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How Do the Risks and Returns in Farming Compare to Other Investments?

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Farmers and investors have typically argued that the rate of return on agricultural investments is not competitive with other alternatives. Conventional wisdom is that farmers must place a relatively high value on the lifestyle and independence associated with their profession, because the economic rewards are not commensurate with what they could receive elsewhere. This article examines these claims by comparing the economic rates of return and the risks of investing in farm assets with those of eight alternative investments, such as stocks, mutual funds and bonds.

The available data for 1960-1988 indicate that the total rates of return on farm assets were comparable to those generated by investments in equity forms of financial assets (e.g., stock and mutual funds) and provided higher average before-tax rates of return than selected debt instruments (e.g., bonds, commercial paper and certificates of deposit). In addition, the relative variability of average farm asset returns was found to be lower than that of stocks, mutual funds and bonds during this period.

Alternative Investments

Two farm and eight nonfarm investments were selected for analysis. The ten

investments studied were (1) farm assets (i.e., land, buildings and improvements, machinery and equipment, and other productive assets), (2) farmland which could be cash rented out to an operating farmer, (3) long-term United States government bonds, (4) high grade municipal bonds of state and local governments, (5) AA-grade corporate bonds, (6) common stocks, (7) growth-and-income mutual funds, (8) U.S. Treasury bills with a six-month maturity, (9) six-month certificates of deposit of commercial banks, and (10) six-month maturity commercial paper of corporate business firms. Although these investment alternatives vary in liquidity, maturity, and tax characteristics, they are readily available options for most farmers and provide a base for comparing the returns and risks of farm and nonfarm investments.

Four dimensions of economic return are examined in this report. The first dimension is composition of the return. That is, what proportion of the rate of return is generated as current income (or loss) and what proportion is due to changes in the value of the asset (capital gain or loss)? Although capital gains are not directly spendable, they do result in increased wealth and should not be ignored. When capital appreciation occurs, this wealth can be converted into cash either by selling the appreciated asset or, by using the asset as collateral for a loan (as occurred in agriculture during the 1970s). When investors evaluate the prospects of buying stocks or bonds, they are interested in whether

the value of the investment (the stock or bond) is expected to rise or fall as well as the annual income stream of dividends or interest and how it is taxed. Likewise, an investor or owner of farm or nonfarm real estate will be concerned about the appreciation or depreciation in the value of the property as well as the annual rent generated by using the property in the production process.

A second dimension of the economic rate of return is the expected level. We use the historical average total rate of return as an estimate of what can be expected from the investment in the future. In this analysis, the average (mean) total rate of return before-tax is measured by adding the mean rate of annual income (or loss) to the mean rate of annual capital gain (or loss). The rate of return measures we report are in nominal (current) pre-tax dollar units. That is, before adjusting for changes in purchasing power of the dollar over time. The corresponding real rates of return (in constant dollar units) could be readily derived by subtracting a representative rate of annual inflation from each of the nominal rates of return we report.

A third dimension is the variability of total annual rates of return. Variability can be measured in numerous ways. In this analysis, the minimum and maximum values for the historical period reflect the extreme values which occurred. The standard deviation is also used as a statistical measure of variability. It indicates the amount of return variability in percentage terms. Finally, the coefficient of variation of the total

Table 1. Average Annual Rates of Return for Farm Production Assets and Farmland in Southwestern Minnesota, 1960 - 1988

