and importance of banks in farm lending during the 1960s. More banks in unit-banking states had encountered problems in financing farmers than had banks in branching states, but they had also made relatively more use of mechanisms designed to cope with such problems. Furthermore, farmers in unit-banking states in 1970 obtained a greater proportion of their credit from banks and also obtained more bank credit relative to farm income and assets. During the 1960s the relative importance of banks in farm lending increased slightly in the unit-banking states but fell in the states permitting branching. Interestingly, the relative total debt of farmers did not vary significantly among these
groups of states, perhaps indicating that the farm loan demands had been similar and that nonbank lenders had offset variations in the farm lending activity of banks.

Several Federal Reserve studies [42] examined the relative proportion of farm loans in bank portfolios before and after banking structure changes, comparing banks involved in such changes with control groups of similar banks not involved. Taken together, their findings were inconclusive. In Ohio and Virginia no significant differences emerged, in Wisconsin banks that branched better sustained their relative farm lending emphasis, but in Florida banks acquired by holding companies rapidly reduced their farm lending. But such results do suggest the need for additional work to determine why the potential farm lending advantages of branch and group banking may not be realized in practice and what adjustments might be helpful.

These studies illustrate the growing volume of literature on financial markets, but it remains true that the literature has been disproportionately oriented to describing specific institutions — particularly lending institutions — rather than to improving the understanding of rural financial markets in a broader sense, including markets for savings and for debt and equity instruments. Among the work already mentioned, Baughman's analysis suggests the economic logic that could be employed in studies of financial markets. Sloan's discussion points out some suspected market imperfections which merit study. Certainly the time is ripe, as noted by Baker, Hopkin, and Brinegar, to undertake some modeling of financial markets. Such modeling will require both more empirical information than is currently available and a more macro-oriented and analytical approach to financial markets than that applied in most past studies.

Effects of National Monetary Policies

Only limited research has evaluated the impact of national monetary and credit policies on agriculture. Doll's empirical analysis of the 1950s [91] concluded that easing of monetary conditions — that is, increasing money supply — would not be beneficial to agriculture. He found the relationship between money supply and farm prices received to be inverse and statistically poor during the period 1947-57. Further, a comparison of farm costs and monetary conditions did not suggest that easy money policies would reduce farm costs.

Contrary to Doll's results, Gramm and Nash [116] found that agricultural incomes and investments had been responsive to changes in the money supply in the same manner as nonfarm incomes and investments. The elasticities of farm and nonfarm incomes in response to money supply changes were similar and statistically significant over the 1919-66 period. However, although farm
investments were related to changes in the money supply, the elasticities of farm and nonfarm investments relative to changes in the money supply were dissimilar, perhaps because interest rates on farm loans were relatively inflexible. Given these results, the authors advised that farm policy "might be more effective if it were more closely coordinated with overall monetary and fiscal policy."

Sharpe [256] examined the impact of tight credit on farm mortgages during 1963-69, a period in which interest rates on farm mortgage loans rose from about 6 percent to almost 9 percent. Over this period federal land banks expanded their share of the market while commercial banks and life insurance companies accounted for reduced shares. In a tight-money year such as 1969 sellers of farms financed a greater proportion of farm real estate transfers. Evans and Warren [98] looked more generally at the impact of tight money in 1966 on both real estate and non-real estate credit experience. They concluded that while mortgage credit had been tight for both farmers and others, farmers had been served well with short-term and intermediate-term credit during a period when some other segments of the economy had experienced difficulties in securing such funds.

Trimble [271] examined the effect of the stringent monetary and credit policies of 1969 and 1970 on the cattle industry, testing the hypothesis that they had contributed to the higher farm-level beef prices of 1973 by causing increased herd culling or decreased investment in productive capacity. He found the effect to be relatively minor in that only 5 percent of the 1973 level of beef prices appeared to be attributable to 1969-70 credit conditions.

At its annual meeting in 1971, the American Agricultural Economics Association sponsored a session on the impact of inflation on agriculture. Brandow [67] pointed out that during the period 1953-70 demand-pull inflation had benefited farmers in some respects while cost-push inflation had been damaging to farmers. He felt that future inflation would more likely be cost-push in nature. Similarly, Tweeten and Quance [276, 277] concluded that the 1970 inflation rate in farm input prices—4 percent annually—if continued would bring hard times to the farming industry. The more severe impact would arise from increases in the prices of inputs for which farmers have relatively inelastic demand, such as taxes, wages, and interest rates. In contrast, price inflation for cash operating inputs with an elastic demand, such as fertilizer, would not be so damaging.

