Future Dimensions Of Farm Finance

Michael Boehlje

Iowa State University

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Future Dimensions Of Farm Finance

Abstract
Tremendous advances in technology have enabled farmers in the United States to achieve continued increases in output per unit of input for several decades. The technological revolution of agriculture is a well known phenomenon. Mechanization, improved varieties, modern chemical pesticides and fertilizers, and new production methods have all contributed to increases in production per acre, per animal and per man hour of labor. This technological revolution has brought about several significant changes in the structure of agriculture. The substitution of physical capital for labor and the increased use of purchased inputs has created a need for substantially more funds both in the aggregate and on a per farm basis. Technology has also resulted in fewer and larger farming units. Over time, profit margins in agriculture have declined, so farmers have been increasingly dependent upon outside sources of funds.

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FUTURE DIMENSIONS
OF FARM FINANCE

by

Michael Boehlje*

No. 99

*Professor of Economics, Iowa State University, Ames, Iowa.
**Introduction**

Tremendous advances in technology have enabled farmers in the United States to achieve continued increases in output per unit of input for several decades. The technological revolution of agriculture is a well known phenomenon. Mechanization, improved varieties, modern chemical pesticides and fertilizers, and new production methods have all contributed to increases in production per acre, per animal and per man hour of labor. This technological revolution has brought about several significant changes in the structure of agriculture. The substitution of physical capital for labor and the increased use of purchased inputs has created a need for substantially more funds both in the aggregate and on a per farm basis. Technology has also resulted in fewer and larger farming units. Over time, profit margins in agriculture have declined, so farmers have been increasingly dependent upon outside sources of funds.

These trends raise some important questions. First, how can the individual farm operator cope with the rapidly raising capital requirements of farming? What combination of equity capital, credit, leasing, custom hiring and contract farming will enable the farmer to achieve a sufficiently

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large farm business, given the usual limitation of a fixed equity capital base? Can the family farm as we know it now survive as an economically viable entity in the face of the rapidly increasing capital requirements of farming?

Another perplexing question is can the institutions and individuals that supply farm credit continue to meet the growing demand for funds? The amount of farm debt outstanding in the U.S. farm sector will have increased by more than six times between 1960 and 1980, and comparable rates of growth are projected for the foreseeable future. Is it possible that some farm lenders will find it increasingly difficult to meet this challenge?

The following discussion will attempt to answer some of the above questions. Since implications will be drawn concerning the future, the discussion at various points will be speculative rather than empirical. The discussion will first focus on the income that farmers receive from farm and nonfarm sources as well as cash income compared to capital gain. Then debt utilization and servicing will be discussed with specific emphasis on problems encountered in servicing increasing amounts of debt with limited cash income. Next, the equity and wealth dimensions of the agricultural sector will be briefly reviewed with emphasis on the distribution of wealth by size. Risk and risk management dimensions will be discussed, and finally, the implications of future trends and public policy for the structure of farm firms will be briefly reviewed. Throughout the discussion, one of the key dimensions that will be highlighted is that of distribution—distribution of income, wealth and debt utilization among farmers with different size, tenure and financial characteristics.
Annual Income

Aggregate net farm income, measured in current dollars, moved erratically upward from 12 billion annually in the early 1960's to about 24 billion in 1978.\(^1\) Aggregate net farm income is projected to exceed 30 billion dollars in 1979.\(^2\) However, in real terms, aggregate net farm income has stayed constant or actually declined slightly during the last ten years.

The per capita disposable income of farmers has historically been lower than that of the nonfarm population, but has been moving steadily toward equality in recent years.\(^3\) A major reason for this improvement is the nonfarm income earned by the farming sector (Figure 1). In recent years, net income from farm sources has accounted for less than half the total net income of the farm population.

If farms are classified by sales category as in Figure 2, off-farm income as a percent of total net income declines as gross farm sales increase. Also, nonfarm income appears to be from different sources, depending upon the size of farm; nonfarm income comes primarily from labor earnings for small farms, whereas nonfarm income comes from off-farm investments and financial instruments for larger farmers. In both cases, this income provides a source of cash flow for debt servicing.

With the steady decline in the farm population, total net income from all sources per farm has increased more rapidly than the general rate of inflation. For the period 1960-63 average annual net income from all sources per farm operator family was $5,387 of which $2,981 or 55% was net farm income. For the period 1975-77 total net income per farm operator
family averaged $15,457 per year with 41% coming from farm sources. Total net income per farm operator family increased by nearly 3 1/2 times while the consumer price index approximately doubled between 1960-63 and 1975-77. Thus, it would appear that, on average farmers and their families are earning reasonable incomes.

Capital Gain

The preceding discussion has concentrated on the annual income flow that accrues in a cash form or in changes in inventory. In addition, farmers have also accrued a sizable capital gain in recent years. Some have argued that farmers are no different than other investors in evaluating the return from capital investments; they look at both the cash return and the change in asset value much like an investor would evaluate alternative stocks and bonds. Rates of return from annual income have been comparable for investments in common stock and farm production assets since 1960 (See Table 1). Furthermore, the capital gains for farm production assets have far exceeded those for common stocks, resulting in a total return on farm production assets substantially higher than that for stocks or bonds. In addition, the variability of total returns is lower for farm production assets—the variability in annual income return is higher for farm assets compared to common stock but the variability in return from capital gains or losses is substantially lower for farm production assets.