Year	All Farm Assets			Cash-Rented Farmland		
	Current Return	Capital Gain	Total Return	Current Return	Capital Gain	Total Return
1960	5.48	-1.06	4.41	5.49	-2.75	2.75
1961	5.34	-0.17	5.17	5.51	-0.40	5.10
1962	5.44	0.48	5.92	5.57	1.21	6.78
1963	3.07	-0.51	2.56	5.37	-1.60	3.77
1964	6.51	1.02	7.54	5.64	2.44	8.08
1965	9.56	1.61	11.17	5.63	3.57	9.21
1966	10.23	2.81	13.04	5.79	6.13	11.92
1967	5.25	5.41	10.66	6.11	9.39	15.50
1968	8.40	4.56	12.96	6.28	9.90	16.18
1969	8.46	2.48	10.95	5.77	5.11	10.88
1970	7.04	-0.41	6.63	4.37	-0.86	3.52
1971	6.43	0.55	6.97	5.66	1.15	6.82
1972	14.97	3.65	18.62	5.74	7.98	13.72
1973	27.99	9.38	37.37	6.03	21.11	27.14
1974	9.82	19.15	28.97	7.72	47.06	54.78
1975	6.66	13.08	19.74	6.90	25.04	31.94
1976	4.21	17.72	21.93	6.79	31.04	37.83
1977	7.63	11.33	18.96	5.53	18.99	24.52
1978	13.13	4.95	18.08	4.48	7.98	12.46
1979	5.42	7.86	13.29	4.32	14.00	18.32
1980	8.90	4.65	13.54	3.74	8.02	11.76
1981	2.56	11.27	13.84	4.01	19.03	23.04
1982	5.34	-6.68	-1.34	3.25	-9.99	-6.74
1983	5.91	-6.87	-0.96	3.61	-10.99	-7.37
1984	3.70	-9.47	-5.77	4.11	-16.06	-11.94
1985	2.94	-16.84	-13.90	4.19	-30.98	-26.79
1986	8.12	-13.79	-5.67	4.89	-28.02	-23.14
1987	16.19	-1.44	14.75	6.53	-3.59	2.93
1988	13.65	6.27	19.92	7.30	16.84	24.14

rate of return is reported as a measure of the relative (unitless) variability of the historical annual rates of return.¹

The fourth dimension is the relationship between fluctuations in rates of return to farm assets and fluctuations in the rates of return for alternative investments. For example, if the rates of return to farm assets and other investments tend to change in opposite directions, those assets will result in a diversification (reduction) of risk when combined in the same portfolio. Thus, investment strategies that combine two or more assets whose rates of return exhibit "negative correlation" will provide better opportunities to reduce income risk through diversification.

Data Description

Returns data were developed for the 10 investment options covering the 29 years from 1960 through 1988. This period was chosen to include returns from three recent decades and capture boom and bust cycles in asset returns. Each subset of years represents a unique economic environment in agriculture and the nonfarm business sector. Agriculture exhibited stable to increasing returns from the late 1960s into the early 1970s. During this same period, the stock market experienced greater volatility with low dividend returns and capital losses. In the 1980s, agriculture experienced a major land price deflation and greater income volatility, while the stock market showed consistently positive total annual returns.

The first (and perhaps the most common) investment strategy for farmers is to reinvest farm business earnings in the farm operation. Data on farm earnings were gathered from Southwest Minnesota Farm Business

Management Association (SWMFBMA) records (Olson et al.). Annual report summaries from 1960 through 1988 provided the necessary farm records information about "average" returns to southwestern Minnesota farms.² Though individual farm data is preferred, adequate disaggregated data was not readily available for this long period. The number of farms consecutively participating in the Association since 1959 is small, and limits the sample size. Moreover, individual farm records before computerization (in the late 1970s) required substantial standardization.

Computed annual average rates of return from the SWMFBMA annual summaries are reported in table 1. While the farms in our computations reflect high and low profit farming operations,

¹To illustrate these measures, assume three annual rates of return: 2%, 6%, and 10%. The mean rate of return is their sum divided by 3, or 6%. The standard deviation is the positive square root of the sum of [the individual rates of return minus the mean rate of return] squared, all divided by 2 (the total number of rates of return minus 1). This is calculated as the square root of [(2 - 6)² + (6 - 6)² + (10 - 6)²]/2 or 4%. Finally, the coefficient of variation is computed as the standard deviation (4%) divided by the mean (6%) multiplied by 100, or 66.7 (no units).

²Using average rather than individual farm data is not expected to impact the mean rate of return estimates but is likely to result in a modest understatement of the variability of returns.

the returns may not be totally representative of all farms in that area of Minnesota. During 1960-1988 several farmers discontinued farming operations. Therefore, the average rates of return we report are for surviving farm operations where rates of return are likely to be somewhat higher than those for all farms that were operating in the region.