In view of the rapid price inflation of 1973-75 and the apparently high probability of continued inflationary pressures, these results suggest a need for additional study of the impact of inflation and of anti-inflation policies on farming and on farm finance.
Suggestions for Future Research

The Question of Research Priorities

As one reviews the literature in agricultural finance, there is a temptation to evaluate the research in light of later developments. Often, however, important subsequent developments are not recognized in advance by researchers or are perceived by relatively few. Further, the literature contains a number of instances where problems and, indeed, proposed research directions were incorrectly perceived by the leaders of the time. Hence, the contribution subsequently deemed important came from the individual who went in a different direction and/or visualized a different priority.

Our reviewers urged us to indicate research priorities in agricultural finance on the basis of our review. We resisted these suggestions for several reasons. Most importantly, the review itself was a humbling experience as it revealed the wide range and the large number of publications in this field. It gave us little reason to believe that our priority set, necessarily influenced by our own special interests and experience, would be more useful than that of numerous other agricultural finance specialists. The review does, however, provide leads and ideas for researchers to consider while formulating their own priorities and interests. With the additional suggestions in this section, it supplements other extensive compilations of research needs [15, 37, 46, 57, 152]. But in this rapidly changing world research lists and priorities must shift as critical problems arise (or sometimes even disappear) almost overnight.

Less Duplication of Descriptive Research

The literature contains numerous publications on sources of farm credit, farmers' attitudes toward credit, calculation of interest rates, and farmers' debt levels. Although such information is necessary and useful for analytic and policy purposes, it is questionable whether each state needs to duplicate the efforts of others in these areas. Probably too little attention has been given to joint utilization of state or USDA publications.

At the beginning of a research project in agricultural finance a descriptive study is often necessary as a basis for further analysis in a second-stage project or for suggesting hypotheses to be tested in follow-up research. Too often, however, only the descriptive study is published. There is no analytical follow-up, and indeed, often the researcher then moves into a different interest area. A general criticism of past publications is relative overemphasis on “what is” or “what has been” at the expense of analysis of alternatives; that is, of “what might be.”

Importance of Basic Data

If policy makers and researchers are to remain informed, there is an important need for continuing, accurate data on cash and capital flows, ownership
of financial resources in farming, returns to those resources, and costs of resource services. The Balance Sheet and other USDA series represent a good foundation, but additional data are needed.

The Balance Sheet provides information on the capital stock and debt of agriculture, but there is no complete and comparable information on flows of cash or capital. For example, information is presently available on outstanding farm loans including both real estate and non-real estate. However, it is almost impossible to obtain full information on gross credit extended and repaid in any one year. Yet, such data are critical to the estimation of flows.

A similar need exists for information on the loss of capital from the agricultural sector in the course of intergenerational transfers. Two important aspects are involved: (1) the estimation of capital that leaves the sector through the sale of farms by retiring farmers or by nonfarmer heirs — capital that must be replenished by new entrants or through borrowing and saving; and (2) the impact of taxation and transfer laws on the individual farmer as well as on the sector. Each of these is important for different policy purposes.

In addition to a need for a breakdown of cash-flow detail by landlords, capital owners, and operators, improved information is desirable on the flows to resource services. It would be useful, for example, if the dollar value of leasing machinery and rental of real estate were available on a national and state basis. Such data would be revealing with respect to terms of trade on capital resources.

Other data that might well be updated from time to time are estimates of the real effects of price changes on the wealth of the farming sector. A number of such studies have been mentioned in this review. None of these studies, however, led to the establishment of a continuing series.

Consistency among data sources is also vitally needed. A single project may use data from the Census, the Balance Sheet, Farm Income Statistics, and lending institutions; yet, in many important respects these series are based on different definitions of farming. The various data sources providing financial information need to be consistent, one with the other, and they need to do a better job of presenting farm numbers and other assumptions going into their construction, calculation, and coverage.

 Provision and analysis of the financial data discussed here have been traditional functions of the USDA. Some researchers are currently concerned that the recent reorganization of the USDA may adversely affect its ability to perform these functions. There seems some danger that the dissolution of the Agricultural Finance Branch and its focal responsibility for financial research may lead to fragmentation and loss of a unifying purpose rather than to improved data generation and analysis.