As to the future, we expect a continuation of the historical trends noted. Nonfarm income will continue to be an important component of the income of farmers, with smaller farmers continuing to contribute labor to the nonfarm sector and larger farmers contributing capital and financial
resources. Larger farmers will diversify their asset holdings to include nonfarm financial and business investments. Some of these investments will be integrated into their farming operation as a means of acquiring control of various inputs, while others may involve attempts to diversify asset holdings into other industries and/or geographic regions. For those large and small farmers who utilize debt, nonfarm income will continue to be a source of cash flow for debt servicing.

As to the relationship between annual income flow and capital gains in the agricultural sector, we also see a continuation of current trends in the near future. Holders of agricultural assets have historically been willing to accept a portion of their income in the form of capital gain, and we expect this attitude to continue. In fact, as we will note later, some dimensions of public policy, particular tax policy, may in fact encourage the conversion of ordinary income into capital gain. Thus, debt servicing will continue to be a problem for some farmers because of the relatively low rate of cash return on farm assets.

The increased volatility of annual cash income experienced in recent years will also be a continuing characteristic of the agricultural sector. Real income of farmers will continue to grow, more from a combination of fewer and larger farms along with growing nonfarm income than from growth in aggregate income from farming. Thus, farmers will continue to improve their income position compared to the nonfarm sector, but income of farmers will be much more volatile than incomes of most firms and individuals in the nonfarm sector.
Debt Use and Servicing

Debt

The balance sheet of agriculture indicates that debt utilization in the farming sector increased to $137,472 million in 1979, a 15% increase over 1978. This 15% increase in debt use by farmers follows a similar 15% increase from 1977 to 1978. Although the aggregate debt to asset ratio is relatively low (16.8%), this ratio is based on market value of farm assets rather than book value. As noted in Table 2, a large proportion of the total debt is held by the larger farm firms, and with the exception of those with gross sales in excess of $100,000, the larger the firm the higher the debt to asset ratio. Thus, larger farms have more debt in relative and absolute terms.

Concerns have been expressed in recent years about the relationship between debt utilization in agriculture and income and cash flow for debt servicing. Melichar notes that the current debt to asset ratio overstates the financial strength of the agricultural sector because it is based on appreciated asset values that may not have sufficient income generating capacity in the future to service the debt load. As Melichar notes, "increases in debt have recently been rising faster than capital formation." In fact, as Figure 3 indicates debt financing has increased dramatically in relation to net income or cash flow since 1970, thus setting the stage for severe liquidity, debt servicing and financial problems in the future if net farm income and cash flows decline. The recovery in farm income in 1979 is expected to reverse this trend, but concerns still remain.
Sources and Uses of Funds

Further insight into the financial health of agriculture and the relative importance of credit can be obtained from reviewing a sources and uses statement. Figure 4 summarizes aggregate data on sources and uses of funds in the farming sector for 1970, 1975, and 1979 with projections to 1985. The major sources of funds are net cash income from farm and nonfarm sources and net annual increases in the amount of farm debt outstanding. The major uses of funds are capital outlays for machinery, equipment, improvements to real estate and purchases of real estate from discontinuing proprietors, personal consumption and other cash expenditures. Of course, production expenses such as seed, fuel, fertilizer, chemicals, etc., would also be major uses of funds, but these items are paid for out of gross cash income. As Figure 4 illustrates, total uses of funds have been increasing rapidly from about $40 billion in 1970 to $90 billion in 1979, with a projection of $160 billion in 1985. However, the proportions of total uses represented by capital expenditures and personal consumption have remained fairly constant over time. In recent years, nearly 40 percent of total uses of funds have been for capital expenditures and just over 60 percent were for personal consumption and other miscellaneous uses of funds.

The data on sources of funds in Figure 4 indicate that farmers have become increasingly dependent on borrowed funds to finance their cash outlays for capital items and consumption expenditures. In 1970, net cash income from farm and nonfarm sources accounted for 94 percent of total sources of cash while the net flow of debt accounted for the remaining 6 percent. By 1979, net cash income accounted for only 81 percent of total sources of funds while debt represented 18 percent.
The projections indicate that, by the mid-1980's, the net flow of debt will represent over one-quarter of total sources of funds, and that agricultural lenders will be called upon to supply over $40 billion annually in net new loan funds—20 times as much as they furnished in 1970.

**Sources of Debt**

The sources of debt for agriculture can be conveniently classified as private, public, and cooperatives. As to the private sector, continued liquidity problems are being faced by rural commercial banks. To illustrate, the average loan-to-deposit ratio for banks in the seventh Federal Reserve District increased from 56.4% in the first quarter of 1975 to 67.3% in the first quarter of 1979.\(^{10}\) Commercial banks will continue to encounter difficulties in maintaining their market share of the loan volume because of increased competition for deposits from Savings and Loans and Credit Unions as well as legal lending limits. Insurance companies will continue to provide long term credit to agriculture, depending upon competitive rates in other industries. Policy loans will reduce the liquidity of insurance companies as long as interest rates remain high. Merchants and dealers will utilize credit as a marketing tool to merchandise their products, and will thus adjust credit to changing demand conditions for their inputs rather than the changing financial needs of farmers.

Undoubtedly, government-sponsored credit programs for farmers such as the Farmers Home Administration ownership, operating and emergency loan programs, the Small Business Administration disaster and other loan programs and the Commodity Credit Corporation will assist in solving some of the financial problems of farmers. These three government agencies had an
estimated $16.8 billion of debt outstanding on January 1, 1979, a three fold increase over 1976.\textsuperscript{11} Debt from these government agencies, particularly FmHA and SBA, is characterized by longer repayment terms than are typically available from conventional private and cooperative sources. Such longer-term loans are expected to better match the reduced repayment capacity of firms that have suffered financial stress. Certainly, extended terms from government agencies will assist in restructuring debt obligations, but such terms will not solve all problems and for some may only provide the time needed for an orderly liquidation.