The annual current rate of return on all farm assets was determined by calculating farm profit (the return to unpaid operator and family labor, management and equity capital) plus interest paid on farm debt, minus an opportunity wage for operator labor (from the Minnesota Department of Jobs and Training). The total current return was then divided by the market value of total farm assets at the beginning of the year. These current returns are primarily attributable to farm production activities in a given year.

The current rate of return series in table 1 indicates that the nominal rates of return to farm assets were positive in all years. The 1981-85 returns are somewhat lower than preceding and subsequent years and reflect the years of recent financial stress in the farm sector. Sharp increases in returns in 1987 and 1988 are indicative of the increase in profitability among farms in Southwest Minnesota. It is important to note that the current rate of return changes when farm profit and/or the market value of assets change. The large increases in the current rate of return in 1986 and 1987 were due to a combination of higher farm profits for those years and the reduced market values of farm assets (principally farmland) that occurred through the early and mid-1980s.

As mentioned, current returns are only part of an asset's total return. Capital gain (or asset value appreciation) is the other component. We based capital gains estimates on changes in land prices in southwestern Minnesota (Schwab and Raup). This procedure recognizes that the majority of a farm's long-term appreciable capital is held in the form of land. While some nonland farm assets may appreciate and others may depreciate in value, we assumed that the average annual net nonland asset appreciation rate was zero.³ Therefore,

the computed capital gain component of farm returns is only attributable to changes in land values.

The capital gain rate of return to total farm assets was computed in three steps. First, we calculated the appreciation of land as the value per acre of southwestern Minnesota farmland at the end of the year minus the value at the beginning of the year (Schwab and Raup). Second, this difference was divided by the value per acre at the beginning of the year. The resulting rate of appreciation was then multiplied by the percentage that land assets comprised of total assets (to adjust the capital gain rate on land to a level consistent with an interpretation for the total farm investment). The annual rates of capital gain on all farm assets reported in table 1 illustrate the abnormally high positive gains which occurred during 1973-1977. Large consecutive capital losses occurred during 1982-1986, which were years of severe financial stress in the farm sector.

Returns to cash-rented farmland were calculated from historic gross rental figures for Minnesota (as reported by the USDA). Gross cash rent per acre was calculated for each year using the state average cash rent per \$100 of land value and multiplying this times reported land values (Schwab and Raup). Property taxes were calculated using the state average property tax rate per \$100 of farmland value. Miscellaneous maintenance charges on land and improvements were estimated at 1 percent of land value.

The current rate of return series for owning cash-rented farmland is reported in table 1 along with capital gain rates of return to farmland (based on annual changes in land prices from Schwab and Raup).⁴ The resulting current return series is relatively stable between 3.25 and 7.30 percent. The capital gain series for rented farmland is also based on changes in land prices. The series exhibits significant variability in the early 1970s and early 1980s, as we noted earlier.

The three bond series used in this analysis are described by Standard and Poor's Corporation (S&P):

(1) **Long-term, United States government bonds:** Yield-to-maturity is based on a varying number of issues with more than 10 years initial maturities. Par (face) value is assumed to be \$100, with an average maturity of 15 years from the date of issuance.

(2) **High-grade, municipal bonds of state and local governments:** Yield-to-maturity is based on the average yield of 15 bonds. Par value is assumed to be \$100, with an initial maturity of 20 years from the date of issuance.

(3) **Composite corporate bonds:** Yield-to-maturity is based on the average yields of representative AA industrial and AA utility bonds. Par value is assumed to be \$100, with an initial maturity of 20 years from the date of issuance.

Current returns, capital gain returns, and total returns are estimated for each bond series. Bonds are assumed to sell at face or par value and the current rate of return in a given year is equal to the yield-to-maturity at the end of the previous year. Capital gains or losses may accrue on existing bonds depending upon changes in current yields for new issues. The annual capital gain or loss is measured by annual changes in a bond's price. The annual total rate of return for a bond issued at face value is the sum of the yield-to-maturity plus the capital gain or loss (Ibbotson and Sinquefeld).