The observations of the American Agricultural Economics Association Committee on Economic Statistics [3] should be considered in formulating
and revising agricultural finance data programs. The committee stressed the need for improved knowledge of capital investment structures, physical as well as human. Its comments relating to the need for better measurement of the increasingly diverse income and assets of farmers and the rural population should be heeded. As it noted, attention must be given to the fact that, for some problems and data, “farm” and “farm sector” are no longer meaningful concepts or feasible units of observation. And it is certainly true that information systems should provide data better suited for program evaluation, to permit analyses of the effectiveness of social programs and private institutions.

The rapidly changing nature of farm and rural society means that continued attention must be focused on updating and rethinking data needs, concepts, and future directions to enable our data systems to continue to support research that contributes effectively to problem solving and policy making.

Use of Theory and Modeling

Throughout the literature review there were numerous instances of the development of theoretical concepts or the adaptation of theories from related areas of work. Conceptualization, theory, and modeling are invaluable in establishing research directions and specifying data needs; they should receive continued attention in all areas of agricultural finance. Currently, theoretical and modeling efforts would seem to have particular potential in work on capital formation, decision theory under risk and uncertainty, sources and uses of funds, capital markets, and firm growth.

Evaluation of Potential Innovations

A number of innovations have been suggested in agricultural finance. Few of these have received serious research emphasis. Examples include variable (principal) repayment plans, permanent or semipermanent debt, new debt instruments, new financial institutions or changes in regulations governing financial institutions, provision of related financial services, and low-equity financing in combination with loan insurance. These types of questions are searchable. As one example, a simulator could be developed to examine effects of innovations such as variable payment loans in which the repayment of principal is related to farm profits, yields, or prices. Effects of permanent debt could similarly be described for both borrowers and lenders under a range of circumstances.

Given the increasing capital needs of farming throughout the period under consideration, there have been suggestions that lenders should provide lower-equity financing. Although low-equity financing has been evaluated in terms
of its effect on growth, we have found no research evaluating low-equity financing from the viewpoint of the lender. Some analysts have suggested, often as part of proposals for low-equity financing, an insured farm loan program similar to the residential mortgage insurance programs of the Federal Housing Administration and the Farmers Home Administration. The experience of these institutions, in terms of its lessons for the feasibility, design, and administration of a similar farm agency, would seem to be worth exploring.

Another suggestion often heard is that credit institutions should provide additional related services. What is the potential for farm credit-related services such as record services, estate planning services, or management consulting services? Research should be able to shed light on the nature and extent of such needs.

Present farmland title registration and transfer procedures seem unduly cumbersome. How might such procedures be modernized and simplified? Could research suggest and evaluate procedures that would be useful in achieving this end?

Perhaps, given the increased variability in output prices and farm income, it is timely for thought and research to return to the area of overdue loans. In such an environment widespread financial setbacks could occur. There may be need for analyses of approaches to debt moratoria or changes in foreclosure proceedings. Past ideas such as the establishment of a debt-adjustment authority may also deserve to be reexplored.

Evaluation of Institutions and Arrangements

There has been a great deal of descriptive research on how various credit institutions operate, but much less evaluative and analytical research has been done on these institutions. An exception might be the Farmers Home Administration. Several studies have analyzed its operations and the extent to which they achieved stated purposes. Somewhat less research has been devoted to evaluation of the cooperative Farm Credit System agencies and the commercial banking system.

A number of institutional changes deserve research. Given what appears to be a continually rising need for capital and credit by American agriculture, can existing institutions meet future farm credit needs? What reorganization or changes might be useful? For example, should the relatively small rural banks be provided with new ways to obtain funds? By what means, such as pooling arrangements, might they increase their farm loans and at the same time keep their risks at acceptable levels? Would new financial institutions be useful — perhaps a counterpart of the Federal National Mortgage Association
to insure farm loans? For many of these questions, modeling and simulation of intermediary institutions and systems serving the farming sector would be a useful approach.

Additional questions needing research are whether existing lending institutions could operate more efficiently and whether present credit arrangements are appropriate. Credit arrangements deserving of evaluation are one-stop credit, line-of-credit financing, and supervised credit. Some studies of these credit arrangements have been undertaken, but continuing analysis would be useful.

One recent institutional change that deserves evaluation is the federal land banks' new role in rural home financing. Have additional funds for rural home financing become available because of this program? Or do these funds substitute for funds from other agencies? Have rural home mortgage credit terms been liberalized because of the program? Has the implementation of this rural home financing option been detrimental to farm borrowers?