As to the cooperative credit system, there is little reason to doubt that it will continue to strengthen its position in the agricultural credit market. In the nonreal estate market, the Farm Credit System increased its market share of loans to farmers from 16.6\% in 1968 to 23.8\% in 1979, whereas the market share of the System in the real estate market increased from 22.1 to 34.1 during the same 10 year period.\textsuperscript{12} Given the elasticity of the supply of funds, the mandate to service agriculture and related industries (and thus the limited competition to service other sectors of the economy), and the basic principles and concepts of a cooperative structure, continued growth in aggregate volume and market share is expected. This growth will probably be more predominate in the long-term market since the private banking sector will be aggressive competitors in the short term market. In fact one of the legitimate issues to be raised concerning the Farm Credit System is whether it is desirable for it to become the dominate long-term institutional lender to farmers. A key policy issue is how the Federal Land Bank will utilize this "market power".
Farmer's Equity

The balance sheet of the farming sector indicates that proprietor's equities have increased dramatically during the last decade. From 1969 to 1979, equities increased from $252.3 to $682.7 billion, an increase of 270%.

On a per farm basis, equity increased from $88,799 in 1970 to $258,970 in 1979, almost a three-fold increase during this nine year period.

Obviously, a substantial portion of this increase in equity is attributable to the gain in asset values, particularly real estate. In addition, Hughes has estimated that the nonfarm equity position of farm operator families is substantial. His estimates indicated that nonfarm assets "are second only to land in proprietor's asset holdings. In fact, they represent 20% of reported assets at the end of 1977. They also represent more in equity positions than is owed on all farm debt by all farm participants".

The balance sheet of the farming sector by value of sales class (Table 2) indicates the skewed distribution of assets and proprietors equities. Over one-quarter of the assets are controlled by farms with gross sales in excess of $100,000, while these farms represent only 6% of the total farms in the United States. Proprietors equities on farms with $100,000 or more gross sales are almost $1 million. Notice that even farms with gross sales less than $2,500 have average equity of close to $100,000.

Net worth or proprietors equities have grown rapidly in recent years in nominal terms. From 1970 to 1977, Table 3 indicates that the net worth of the farm business sector increased at a compound annual rate
of 12.3%. In comparison, the inflation rate in the general economy during this period was 6.2%, and the national growth rate in equity was 10.5%. Thus, farmers have fared better in equity growth than most other sectors of the economy in both real and nominal terms.

Intergenerational Transfers and Nonfarm Equity

With the rapid growth in the equity base of agriculture, a key concern of farmers and their lending institutions is the issue of maintaining that equity base during the process of intergenerational transfers. The estate tax reforms of recent years certainly reduce the potential equity drain from agriculture to pay estate taxes, but they do little to solve the potentially more serious problem of equity outflows to compensate nonfarm heirs during the intergenerational transfer process. With growth in firm size and the desire to maintain these larger farm units as "going concerns" beyond a single generation, the problem will become more acute. Certainly, the legal structure is available to encourage business continuity during the intergenerational transfer process (in particular, the corporation or even a properly structured partnership), but additional innovation in financial markets and instruments may be necessary to encourage the nonfarm heirs to maintain their equity interest in the farm firm. Utilizing a combination of debentures and stock in the capital structure of the corporation with the nonfarm heirs receiving debentures that generate a competitive rate of return and have a specified liquidation value holds promise, but other innovations may be needed. In any event the credit demands that will exist in the future to finance intergenerational transfers will be substantial and will significantly influence the debt-equity structure of many farm firms.
A related issue is that of nonfarm sources of equity capital for farmers. Many people abhor the infusion of nonfarm equity capital into agriculture, whether it be in the form of a large corporate entity buying and operating a farm or a local businessman, banker, or doctor buying farm real estate. Yet others claim that such nonfarm investment is beneficial to beginning farmers by maintaining the rental market for farmland, thus enabling smaller farmers to acquire a land base, obtain economies of size, and share risk with other equity investors.

The issues of nonfarm equity capital in farming can probably be most rationally analyzed if one focuses on the terms of trade and incentives provided to farmers and nonfarmers to acquire farm assets. In my judgment, public policy should attempt to eliminate any unique incentives that nonfarmers may have in comparison to farmers in purchasing agricultural assets—both groups should at a minimum have equal tax and other incentives for such purchases. Furthermore, policy should be structured to maintain a balance between the rights of owners and the rights of renters of agricultural assets. If "reasonable" terms of trade are maintained and artificial incentives eliminated, the issue of who owns the asset becomes less crucial although it is by no means eliminated entirely.

Farm Growth and Structure

The incentives for growth of the farm firm have been well documented. Economies of size encourage farm expansion (at least to a point of the minimum cost of production), and motivations to increase family income
encourage growth beyond the point of minimum cost since there is little evidence that the average cost curve is upward sloping with size. Opportunities to obtain quantity discounts in the purchasing of inputs, and possible higher prices for a large volume of higher quality products also encourage increases in size. Improved management skills enable operators to handle larger farms. Figure 5 indicates the current and projected size distribution of farms in the U.S.

In addition to the private incentives for growth, government programs, particularly price support programs and taxation policies, may have implications for growth as well as the relationship between capital gains compared to cash return on agricultural assets.

**Price Support Programs**

The impact of government price and income support programs on asset values, particularly land, has been well documented. Recent research completed at Iowa State University has analyzed the financial linkages and the cash flow implications of government support price programs as well as their impact on asset (land) values. The results of this research will only be briefly reviewed here.

