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# An Empirical Analysis of Dairy Farm Reinvestment Versus Tax-Deferred Plans for Retirement Income

Loren W. Tauer

This study empirically compares the retirement values of dairy farm investments to tax-deferred retirement investments that are funded with bank certificates of deposit or common stock. For a successful dairy farm, the results indicate that tax-deferred retirement plans that generate rates of return similar to certificates of deposit or common stock mutual funds are probably not as good an investment as reinvesting farm earnings back into the farm business.

Farmers looking towards retirement may establish and invest in tax-deferred retirement plans. This entails foregoing either alternative investments or current consumption. For many farmers, the alternative investment foregone is additional investment in the farm business. To decide whether to invest in a tax-deferred retirement plan or to make additional investment in the farm business, a farmer must consider the likely outcomes of the investors under relevant rates of return, taxes, and investment duration. Because the possible performance of these investments would be useful to farmers contemplating investments, this study uses empirical data to assess the financial performance of a dairy farm investment compared to tax-deferred retirement plans.

Although various researchers have analyzed the entry, growth, and exit processes of farmers, very few have empirically measured investment returns for retirement. Lee and Brake studied the process of converting farm assets to alternative investments and income during the retirement years. Because their study covered a period of relatively low farmland prices and returns, they recommended higher return, more liquid investments than farmland for retired farmers. Spence and Mapp developed a stochastic simulation model which can be used to evaluate investment opportunities available to retiring farm

operators who have not participated in pre-retirement planning. Both of these studies focused on disinvestment from farming during retirement rather than investing for retirement. Acker, Wright, and Harrison numerically analyzed the value of farmland investment, nontax-deferred investments, and tax-deferred retirement plans for retirement income under various assumed return and tax rates. Their analysis did not empirically assess these investments under historical return rates. Tauer demonstrated how to calculate the retirement value of alternative investments given stated return and tax rates, but did not empirically assess alternative investments.

## Investments for Retirement Income

There are two tax-deferred retirement plans available to a noncorporate farmer. There are the Keogh or HR-10 plan and the Individual Retirement Account plan (IRA). Either plan permits a farmer to place a portion of his current farm earnings into a restricted fund for retirement. The annual amount deposited in a Keogh plan is currently limited to the lesser of 15 percent of earned income or \$15,000 (defined contribution plan). The annual maximum for an IRA is currently the lesser of 100 percent of earned income or \$2,000. The amount deposited is excluded from taxable income the year for which the deposit is made. In addition, the earnings from the retirement plan are not taxed as they accrue. However, when the retirement fund is liquidated, the entire amount of the fund is subject to taxation.

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Additional investment in a farm business will generate current income and price appreciation. Current income will be taxed each year it is earned, but in farming, some current income often receives capital-gain taxation treatment. An example is the income from the sale of qualified breeding livestock. Price appreciation accumulates each year and increases the value of the farm investment, but it is not taxed until the investment is sold and then it is often capital gain. Farm investment is not deducted from taxable income the year of investment except for some inventories (cash basis farmer). Depreciable property is deducted as a depreciation allowance over a period of years. Some types of farm investments receive investment tax credit which reduces taxes the year of investment.

### Empirical Analysis

To analyze a farm investment versus a tax-deferred retirement plan, the following hypothetical situation is used. A dairy farmer, age 55, has developed his farm business to where it will comfortably support his family by reinvesting all savings into the business by the purchase of land, buildings, equipment, dairy cows, and other farm property. At this point in his life he wants to compare the two alternatives of continuing this annual farm reinvestment or reducing it by \$1,000 a year and placing that \$1,000 annual income into a tax-deferred retirement account for a ten-year duration. At age 65, the farmer will liquidate either investment as a lump sum.<sup>1</sup> The formulas used to calculate the future after-tax value of these two series of investments are those formulated in Tauer, except that the annual investment variables were allowed to change for each of the 10 years. The investment decision is made during 1980 so the relevant tax code in effect at that time was used as the expected tax treatment for the ten-year period. The 10 years of return rates for the farm investment and tax-deferred retirement plan required by the formulas were obtained from historical performance data under the assump-

<sup>1</sup> In reality the investments may be liquidated gradually through sales or an annuity, and generate additional income. However, the purpose of this analysis is not to determine the optimal disinvestment strategy which would be unique for each farmer. If the after-tax lump sum of an investment is more valuable than the after-tax lump sum of an alternative investment, it is likely that its annuity, gradual sale, or installment sale will also be more valuable.

tion that these return rates can occur during 1980 to 1990.