Credit institutions themselves have undertaken little research on innovations, policy changes, or their own operations. Probably the major exception is the Federal Reserve System, which employs a number of research economists who have examined policy questions and provided some meaningful information to decision makers. However, commercial banks as a group sponsor little research on farm credit. The Farm Credit System does some research, but this has, in general, focused on data gathering rather than analysis. Similarly, life insurance companies do little research in farm credit. All these institutions could well undertake or underwrite a larger share of the research responsibility.

Credit Policy Analysis

From time to time analysis is needed of the financial or economic effects of specific public policies. For example, it would be useful to know more about the effects of specific monetary policies and/or usury laws on farmers. During periods of tight money, do farmers cut back investment plans and thereby cause higher prices at some later time? Or are farmers relatively sheltered from the effects of monetary policy actions? What are the effects of state usury laws, rural bank mergers, and bank holding company acquisitions on the availability and cost of farm credit? What are the effects of various federal income and estate taxes on farmers? How would farmers be affected by being required to file income taxes on an accrual basis rather than on a cash basis? Such issues have received rather minimal research attention over the period since World War II; yet they are the questions facing policy makers and the public.

Perhaps researchers have treated credit policy issues to the greatest extent
in speeches, interviews, legislative testimony, and popular periodicals. If so, there is need for a periodic or ongoing forum in which these thoughts are gathered and discussed. In this respect the Agency for International Development Spring Review of Small Farmer Credit can be cited as a noteworthy attempt to focus on some of the important issues in small farmer credit programs in developing countries [284, 285]. Similar treatment of domestic programs and policies would be useful.

Disinvestment from Farming

A neglected area of research has been disinvestment from farming. Perhaps this lack of interest came in part from the fact that many farmers continued to farm until they died. Yet now many farmers retire from farming. For those who do not, their widows may face retirement problems. They, too, need help in planning for retirement. What are the alternatives these retiring farm families face? How can they protect their capital from inflation and other drains to best meet their retirement goals? Where can they get qualified help in making the decisions that will affect their level of living for the remainder of their lives?

Rural Financial Markets

The rural financial market has been neglected until recently. This represents one place where a basic descriptive study is needed as a start. Questions to be answered are the extent to which rural borrowers and savers have access to credit and investment markets and whether such markets operate efficiently. While the credit market serving farmers appears to be relatively efficient, there is reason to believe that other rural borrowers face a more imperfect market. In both markets there is not enough continuing information on the volume and terms of real estate loans from individuals and non-real estate loans from merchants and dealers. It may be the case that more research has been done on the functioning of rural financial markets in developing countries than in the United States.

Too often the concern with rural capital markets is a concern only with their functioning from the standpoint of borrowers. One suspects that the market for savers functions less effectively than the market for borrowers. In many rural areas stock brokers have no offices within a reasonable driving distance; nor is it easy for rural savers to purchase debt instruments of governments or corporations. Probably many rural savers recognize only a savings account at the local commercial bank or the purchase of real estate as options for investing savings.

The linkage between rural and national capital and credit markets should also be explored. Capital should flow freely into and out of rural areas, de-
pending on relative demand-supply relationships. What methods might be used to increase the efficiency of markets for debt instruments? Do the debt instruments themselves need to be changed? Are new markets necessary?

Another area for potential contribution concerns the effects of inflation on rural financial markets. Does capital flow less freely during a period of inflation? Do capital flows shift because of market imperfections? Or are such flows kept from shifting because of arbitrary restrictions? Is the rural borrower or saver at a disadvantage (or advantage) compared to his urban counterpart during inflation?

Analysis of Fund Flows

Recently attention has been given to the development of flow-of-funds accounts and models for the agricultural sector. However, considerable additional effort is needed. Understanding of the sources and uses of funds, whether in the context of the individual farm operator or the agricultural sector as a whole, is important to understanding what is happening financially in agriculture. From the standpoint of the farm operator this information is needed in planning the farm operation and in making plans for borrowing and repaying debt. Policy makers in government, in farm cooperatives, and in firms manufacturing or distributing farm inputs require similar information for the entire agricultural sector.

A cash or capital flows approach to agricultural finance research is one area in which considerable conceptualization and theory is needed. Theory and conceptualization should lead the way in specifying data needs and uses. For example, what data are useful in a decision-making context for the individual farm firm? How should debt service be related to cash flow? How do family living expenditures relate to the cash flow for the farm business unit? How does cash flow affect decisions on new equipment investments or upon timing of such investments?

What are the important relationships to be examined in a regional type-of-farming model or a national sector model? Can flows data be organized to tell us how farm balance sheets change from one year to the next, who finances the changes, what happens to the assets of farmers who leave farming, and how those who enter acquire capital?