The specific purpose of the Iowa State research was to evaluate proposals to index government support prices based on the cost-of-production. The results indicated (as expected) that with current price expectations and conservative inflation rates, the cost-of-production indexed support price mechanism could increase land prices dramatically within a short period of time. This increase occurs because of both the increased net income and the reduced risk and thus capitalization rate as the cost-of-production indexed support price places an increasingly higher floor under commodity prices. For example, land prices were driven upward by this support price
mechanism from the initial value of $1770 per acre to $7,000-8,000 per acre within 15 years, depending upon the price support parameters and the size of firm (and consequently economies of size) used in the analysis.

However, the distributional impacts of such programs are of most significance. Although all current land owners receive the benefit of the capital gain that results from higher priced land, the larger, high equity operator is the only one financially able to pay the higher price for additional land. Thus, the government support price program enables the larger, higher equity farm to expand more rapidly than the smaller, highly leveraged unit in terms of the land base. In essence, the government support price program improves the guaranteed cash flow of the larger compared to the smaller unit, and this combined with the lower debt servicing requirement and larger amount of uncommitted cash from current land holdings enables the larger farmer to expand his land base more rapidly, pay a higher price for the land, and still enjoy a higher level of consumption and family living. So the great majority of the benefits of such a cost-of-production indexed support price program go to the larger producers.

Tax Policies

Various changes in tax laws have been implemented in recent years, and the implications for capital gains in agricultural assets are now becoming apparent. For example, the 1976 Tax Reform Act included two major provisions that will influence the income and estate tax burden associated with rural real estate. The first provision calls for the valuation of land, for estate tax purposes only, based on its income generating capacity rather than market value. 18/ If certain qualifications
are met, land will be valued based on the value of cash rent minus property taxes capitalized by the Federal Land Bank interest rate on new loans. Five year historical averages are to be used in this capitalization procedure. Recent analyses in Iowa indicate that such a valuation procedure will reduce the value of land for estate taxation purposes by 50-60 percent. The special use value legislation is written to limit this procedure only to "bona-fide" farmers, but such restrictions will not completely eliminate the potential impact of this special tax treatment on the value of land. Farmers who can qualify additional purchases of real property for special use valuation will be willing to offer a higher price for real estate than other producers who will not qualify for the privilege, or who will be unable to take advantage of it until many years in the future. Consequently, the bid price for farm real estate would be expected to rise in the amount of the net present value of such tax benefits. Illustrative per acre benefits for different size estates are summarized in Table 4.

Because of the pre-death requirement that qualified property must be used for farming or other closely held business purposes for five of eight years preceding death, one could presumably not obtain the use valuation benefits of a current purchase for at least a minimum of five years. If a purchase of qualified real property is made with expectations of death in five years, the present value of the use valuation benefits total $238 per acre for the $500,000 estate (Table 4). With the $1,000,000 estate, the present value of the benefits for a death in five years totals $260 per acre. As the expected life increases, and thus more
years elapse between the purchase of the property and the date of death, the present value of the "use" valuation benefit declines. The benefits total $40-80 per acre if death is expected to occur 20 years following the purchase.

These figures indicate the per acre price premium that could be paid for real property that would qualify for "use" valuation. For a farmer with a life expectation of five years, the price premium of Table 4 amounts to as much as 12% of the fair market value of the land used in the analysis. Thus, it could be expected that with increasing age, farmers would be encouraged to move toward a greater investment in land and less investment in non-land assets. Those with a longer life expectancy would pay a smaller premium for the benefits of "use" valuation as indicated in Table 4. Thus, the "use" valuation legislation could enable older farmers to outbid younger farmers for a particular parcel of land based strictly on the value of the tax benefits each would receive. In general, the bid price for farm real estate would be expected to rise in the amount of the net present value of such tax benefits. This can only result in an increased divergence between the value of the land and its cash income generating capacity. If non-farm investors are also able to qualify for special use valuation treatment of land in their estates, additional upward pressure on land values would be expected.

A second set of regulations that may have an impact on land values capital gains and credit needs are the regulations on carry-over basis. The provisions of the 1976 Tax Reform Act require that property received by beneficiaries at a decedent's death will not be given a new income
tax basis at that time. Instead, the recipient of the property will take a "carry-over" basis—the income tax basis the property had in the decedent's estate while he owned it. At the time of a subsequent sale, tax will be due on the amount of the gain in the property as calculated by the market value of the property at the time of the sale minus the basis of the property adjusted for the gain that has accrued prior to December 31, 1976.\footnote{20} Although these rules have been moratoriumed until January 1, 1980, it appears that they or a tax on appreciation at death will take effect in 1980.

In essence, the new carryover basis rules would result in the accumulation of additional gain in property such as real estate that is expected to appreciate in value over time, and this gain will be taxed at a subsequent sale. If real estate continues to increase in value, a substantial gain and thus tax liability will also accrue so that recipients of property transferred at death may be reluctant to sell because of the large tax burden. This "locked-in" effect may result in reduced offerings of real estate on the market and more rental arrangements. With reduced offerings, values for property on the market may be bid up even further, and certainly different types of credit demands will exist to finance rental arrangements rather than real estate purchases. A tax on gain at death would not have this same effect since the tax would be paid before the heirs receive the property.

One might anticipate that a combination of the "carry-over basis" and "use valuation" rule could sufficiently discourage current land owners from transferring real property to non-family members so that a rather exclusive class of rural land holders would develop over the years. The
political and social implications of such a "landed gentry" are beyond the scope of this discussion, but such a land tenure system may not be in the best interests of the "family farm".