Common stock returns are described by the S&P 500 Composite Stock Index of 400 industrial, 20 transportation, 40 public utility, and 40 financial stocks (Standard and Poor's Corporation). Statistics were gathered from the Standard and Poor's Corporation for closing annual prices and yields of the Composite Stock Index. Returns are calculated as annual rates of return. A rate of return index for ten growth-and-income mutual funds was also obtained for this analysis (Wiesenberger and Company). The mutual fund index is based on price movements of a representative group of large mutual funds, reflecting total returns on an investment with income dividends reinvested and capital gains accepted in shares. Because the index was compiled for total returns, the current rate of return and capital gain rate of return could not be separated.

U.S. Treasury bills, certificates of deposit (CDs) and commercial paper offer safe, short-term returns. Treasury bills and CDs (of less than \$100,000) are

³Data was not available from which to determine if this assumption results in a systematic overstatement or understatement of the total capital gains return.

⁴The reader is cautioned that the rates of return for cash-rented farmland in table 1 reflect statewide averages while the rates of return for farm assets are for southwest Minnesota only.

Table 2. Annual Rates of Return and Risk Measures for Selected Farm and Nonfarm Investments, 1960-1988

	Farm Assets	Farm Land	Stocks	Mutual Funds	Govt. Bonds	Muni. Bonds	Corp. Bonds	Treas. Bill	Comm. Paper	Cert. of Deposit
	----- Percent -----									
Mean Current Rate of Return	8.2	5.4	3.9	--	7.3	6.2	8.2	6.5	7.1	6.8
Mean Capital Gain Rate of Return	2.5	5.2	6.5	--	-1.2	-0.8	-1.6	--	--	--
Total Rate of Return:										
Mean*	10.7	10.6	10.4	10.5	6.1	5.4	6.6	6.5	7.1	6.8
Minimum	-13.9	-26.8	-24.3	-21.3	-4.1	-16.3	-5.3	2.6	3.0	2.5
Maximum	37.4	54.8	35.6	33.0	37.2	44.2	40.9	13.1	14.8	15.8
Standard Deviation	10.7	16.9	14.8	14.6	9.8	13.4	10.0	2.6	2.9	3.3
Coeff. of Variation (no units)	100	160	143	138	160	248	152	41	42	48

*The mean total rates of return are equal to the mean current rates of return plus the mean capital gain rates of return. These rates of return are before-tax; U.S. government securities are exempt from state taxes and municipal securities may be exempt from federal and state income taxation.

insured from loss by the “full faith and credit” of the United States government. U.S. Treasury bill returns are annual rates of return from six-month issues traded in the secondary market and reflect the average of closing bids quoted by at least five dealers. CD rates of return are for six-month certificates traded in the secondary market and are the average of rates offered by at least five dealers. Commercial paper rates of return are for six-month maturities, taken as the average rate offered by at least five security dealers quoted on a bank-discount basis (Federal Reserve). The six-month rates of return for CDs and commercial paper are treated as annual rates of return. We assume that the six-month instruments could be readily reinvested at the same rate for the remaining six months. We make no adjustment for commissions or fees on any of these transactions (which would reduce several of the rates of return we report).

Returns and Risk

Table 2 contains a summary of the computed pre-tax rates of return and variability measures for the 10 selected investment alternatives during 1960-1988. As one would expect, the mean

total rate of return is substantially higher for equity investments (such as farm assets, farmland, common stocks or mutual funds) than for debt instruments (such as bonds, Treasury bills, commercial paper or CDs).⁵ Note that the total rate of return in farming (10.7 percent) is quite comparable to that received by investing in common stocks (10.4 percent), mutual funds (10.5 percent), or farmland (10.6 percent). The composition of this return, however, is quite different. There is a higher current return to farm assets (8.2 percent) compared to investing in stocks (3.9 percent), and a higher capital gain in stocks (6.5 percent) compared to farm assets (2.5 percent). Cash-rented farmland generated almost equal rates of current return (5.4 percent) and capital gains return (5.2 percent). Bonds generated negative average capital gain rates of return, which partially offset the positive current rates of return from these investments. The capital loss on bonds is a result of generally rising interest and inflation rates during this period.