Already a flows approach has shown much merit for projecting future capital and credit needs. The approach seems to offer potential for further research if data problems can be resolved and if data needs and uses are better conceptualized.

Problem-Oriented Research

Problem-oriented research necessarily depends on the times and hence the financing situation of farmers. Firm growth, for example, is an area that has
received much attention, but more effort would reveal further insights. What are the choices and trade-offs among alternative sources of capital? What are optimal strategies for growth? To what extent do optimal strategies vary by type of farm, stage in life of the operator, or the economic setting of the country? How are risk and uncertainty considered in the context of firm growth? These and many other questions relating to growth need attention.

Some problem-oriented research also adds to our basic understanding of financing. For example, the major thrust of past work has emphasized external financing. Yet, the major financing of the farm business has been internal; that is, nondebt financing. The literature has surprisingly little to offer in the way of descriptions of internal financing or of theoretical and conceptual models dealing with internal financing decisions. Additional research may prove rewarding in terms of improved understanding of loan demands as well as of saving and investment decisions.

Additional theory and conceptualization are needed in management of financial resources. Replacement and investment decision models deserve further development. What factors should receive central focus in such models?

There is considerable room for development of management and decision-making strategies for risk and uncertainty situations. Insurance strategies need to be formulated and analyzed. Informal insurance, diversification-specialization questions, and other considerations involving risk and uncertainty merit similar study.

In the 1970s risk stemming from price changes has taken on new dimensions. The relative price stability of the 1960s has been replaced with both rapidly increasing input prices and highly volatile product prices. The financial manager must now give increased attention to the management of marketing and price risks arising from variations in national farm policy and international markets. Analysis of strategies for dealing with these risks appears very timely, as does the study of their implications for farm finance.

There is a continuing need for research to answer practical problems that farmers or farm families face. Often these problems are associated with stages in the operator’s life cycle— for example, the problem of getting started in farming. The acquisition and control of capital by beginning farmers requires continuing study as farm income and credit conditions change. Expansion and disinvestment stages are additional problem points. With respect to each of these, continuing research should examine typical situations farmers face, their alternatives, and strategies to achieve family goals and objectives.

Research should continue to examine the effects of tenure and organizational forms on financial progress. Rental, leasing, owning, partnerships, and corporations all have their advantages and disadvantages, and as laws change and asset prices fluctuate new studies are needed to indicate the situations in which each is most useful. As farms increase in size and the partnership and
corporate forms of organization are employed more often, the relationships between individual and firm life cycles may prove a rewarding research area. And if many farm firms achieve sufficient size to have their shares publicly traded, there will be new questions to examine.

Research emphasis on estate planning to achieve firm and family objectives should be continued. As tax laws change and as farmers' situations change, there is need to update analyses. Similarly, federal and state income tax changes should be analyzed for their impact on farmers' tax strategies.

Effects of Credit on Income Distribution

Credit policy over the years has implicitly assumed that credit represented a means of helping producers who could utilize additional resources to obtain those resource services. The tone of the early Farmers Home Administration programs and many of the credit programs in developing countries seemed to be built on this premise. In essence, credit programs provided a means of helping those without adequate resources to expand faster and become viable business firms.

Policy makers need analyses of the distribution of the income and other benefits of credit programs in order to help them choose among alternative programs. This would seem to be an area in which theory and conceptualization could point the way for research. For example, to what extent can alternative credit programs help disadvantaged individuals to better their situation? How would various restrictions or adjustments in credit policies affect the income distribution of the borrowers utilizing a given program or the distribution of the income or other benefits achieved under that program?

Concluding Comments

In concluding, two additional comments are offered. First, the total contributions in agricultural finance could have been greater had there been better coordination and communication among researchers. There is ample evidence both of needless duplication and of failure to build on previous research. Had there been more leadership exerted or more conscious efforts made to focus or coordinate research in agricultural finance, perhaps the results might have fitted better into a complete picture. A conference held at Allerton Park, Illinois, in 1968 represented such an attempt to promote discussion of problems and to focus research [152]. This was a useful undertaking. Future efforts of this type are to be encouraged.

Finally, in looking ahead to future social and economic needs, probably more emphasis should be put on rural financial research as opposed to farm financial research. This is not to argue that less emphasis should be put on
farm finance but rather to suggest that rural nonfarm residents and businesses, as well as rural communities and governments, deserve more attention to their problems.

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