The Revenue Act of 1978, which increased the amount of net long-term capital gain that can be excluded from gross income from 50% to 60%, also will have an impact on capital gains in agriculture. In essence, this change reduces the tax obligation upon the sale of a qualified capital asset by 10%, thus increasing the after-tax return from such assets. Such a change in the tax regulations could again encourage buyers to pay more for qualified capital assets, particularly land, thus resulting in higher prices without an increase in the annual cash flow.

Structure Policy and Implications

The aforementioned discussion has significant implications for the ownership and control of agricultural assets, particularly real estate. The position that the Farm Credit System takes on such policies could be influential in determining future farm structure. Furthermore, policies of the Farm Credit System concerning loans and credit terms for nonfarm investors may also have important implications for structure and farm tenure arrangements. With the current national dialogue on the structure issue, it would seem important for the Farm Credit System to evaluate its policy concerning loan terms for various types of borrowers (beginning farmers, established operators, part-time farmers, non-resident foreign investors, nonfarm investors, etc.) to determine the impacts that such policy may be having on the ownership and control of farm assets and the structure of agriculture.
A further dimension of the structure question that has implications for the specific lending agencies of the Farm Credit System is the dimension of legal entity. With increased size of farm businesses and recent changes in tax laws, the corporate and partnership form of business organization will become much more common in the agricultural sector. Furthermore, limited partnerships, and various combinations of the corporate and partnership arrangement will be utilized. Farm firms of the future will have subsidiaries that are separate legal entities, including leasing corporations and nonagricultural businesses. The farm business may be organized with separate legal entities for the land (land holding corporation) and the machinery, and crop and livestock inventories (an operating corporation). Continued growth in the use of multiple legal entities and subsidiaries and multiple management is expected in the agriculture of the future.

The implications of such complex legal and economic structures are clear. Policies that do not implicitly or explicitly discriminate against such entities will be necessary if the Farm Credit System expects to service such entities. Such policies as personal guarantees for legal obligations of a corporate entity are just one example. Furthermore, loan officers will have to be much better versed in credit analysis and loan documentation. Few loan officers servicing the agricultural sector are now trained to evaluate and service loans to such complicated legal entities. They have not had the training in such areas as consolidating income statements and balance sheets from multiple entities including for example a land holding corporation, an operating corporation, a limited partnership that is feeding cattle, a leasing corporation, a subsidiary that owns a feed or machinery dealership and another subsidiary that is developing an office and professional complex in another state.
Risk

Earlier comments suggest that both business and financial risk have increased in recent years in agriculture. Business risk has increased because of wider fluctuations in commodity prices; financial risk has increased because of the larger debt servicing requirements compared to cash income. Note that the traditional concept of financial risk which relates debt utilization to equity may not be particularly useful in agriculture since the real concern is debt servicing capacity, and capital gain, the major source of equity increases, can be used to service debt only through refinancing. The increased risk in agriculture means that careful financial planning and risk management have become more important than ever.

Interest Rate Risk

Melichar has noted that although physical and product market risk have received the most attention in studies of risk in farming, "risk of adverse changes in farm input markets have become more prominent. And among these, the risks originating in financial markets—manifested as unanticipated adverse changes in the cost and availability of farm loans—are becoming more important." Melichar argues that risk originating in financial markets are manifested in two ways—changes in the availability of farm loans and interest rates. He indicates that with respect to the availability of farm loans, supplies of funds to farmers have not been drastically curtailed in the aggregate even during "credit crunches", although various institutions, particularly rural commercial banks, have encountered severe liquidity problems during such periods. As to
interest rates, evidence is mounting of "significantly increased
cyclical variability of rates at rural banks." With the increased
dependence of rural banks on money market certificates and other deposits
tied to national money market conditions, interest rate variability
is reflected in the cost of funds for farm borrowers.

With the variable rate interest plan, the Farm Credit system has
also transferred (in part) the risk of interest rate changes to their
borrowers. Thus, farmers are subject to more fluctuation in the cost
of debt, and with increased utilization of debt in comparison to the income
stream, the risk of repayment is substantially increased.

Melichar has argued further that because, in part, of variable
interest rates, "lending operations of financial institutions are no
longer quickly discouraged by the interest rate increases or monetary
restraint initially encountered during a business expansion. . . . loan
availability is maintained and borrowers who are enjoying higher sales
and profits are not likely to be significantly dissuaded from further
borrowing by moderate rate increases alone. Thus, the rapid build up of
debt now continues beyond the point at which it earlier would have been
slowed by problems of the lenders." In essence, Melichar argues that
variable rates may lead to credit overextension.

Concern about the risk encountered by lenders (or passed through to
borrowers through variable interest rates) can not be ignored by the Farm
Credit System. Farm Credit System agencies have a responsibility to
reduce the risk incurred by their borrowers from fluctuations in input
prices (i.e. credit). A recent study completed at Iowa State University
indicates the potential to reduce variability in debt cost for Federal Intermediate Credit Banks by appropriate participation in various bond maturities. The methodology developed utilizes standard portfolio theory commonly applied in asset management decisions, but applies it instead to the bond and note participation decisions of the Omaha Federal Intermediate Credit Bank. The results indicate the maturities that should be purchased to minimize risk (measured as the standard deviation in debt costs) for specified levels of debt cost, given stochastic projections of debt needs. Briefly the conclusions of this study suggest that a movement from low expected cost and high cost variance portfolios to higher expected cost but lower cost variance portfolios entails a shift from one-month discount notes to six-month bonds to nine-month bonds to term bonds. A projected increase in expected interest rates over the planning horizon will cause longer-term bonds to be used to lock in a low debt cost. A projected increase in expected interest rates over the planning horizon will cause longer-term bonds to be used to lock in a low debt cost. A projected decrease in expected interest rates will cause short-term bonds and notes to be used to take advantage of the decrease. However, the specific maturities used depend upon the duration of the movement and variance level. The long-term activities used at lower variances will be term bonds; long-term activities at higher variances will be nine-month bonds. Short-term activities used at lower variances will be nine-month and six-month bonds; short-term activities at higher variances will be discount notes.