⁵Because of the generally higher risk for equity investments compared to debt instruments, investors generally require a higher return.

Farmers concerned with current earnings available to support family living requirements would have found that investments in farm assets, government bonds, AA corporate bonds and commercial paper tended to produce slightly higher current returns. Common stocks tended to generate the lowest current rate of return and provided relatively little current income for consumption and other cash uses. Farmers primarily seeking investments where existing capital could be stored or potentially increase in value should have generally avoided bonds. The capital value of all three types of bonds decreased slightly in nominal value terms. The losses in real purchasing power would have been somewhat greater (since one would need to subtract the effects of annual inflation). Different measures of variability are also summarized in table 2. The minimum and maximum total rates of return indicate that farm investments had a larger minimum return and similar maximum return when compared to farmland, stock or mutual fund investments. The minimum return was generally greater for debt instruments than for equity investments, but the maximum return was highly variable across these debt instruments. The standard deviation of total

returns indicates that farm assets exhibited the lowest risk of the equity investments and a level of variability similar to that of U.S. government or corporate bonds.

The coefficient of variation for farm assets indicates the relative level of risk involved. For example, farm assets (at a level of 100) had less relative risk than that of other "equity" investments (farmland, stocks, mutual funds) and bonds. A similar comparison indicates that the relative risk of farm assets was almost double that for Treasury bills, commercial paper and CDs. The coefficient of variation measure is often interpreted as a "risk/reward" ratio. That is, the amount of risk (standard deviation of returns) one must be willing to accept to receive the associated reward (return). Interestingly, the computed risk/reward ratio for farm assets is relatively low when compared to farmland alone and financial assets such as common stocks, mutual funds, and bonds. Short-term, high-grade investments such as Treasury bills, commercial paper, and CDs have relatively low risk/reward ratios.

Figure 1 is an illustration of the risk/reward relationships between the mean total rates of return and the standard deviation for the various investment alternatives. The comparative height of the rate of return and standard deviation bars in figure 1 indicates the trade-off between return and risk, respectively. A higher standard deviation bar compared to the rate of return bar indicates more risk per unit of return. A lower standard deviation bar relative to the rate of return bar implies less risk must be encountered to obtain a given rate of return.

Diversification

Investors frequently diversify their portfolios of assets to achieve a more acceptable risk/reward ratio. This underlying "principle of diversification" states that the amount of risk is likely to be reduced when one combines assets whose returns tend to be either "negatively correlated" or "independent" of each other. This principle is analogous to the old adage about "not putting all

one's eggs in one basket." An important thing to note is that all attempts at diversification are not equally effective at avoiding risk.

The key to successful diversification is identifying correlation relationships which are likely to hold in the future. Typically, we do this by using past rate of return information. If rates of return for two assets tended to move in opposite directions when they changed, they would be negatively correlated and good candidates for use in diversifying the portfolio of assets. Similarly, if the rates of return did not systematically move in either the opposite or the same direction in the past they could be viewed as "independent" of each other (that is, they have a zero correlation). The combining of assets with independent rates of return also results in an effectively diversified portfolio. Of course, when one diversifies the portfolio some reduction in the average total rate of return may also occur, so one must search for assets which generate rates of return that meet both the acceptable risk and desired rate of return objectives.

Figure 1. Means and standard deviations of total rates of return for various farm and nonfarm investments, 1960-1988