To obtain the farm investment return rates, a sample was drawn from participants in the New York Dairy Farm Business Summary. Selected counties were drawn from various regions of the state, and 27 participants who had participated in the Summary for any 10 consecutive years during the period 1964 to 1978 were selected from these counties. This provided 27 observations of various ten-year segments which encompass poor and good years for dairy farmers.

The Farm Summary data include information on receipts, expenses, and assets. In the earlier years, no data on liabilities were available. Thus, percent return was calculated as return to assets rather than return to equity. Return to equity could be either higher or lower than return to assets for a leveraged farmer. Percent return was calculated as it was calculated in the early years' New York Farm Business Summaries (Bratton and LaDue), but for this study was separated into the three components necessary in the investment formula—current income return, current capital gain return, and appreciation return.<sup>2</sup> These were average returns from the entire farm investment and not marginal returns from the last \$1,000 invested, which could not be calculated.<sup>3</sup>

Cash livestock sales were separated from farm income and were treated as capital gain income. Because no tax basis data on livestock were available, it was initially assumed that all livestock were raised and thus had a zero tax basis. In a revised analysis, all livestock sales were treated as ordinary income. Both capital gain and ordinary income were divided by beginning total farm assets to ob-

<sup>2</sup> Cash expenses before 1971 included capital expenditures rather than depreciation, but depreciation was implicit in net accrual farm income because inventory values included the ending market value of any capital expenditures made during the year. Explicit machinery and real estate depreciation were available after 1971. Interest was not included as an expense since return to assets was calculated. The value of the operator's and the family's unpaid labor, which was standardized for all participants before 1973 but was estimated by each participant after 1972, was subtracted from net farm income so that only returns to investment remained.

<sup>3</sup> With an optimal unconstrained investment, marginal return should be equal to or less than average return. However, a study completed during the data period, using synthesized farms, indicated economies of size in dairy farming (Buxton and Jensen). This would suggest that marginal returns from dairy farms operating under a capital constraint could be higher than average returns.

tain percent returns. Real estate value increases from the ending to the beginning balance sheet were divided by total beginning farm assets to obtain an appreciation rate for pre-1973 data. Real estate appreciation had been explicitly estimated by participants since 1973. Some farmers putting money into a retirement plan, especially only \$1,000 a year, may not be unduly curtailed in their purchase of additional real estate. Thus, an analysis was also completed with no appreciation on the farm investment since that appreciation would then not be an opportunity cost against the retirement plan.

Yearly new investments in machinery and purchased livestock were divided by total new investment in farm assets to arrive at the fraction of new investment that qualified for federal investment credit. This procedure assumes that all machinery and purchased livestock qualify for full investment credit. This assumption is later relaxed to examine its sensitivity. Investment tax credit was not claimed on farm investments made the last two years of the 10-year period, and only one-third and two-thirds of the investment qualified during the eighth, seventh, and then fifth, sixth years, respectively.

Yearly income tax rates (using 1980 tax rates) were obtained by determining the tax bracket for the net farm income of each year minus the standard deduction and two personal exemptions. There was no information to calculate itemized deductions. The tax rate used to calculate the after-tax retirement value was the average tax rate of the five years before retirement, since a farmer can always income average using the current and previous four tax years.

The state average total return to assets for the Summary participants for the years 1964 to 1978 was 7.6 percent. The average for the sample during this period was 12.6 percent. (The average ordinary income rate of return for the group was 4 percent, the average annual capital gain return was 4.5 percent, and the average appreciation rate was 4.1 percent. The average tax rate for the group was 21 percent, and 68 percent of their new farm investment on average qualified for investment tax credit.) Thus, it appears that the 27 sample farms as a group had greater returns than the average of the Summary participants. The only readily available measure of dispersion for the Summary participants is the information that the top ten percent farms had a total

average return of 16.5 percent for the years 1964 to 1972, compared to 8.8 percent for the state average, and 11.6 percent for the sample average. Assuming a normal distribution, this would place the sample farms in the quartile above the mean, and thus better than average. Yet, it may be that the farmers with higher returns are the only farmers who have excess funds to consider alternative investments. Farmers with low return rates may find that they have no alternative but to reinvest all available earnings back into the farm to maintain it as a viable business.

In rural areas, tax-deferred retirement plans are available through local financial institutions, life insurance companies, and brokerage firms. The most prevalent and possibly the widest used are tax-deferred plans sponsored by local commercial banks. The banks generally establish these plans to invest in small denomination certificates of deposit. In the 1960s and 1970s, these certificates were subject to interest rate ceilings. These ceilings are being phased out during the early 1980s. Thus, rather than use rates that may have been subjected to a ceiling rate of interest which will not apply in the future, it was decided to use the competitive \$100,000 certificate of deposit, whose rate was determined by unrestricted market demand and supply, and is more indicative of future rates on all deposits.