As expected, the addition of policy constraints results in higher expected debt cost at each level of variance. With a most probable
forecast of debt cost, expected cost was $5 to $8 million higher with policy constraints; with a recession forecast, expected cost was $2 to $3 million higher. The impact of policy limits was greater for the most probable forecast of debt cost because the debt policy constraints limited the extensive use of a low-cost term bond and there was no other long-term bond to serve as a replacement. With the recession forecast the use of the discount notes was constrained, but they were replaced at a small penalty cost with six-month and nine-month bonds. The policy constraints limited the high levels of variance (cost risk) that the bank could be exposed to with the recession forecast of interest rates by limiting the use of discount notes. Unfortunately, they also eliminated alternative low variance solutions as well.

It is impossible to compare the solution results for 1979-1981 to past financing activities of the Omaha FICB because of the transition to System-wide securities which were included in the model but were not completely available to the Bank before 1979. However, with the coefficient values used in the model, it would appear that more extensive usage of both long-term bonds and discount notes should occur. The nine-month and six-month bonds are very similar as to expected costs, variance-covariance, and duration. It therefore appears that they are good substitutes for each other, depending upon funding needs of the Bank and relative costs. Concern about risk in debt cost may also lead the Farm Credit System to investigate more thoroughly the potential use of financial futures markets to reduce interest rate and debt cost variability.
Refinancing

If the cash flow is insufficient to meet current debt servicing obligations, one of the common solutions is to refinance accumulated short-term obligations on a long-term payout using land equity as security. Such refinancing arrangements are not uncommon—in 1978, 20% of the funds advanced by the Omaha Federal Land Bank were used to refinance short-term debt obligations.\textsuperscript{26} If land equity is available for refinancing, such an arrangement is typically in the best interests of both the borrower and lender. However, caution should be noted with respect to the concept of refinancing short-term debt on the basis of equity in long-term assets that has accrued through appreciation. An equity base that has accrued primarily from appreciation in asset values may not provide a very solid base for debt servicing. This may particularly be the case when the equity is returning only a 3-4 percent cash return (based on current market value) and the cash required for repayment totals 9-11 percent for interest and 2-3 percent for principal. Furthermore, an attitude for liberal extension of short-term credit because of the "cushion" provided by the equity based in long-term assets due to appreciation can present severe problems if land values would decline and the equity base would shrink. The "cushion" may disappear and even if it does not disappear the ability of this "cushion" to service debt by generating cash flow may be severely limited.

Risk Management Strategies

A comment should be made concerning risk management strategies that can be used in agriculture. One might classify such strategies into three categories: 1) production strategies including such common
arrangements as product diversification, flexibility in machinery and facility investments and maintaining a low proportion of total costs as fixed costs, 2) marketing strategies including such options as spreading sales, forward contracting and hedging, and 3) financial strategies which include using the appropriate balance of short, intermediate and long-term debt, as well as maintaining the appropriate overall leverage position.

It should be emphasized that debt structure is as important as total debt utilization in managing risk since it has significant implications for cash flow and annual debt servicing requirements of the farm business. Consequently, it is increasingly important for short-term lenders to coordinating their lending program with the debt servicing requirements of the long-term lender and vice versa. The implications for integrated lending programs of the Farm Credit System agencies are apparent. In addition to its many other unique dimensions, the Farm Credit System is the only major institutional lender that offers operating, intermediate-term and long-term debt to farmers. With increasing concern about debt structure, Farm Credit System agencies may be missing numerous opportunities, and even increasing the risk of their borrowers, by not offering an integrated package of total debt services properly structured to match the cash flow of the farm business.

With respect to production and marketing strategies to reduce risk, a recent study at Iowa State University that analyzed the benefits of marketing strategies such as hedging may be of interest. The purpose of the study was to determine if hedging programs for grain and livestock could be utilized by the Midwest cattle feeder to reduce the risk encountered in his farm operation without significantly decreasing his return.\textsuperscript{27} The results indicate that the introduction of more sophisticated
marketing activities such as hedging has several effects upon farm organization. The most obvious is that it allows more aggressive investment and production strategies. At comparable solutions, from 12 to 75 more acres are purchased by a typical farmer feeder in Northwest Iowa throughout the planning horizon and farm acreage is never smaller when hedging strategies are available. At high levels of risk aversion, the added marketing activities allow up to 50 percent more acres to be farmed. The higher acreages farmed allow a farmer to produce more cash grain crops. Furthermore, due to the larger investments in land as well as greater crop and livestock production, more credit is used when hedging strategies are available. At higher levels of risk aversion, as much as 55 percent more money is borrowed (over four years) when hedging strategies are used and yet the variability of net worth is reduced.

Finally, the additional marketing strategies provide more benefits in managing risk for highly risk averse farmers than they do for those more indifferent to risk. For example if hedging is used a highly risk averse farmer could obtain a 5.4 percent increase in ending net worth and a 14.1 percent reduction in the standard deviation of net worth. In contrast, at higher risk solutions—hedging results in a 4.2 percent higher net worth but the standard deviation is lowered only 3.8 percent.