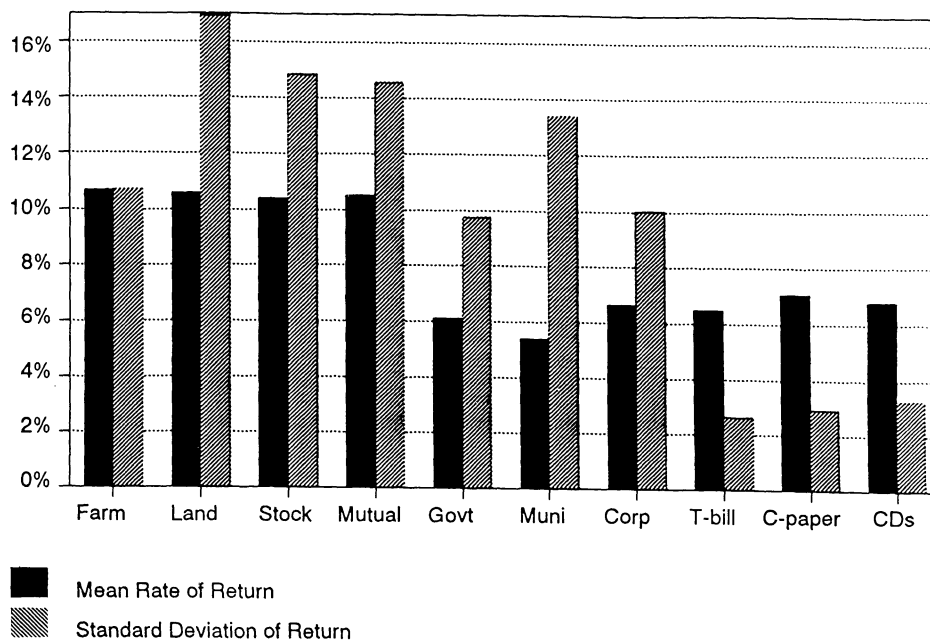


Figure 2 illustrates the correlations between the total rates of return on farm asset investments and the rates of return on the other nine types of investment alternatives.⁶ The figure is evidence that a farmer may have to go outside of agriculture to find assets that provide effective diversification. Farm asset returns were strongly, positively correlated with returns on cash-rented farmland. By comparison, farm asset returns were positively correlated only to a very small degree with returns on commercial paper. Farm asset returns were negatively correlated with the returns from other investments. The largest negative correlations occurred between farm assets and bonds, stocks, and mutual funds. Because common stocks and mutual funds provided similar total rates of return to those from farm assets and they exhibited relatively large negative correlation coefficients with farm assets, they were the best diversification alternatives for a farmer to consider.

To illustrate the benefits of diversification we computed the returns for four alternative portfolios where farm assets comprised 75 percent of the total value of each portfolio and the balance (25 percent) was invested in another type of asset (mutual funds, government bonds, CDs or farmland). The resulting portfolio returns and risk measures are reported in table 3. If a farmer would have allocated 25% of the overall investment to a representative income-and-growth mutual fund rather than all to farm assets, the average portfolio rate of return would have fallen slightly from 10.70% to 10.65%, but the variability of the portfolio rate of return would have been reduced significantly from 10.70% to 7.33%. There would have been a corresponding reduction in relative risk (the coefficient of variation declines from 100 to 68).

Similar diversification effects are illustrated using government bonds and CDs. The exception to this pattern occurs when the additional 25% is invested in farmland. In that situation

Figure 2. Correlation coefficients for farm assets versus farmland and off-farm investments, 1960-1988