An alternative investment for a Keogh or IRA is a common stock mutual fund. Twenty-seven mutual funds, whose objective is growth and current income, were randomly selected from a listing of common stock funds that have IRA and Keogh plans. The listing and annual returns for each of the funds were obtained from the Wiesenberger Investment Companies Service, which computes and publishes annual returns for most mutual funds. The annual return is the percent change in net assets per share with any capital gains and income dividends added back in.

To compute the retirement investment outcome, \$1,000 minus any sales charge was added each year to previous deposits and accumulated interest or earnings. The return rates on both tax-deferred plans were collected for concurrent 10 years as the farm return data for each of the 27 farmers. At the end of the ten-year investment period, income taxes were paid on the lump-sum amount in the fund. The tax rate used was again the farmer's average tax rate during the previous five years.

## Empirical Results

The empirical results are shown in Table 1. The average value of the farm investment for the 27 farmers was \$15,644. The average for the bank CD tax-deferred investment was \$10,560, or \$5,084 less. The average for the stock mutual fund tax-deferred investment was \$8,664, or \$6,980 less than the farm investment and \$1,896 less than the bank CD tax-deferred investment. For each farmer, the farm investment was a better alternative than the mutual fund tax-deferred investment, and the farm investment was a better alternative than the bank CD tax-deferred investment for 25 of the 27 farmers.

Stochastic dominance testing of investments permits the comparison of distributions of outcomes rather than merely comparing averages. Elimination of an investment by first-degree stochastic dominance means that investment would be disliked by an individual who prefers more wealth to less wealth. Elimination of an investment by second-

degree stochastic dominance means that investment would be disliked by an individual who is risk averse (Anderson, Dillon, and Hardaker).

A stochastic dominance comparison of the empirical distributions of the farm investment and retirement plans indicates that the farm investment dominates both tax-deferred investments by first-degree stochastic dominance, and thus by second-degree stochastic dominance. The bank CD tax-deferred investment also dominates the stock mutual fund tax-deferred investment by first- and second-degree stochastic dominances.

When appreciation was removed from the farm investment its average value fell from \$15,644 to \$12,064 (Table 1). Yet, the farm investment was still a better alternative than the bank CD tax-deferred investment for 22 (rather than 25) of the 27 farmers. The farm investment still dominates both tax-deferred investments by first-degree stochastic dominance and thus by second-degree stochastic dominance.

**Table 1. The After-Tax Values of a Farm Investment and Tax-Deferred Investments After 10 Years of \$1,000 Annual Contributions for 27 Dairy Farms**

Farm Number	Farm Investment	Farm Investment with No Appreciation	Bank CD Tax-Deferred Investment	Common Stock Mutual Fund Tax-Deferred Investment
1	\$10,043	\$ 7,204	\$12,563	\$ 7,676
2	10,117	8,752	6,952	5,085
3	11,871	9,961	10,782	7,767
4	12,113	10,696	10,534	10,502
5	12,309	10,430	10,073	8,565
6	12,452	9,600	7,866	5,991
7	12,575	11,566	7,214	8,997
8	12,927	9,290	12,952	10,281
9	13,558	11,729	10,923	9,981
10	13,647	12,197	9,053	8,329
11	14,198	11,331	10,394	7,303
12	14,345	11,656	10,073	7,345
13	15,684	10,362	11,518	13,706
14	15,742	12,070	12,307	12,548
15	15,943	12,954	9,619	9,832
16	16,128	14,136	10,675	10,249
17	16,784	12,216	11,813	7,707
18	17,033	12,856	10,073	9,549
19	17,372	12,710	9,647	8,327
20	18,013	13,356	12,140	7,307
21	18,532	12,120	10,624	11,766
22	19,423	13,164	11,671	9,168
23	19,446	16,237	8,046	5,117
24	19,663	16,199	12,004	8,254
25	19,926	14,264	11,716	5,935
26	20,094	14,812	11,883	9,946
27	22,447	13,854	11,999	6,684
Average	\$15,644	\$12,064	\$10,560	\$ 8,664

These results indicate that successful dairy farmers who prefer more wealth should invest farm earnings back into the farm business rather than into a tax-deferred retirement plan. The reasons are that dairy farming is generally profitable for this group of farmers, it benefits from tax-deferment because of capital appreciation, and it shelters some income from income taxes because of investment tax credit and capital gain taxation.