Conclusions

The future financial structure of agriculture suggests larger capital requirements, more financial risk, increased disparity in
income, repayment capacity, and growth potential of various farm firms and more complex legal and business organizations. The policies of the Farm Credit System must continually be revised to serve this changing agriculture, and employees of the System must be trained to evaluate and monitor the financial performance and tailor loan terms to firms that are not only larger and more complex, but may even include extensive activities outside the production sector. As to public policy, the Farm Credit System has an opportunity (and obligation) to participate in the national dialogue concerning the future structure of agriculture and rural communities.
Figure 1: Per capital disposable income of the farm population as a percent of the per capita disposable income of the nonfarm population.

Figure 2. Net income per farm operator from farm and nonfarm sources, 1977.

Figure 3. Debt Financing Compared with Income Flows

A. Farm cash flow, net income, and increase in debt

Figure 4. Sources and uses of funds.

Figure 5. Number of farms by sales class.

Table 1. Annual rate of return on total investment in common stocks, long-term government bonds and in farm production assets. (Current market valuation of assets)

<table>
<thead>
<tr>
<th>Year</th>
<th>Return from annual income</th>
<th>Return from capital gains or losses a</th>
<th>Total return</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Common stock</td>
<td>Long-term U.S. bonds</td>
<td>Farm production assets</td>
</tr>
<tr>
<td>Annual average</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960-64</td>
<td>3.20</td>
<td>4.00</td>
<td>3.48</td>
</tr>
<tr>
<td>1965-69</td>
<td>3.18</td>
<td>5.01</td>
<td>4.24</td>
</tr>
<tr>
<td>Annual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>3.83</td>
<td>6.59</td>
<td>4.20</td>
</tr>
<tr>
<td>1971</td>
<td>3.14</td>
<td>5.74</td>
<td>3.98</td>
</tr>
<tr>
<td>1972</td>
<td>2.82</td>
<td>5.63</td>
<td>5.43</td>
</tr>
<tr>
<td>1973</td>
<td>3.06</td>
<td>6.30</td>
<td>9.79</td>
</tr>
<tr>
<td>1975</td>
<td>4.32</td>
<td>6.98</td>
<td>5.19</td>
</tr>
<tr>
<td>1976</td>
<td>3.77</td>
<td>6.78</td>
<td>3.61</td>
</tr>
<tr>
<td>1977</td>
<td>4.56</td>
<td>7.06</td>
<td>3.33</td>
</tr>
<tr>
<td>1978 a</td>
<td>5.28</td>
<td>7.89</td>
<td>4.49</td>
</tr>
</tbody>
</table>

Coefficient of Variation in Annual Rate of Return

|                           | 18.9 | 23.5 | 33.9 | 281.8 | 216.1 | 63.8 | 156.0 | 175.7 | 50.6 |

a Returns from value change reflect primarily unrealized capital gains
b Preliminary.

Table 2. Balance sheet of the farming sector by value of sales class, January 1, 1978.