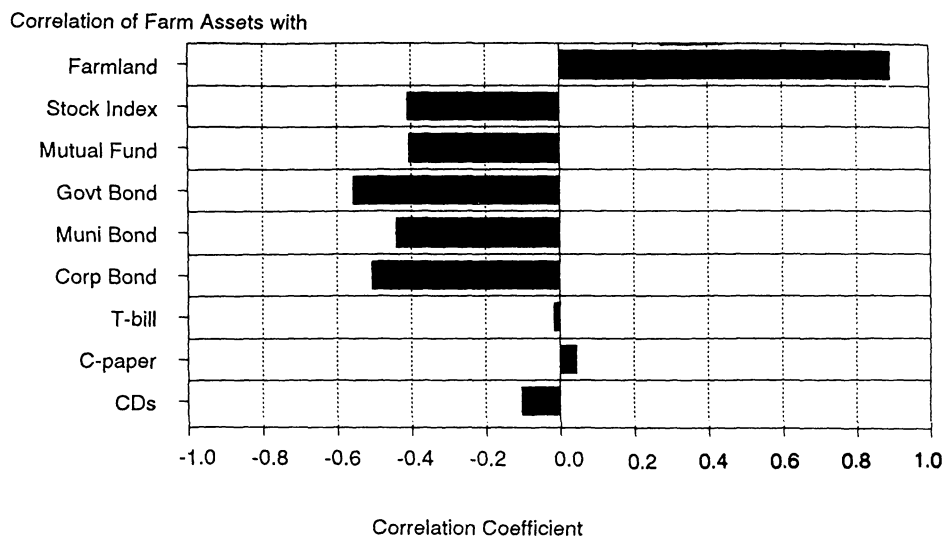


Table 3. Effects of Diversification on Alternative Portfolio Rates of Return and Risk

Portfolios	Average Total Return	Standard Deviation of Total Return	Coefficient of Variation
		percent	
Farm Assets (100%)	10.70	10.70	100.
Farm Assets (75%) and Mutual Funds (25%)	10.65	7.33	68.
Farm Assets (75%) and Govt. Bonds (25%)	9.55	6.96	73.
Farm Assets (75%) and CDs (25%)	9.73	7.98	82.
Farm Assets (75%) and Farmland (25%)	10.67	11.96	112.
Farm Assets (25%) and Farmland (75%)	10.63	15.13	142.

⁶In effect the farm asset, common stock, mutual fund, government bonds, municipal bonds, corporate bonds, commercial paper and bank CD investments we have selected for analysis are already portfolios since their returns are based on groups of highly similar assets with somewhat different rate of return and tax characteristics.

the expected rate of return is slightly reduced (to 10.67%) but the variability of returns is increased from 10.7% to 11.96%. The increase in the coefficient of variation from 100 to 112 clearly shows that the additional investment in farmland would have accelerated the relative degree of risk instead of reducing it. Recall that farmland and farm assets were highly positively correlated and, therefore, no diversification of risk can be expected by combining additional farmland with farm assets.

The other side of this latter relationship is that adding nonland farm assets to a portfolio dominated by farmland would produce some diversification effect even though their rates of return are highly positively correlated. To illustrate this, the percentages of portfolio investment were reversed to 75% in farmland and 25% in total farm assets (which is comprised of land and nonland assets). The mean rate of return rises slightly from 10.6% (for 100% farmland) to 10.63% (for the combination of farmland and farm assets), and the variability of return declines from 16.9% (for 100% farmland) to 15.13% (for the combination). The corresponding coefficient of variation index declines from 160 (for 100% farmland) to 142 when some nonland farm assets are included in the portfolio. In effect the portfolio of farm assets modifies the risk associated with holding only farmland.

Conclusion

Data from farm business records of farm operators (admittedly the surviving farmers) located in southwest Minnesota

indicate that if both current income and capital gains are considered, those farmers generated comparable total rates of return before-tax with less risk than investors in cash-rented farmland or those who invested in common stocks or mutual funds during 1960-1988. Bonds and other debt instruments provided significantly lower rates of return and were not always less risky than investments in farm assets. These results indicate that the economic returns to farming in southwest Minnesota were comparable to, or higher than, those of selected non-farm investments. Moreover, the relative risks of average farm asset returns were lower than those associated with comparable nonfarm, financial assets.

The results also document the benefits of longer term diversification for farmers. Returns to farm assets are highly correlated with returns to cash-rented farmland so combining these assets in a portfolio actually increased risk. Diversified portfolios that combine farm assets with common stocks and mutual funds had total rates of return similar to the rate of return for farm assets. Rates of return on stocks and mutual funds were found to be negatively correlated with those for farm assets. Therefore, stocks and mutual funds may provide the best diversification alternatives for a farmer to consider without sacrificing an acceptable average total rate of return.

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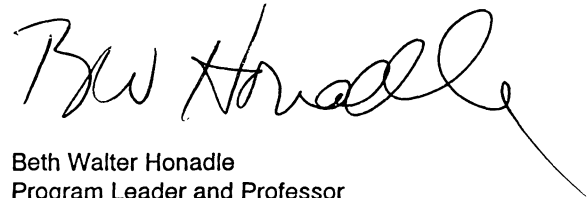
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