The preceding analysis assumed that all livestock and machinery purchases qualified for investment tax credit, and all livestock sales and farm appreciation qualified for capital gain taxation. To examine sensitivity to these assumptions, they were completely relaxed by eliminating both investment tax credit and capital gains taxation preference treatment. The value of the tax-deferred investments did not change. The value of the farm investment with appreciation included dropped as expected, but the drop was relatively small. The average value of the farm investment dropped from \$15,644 to \$13,668. Yet, stochastic dominance tests indicate that the farm investment still dominates both tax-deferred investments by first- and second-degree stochastic dominance. However, the farm investment without appreciation, with an average value of \$10,885, does not dominate the CD tax-deferred investment by stochastic dominance and thus a farmer would be indifferent between the two investments.

One selling point for tax-deferred investments is that a taxpayer may be in a lower tax bracket when he retires, thus reducing the taxes paid on the tax-deferred investment. To measure the maximum impact of a lower tax bracket at retirement, the retirement income tax rate for each farmer in the analysis was set to zero. The effect is to substantially increase the after-tax values of the tax-deferred investments, but to only marginally increase the after-tax value of the farm investment. Much of the farm investment return had been taxed before retirement, and the farm appreciation had received capital gain preference treatment, resulting in lower taxes. The average value of the farm investment for the 27 farmers was \$15,958. The average for the bank CD tax-deferred investment was \$14,116, or \$1,842 less. The average for the stock tax-deferred investment was \$11,601, or \$4,357 less than the farm investment. Although the average was greater for the farm investment, its probability distribution does not dominate

the distribution of the CD tax-deferred investment by either first- or second-degree stochastic dominance. The farm investment, however, does dominate the stock tax-deferred investment. Thus, with a zero tax rate at retirement, the farm investment cannot be preferred over the CD tax-deferred retirement plan or vice versa based on this decision criterion, but the farm investment and the CD tax-deferred investment can both be preferred over the stock tax-deferred investment. If appreciation is not measured on the farm investment, the CD tax-deferred investment does dominate the farm investment by second-degree stochastic dominance. The CD tax-deferred investment would then be preferred by risk averse farmers.

### Summary and Conclusions

This study empirically compared the retirement values of dairy farm investments for relatively successful dairy farmers to tax-deferred retirement investments that were funded with bank certificates of deposit or common stock. Under most situations, the dairy farm investment outperformed the tax-deferred investments. This was the case even without the benefits of investment tax credit or capital gain taxation treatment for farm investments. However, if the income tax rate of a farmer approached zero at retirement, there was no clear choice between the farm investment and the bank CD tax-deferred retirement plan, although both were preferred over the common stock mutual fund tax-deferred investment. Even with no appreciation of the farm investment, it still outperformed the tax-deferred investments unless the benefits of investment tax credit and capital gain taxation treatment were removed, in which case there was no clear choice between the farm investment and the bank CD tax-deferred retirement plan. If the income tax rate at retirement is zero, a risk averse farmer would prefer the bank CD tax-deferred plan over both the farm investment with no appreciation and the common stock tax-deferred mutual fund.

For a successful commercial dairy farm, the results indicate that tax-deferred retirement plans that generate rates of return similar to certificates of deposit or common stock mutual funds are probably not as good an investment alternative as reinvesting farm earnings back into the dairy farm business. Al-

though this study not only analyzed dairy farm investment, many other farm types were at least as profitable as dairy farms during the analysis period. Thus, it is probable that other types of farmers may also fare better by reinvesting in their farms rather than in retirement plans.

## References

- Acker, D. L., P. L. Wright, and G. A. Harrison. "Tax Sheltered Retirement Plans or Farm Investments," North Central Regional Extension Publication No. 55, 1978.
- Anderson, J. R., J. L. Dillon, and B. Hardaker. *Agricultural Decision Analysis*, The Iowa State University Press, Ames, Iowa, 1977.
- Bratton, C. A., and E. L. LaDue. "1966 Dairy Farm Business Summary," A.E. Res. 222, Department of Agricultural Economics, Cornell University, July 1967.
- Buxton, B. M., and H. R. Jensen. "Economics of Size in Dairy Farming," University of Minnesota Agricultural Experiment Station Bulletin 488, 1968.
- Lee, W. F., and J. R. Brake. "Conversion of Farm Assets for Retirement Purposes," Research Report 129, Michigan Agricultural Experiment Station, January 1971.
- Spence, L. C., and H. F. Mapp, Jr. "A Retirement Income Simulation Model for Farm Operators," *Southern Journal of Agricultural Economics* 8(1), July 1976.
- Tauer, L. W. "Calculating the Values of Alternative Investments for a Farmer's Retirement," *North Central Journal of Agricultural Economics* 3(2), July 1981.
- Wiesberger Investment Companies Service, A Division of Warren, Gorham and Lamont, Inc., New York, New York.