<table>
<thead>
<tr>
<th>Item</th>
<th>1A</th>
<th>1B</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>All farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>$100,000 and over</td>
<td>176,150</td>
<td>118,310</td>
<td>70,986</td>
<td>42,591</td>
<td>28,920</td>
<td>25,239</td>
<td>63,624</td>
<td>525,820</td>
</tr>
<tr>
<td>and under $99,999</td>
<td>11,536</td>
<td>7,530</td>
<td>4,394</td>
<td>2,562</td>
<td>1,762</td>
<td>1,556</td>
<td>2,612</td>
<td>31,952</td>
</tr>
<tr>
<td>Total</td>
<td>23,548</td>
<td>22,911</td>
<td>7,637</td>
<td>3,182</td>
<td>1,909</td>
<td>1,273</td>
<td>3,182</td>
<td>63,642</td>
</tr>
<tr>
<td>1A</td>
<td>23,548</td>
<td>22,911</td>
<td>7,637</td>
<td>3,182</td>
<td>1,909</td>
<td>1,273</td>
<td>3,182</td>
<td>63,642</td>
</tr>
<tr>
<td>1B</td>
<td>20,968</td>
<td>13,808</td>
<td>10,229</td>
<td>2,557</td>
<td>1,934</td>
<td>1,021</td>
<td>1,023</td>
<td>51,147</td>
</tr>
<tr>
<td>2</td>
<td>1,697</td>
<td>1,589</td>
<td>682</td>
<td>310</td>
<td>130</td>
<td>54</td>
<td>45</td>
<td>4,489</td>
</tr>
<tr>
<td>3</td>
<td>46,195</td>
<td>38,308</td>
<td>18,548</td>
<td>6,049</td>
<td>3,573</td>
<td>2,348</td>
<td>4,252</td>
<td>119,273</td>
</tr>
<tr>
<td>4</td>
<td>190,451</td>
<td>127,366</td>
<td>78,074</td>
<td>51,259</td>
<td>35,434</td>
<td>31,271</td>
<td>79,837</td>
<td>593,692</td>
</tr>
<tr>
<td>5</td>
<td>236,646</td>
<td>165,674</td>
<td>96,622</td>
<td>57,308</td>
<td>39,007</td>
<td>33,619</td>
<td>84,089</td>
<td>712,965</td>
</tr>
<tr>
<td>6</td>
<td>236,646</td>
<td>165,674</td>
<td>96,622</td>
<td>57,308</td>
<td>39,007</td>
<td>33,619</td>
<td>84,089</td>
<td>712,965</td>
</tr>
<tr>
<td>Percent</td>
<td>19.5</td>
<td>23.1</td>
<td>19.2</td>
<td>10.6</td>
<td>9.2</td>
<td>7.0</td>
<td>5.1</td>
<td>16.7</td>
</tr>
<tr>
<td>1A</td>
<td>823,131</td>
<td>305,711</td>
<td>204,571</td>
<td>142,445</td>
<td>102,918</td>
<td>89,819</td>
<td>73,724</td>
<td>196,789</td>
</tr>
<tr>
<td>1B</td>
<td>53,907</td>
<td>19,457</td>
<td>12,663</td>
<td>8,569</td>
<td>6,270</td>
<td>5,537</td>
<td>5,027</td>
<td>11,958</td>
</tr>
<tr>
<td>2</td>
<td>100,463</td>
<td>52,832</td>
<td>32,496</td>
<td>21,371</td>
<td>14,982</td>
<td>11,502</td>
<td>9,407</td>
<td>20,064</td>
</tr>
<tr>
<td>3</td>
<td>47,079</td>
<td>20,377</td>
<td>10,395</td>
<td>5,408</td>
<td>2,832</td>
<td>1,416</td>
<td>576</td>
<td>9,310</td>
</tr>
<tr>
<td>4</td>
<td>14,911</td>
<td>9,269</td>
<td>5,689</td>
<td>5,064</td>
<td>4,858</td>
<td>4,865</td>
<td>4,899</td>
<td>6,157</td>
</tr>
<tr>
<td>5</td>
<td>25,098</td>
<td>8,548</td>
<td>4,839</td>
<td>3,632</td>
<td>3,363</td>
<td>3,626</td>
<td>3,386</td>
<td>6,112</td>
</tr>
<tr>
<td>6</td>
<td>3,117</td>
<td>1,894</td>
<td>1,337</td>
<td>1,284</td>
<td>1,166</td>
<td>1,491</td>
<td>1,580</td>
<td>1,652</td>
</tr>
<tr>
<td>Total</td>
<td>1,105,822</td>
<td>428,098</td>
<td>278,451</td>
<td>191,666</td>
<td>138,815</td>
<td>119,641</td>
<td>97,437</td>
<td>266,829</td>
</tr>
<tr>
<td>Percent</td>
<td>19.5</td>
<td>23.1</td>
<td>19.2</td>
<td>10.6</td>
<td>9.2</td>
<td>7.0</td>
<td>5.1</td>
<td>16.7</td>
</tr>
</tbody>
</table>

Table 3. Net worth of selected sectors of the U.S. economy.a/

<table>
<thead>
<tr>
<th>Year</th>
<th>Farm business sector</th>
<th>Nonfarm noncorporate business</th>
<th>Nonfinancial corporate business</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-Billion dollars-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>244.9</td>
<td>368.7</td>
<td>478.8</td>
<td>3160.9</td>
</tr>
<tr>
<td>1971</td>
<td>264.0</td>
<td>377.0</td>
<td>508.7</td>
<td>3354.4</td>
</tr>
<tr>
<td>1972</td>
<td>296.2</td>
<td>408.6</td>
<td>541.3</td>
<td>3675.5</td>
</tr>
<tr>
<td>1973</td>
<td>372.6</td>
<td>464.0</td>
<td>584.7</td>
<td>4184.5</td>
</tr>
<tr>
<td>1974</td>
<td>408.2</td>
<td>530.9</td>
<td>648.7</td>
<td>4768.3</td>
</tr>
<tr>
<td>1975</td>
<td>458.5</td>
<td>578.6</td>
<td>709.4</td>
<td>5257.3</td>
</tr>
<tr>
<td>1976</td>
<td>517.7</td>
<td>623.5</td>
<td>775.2</td>
<td>5783.2</td>
</tr>
<tr>
<td>1977</td>
<td>552.6</td>
<td>689.5</td>
<td>828.9</td>
<td>6367.0</td>
</tr>
</tbody>
</table>

-percent-

Annual compound rate of growth: 12.3  9.3  8.1  10.5

a/Source: Division of Research and Statistics, Board of Governors of the Federal Reserve System.

Table 4. Value of Benefits from "Use" Valuation Per Acre of Land

<table>
<thead>
<tr>
<th>Net Worth</th>
<th>Benefits Per Acre</th>
<th>Present Value of Benefits (8%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Assuming Death in:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 years</td>
</tr>
<tr>
<td>$250,000</td>
<td>$200</td>
<td>$136</td>
</tr>
<tr>
<td>500,000</td>
<td>349</td>
<td>238</td>
</tr>
<tr>
<td>1,000,000</td>
<td>382</td>
<td>260</td>
</tr>
<tr>
<td>1,500,000</td>
<td>303</td>
<td>206</td>
</tr>
<tr>
<td>2,000,000</td>
<td>247</td>
<td>168</td>
</tr>
<tr>
<td>2,500,000</td>
<td>208</td>
<td>142</td>
</tr>
</tbody>
</table>

Footnotes


4/ Lee, et.al, op. cit., Chapter 1.

5/ It is not altogether clear that the returns from these two sources are additive, but certainly unrealized capital gains have some current value as a source of equity growth.


9/ Lee, et. al. op. cit., Chapter 1.


12/ Evans, op. cit., pp. 10-12.


14/ Ibid, p. 3.


18/ I.R.C. § 2032A.

19/ I.R.C. § 1023

20/ Other adjustments are also allowed, see I.R.C. § 1023.

21/ Revenue Act of 1978.


