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IMPACT OF FARM INDEBTEDNESS ON
FARM INCOME AND SURVIVAL*

by

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Abstract

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The ever increasing capital requirements in agriculture, along with increasing debt levels and fluctuating interest rates, have increased the intensity of cash flow problems and financial crisis. This paper evaluates effects of debt level on farm income level, enterprise mix and farm survival. Farms with debt of 50 percent or more had negative capital accumulation even with interest rates of 10 percent.

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Can farmers with high indebtedness survive the growing financial crisis in agriculture? Can they survive the high interest rates, falling equity, increasing capital investment and low profit margins?

One of the most prominent themes involving today's modern farming relates to the high amounts of capital investment required to generate a satisfactory return to the farmer. Indeed modern agriculture has become heavily dependent upon capital investment and other associated factors.

The use of credit has played a major role in the growth of the agricultural industry. A great many farmers use borrowed capital for purchase of resource land, equipment, operating inputs, etc. For them this means increased debt and greater interest payment obligations.

A recent study by Jolly, et al., showed that nearly 19 percent of all farm operators had debt/asset ratios (D/A) exceeding 40 percent. Slightly over half, 50.3 percent, of all farm operators in the U.S. had negative cash flow. Of all U.S. farm debt, 62 percent is held by farm operators with D/A ratios over 40 percent. To compound the problem, farmers using borrowed capital have been facing both larger interest charges and a depreciating value of collateral. Assets are declining in value while liabilities have increased.

A recent study by the Food and Agricultural Policy Research Institute (FAPRI) suggests sill further deterioration in the financial condition of U.S. farmers. According to a survey conducted by FAPRI, more farmers found themselves in very high financial leverage categories at the beginning of 1985 than at the same time a year earlier. The survey indicated that 12.8 percent of all farmers had D/A ratios over 70 percent. This group represented 26 percent of farm debt. The survey suggests that close to 40 percent of all farms in the

Central States are in the 40 percent or over D/A ratio category. They account for 75 percent of all farm debt. FAPRI also indicated that, as a group, farmers have been paying much higher interest rates than are non-farmers. Total farm debt (including CCC loans) at the beginning of 1981 was $174.5 billion, over three times the 1970 level. By 1985, total farm debt exceeded $210 billion (USDA Agricultural Statistics).

The overall objective of this paper is twofold. First is the determination of what equity position and interest rate combination a farmer can make a living and survive financially. Second, the impact of equity and interest rates on farm organization and income are evaluated.

PROCEDURE AND METHODOLOGY

To examine these issues, a case farm in the Western Corn Belt was used. It was a typical farm for the area with the usual component of crops (corn, milo, soybeans, wheat, hay and pasture) and livestock, mainly beef cattle.

A dynamic multi-period linear programming model was used to determine the optimum farm plan for each of ten years, and to study the effects of different levels of debt and interest rates on farm income. Linear programming (LP) was selected as it is a widely used mathematical programming technique which provides an optimal solution given resource availability and constraint levels. Resource availability and constraints for the case farm are discussed immediately below.

With the multi-period model, income from production in one time period becomes an input in the next period; thus, the model becomes one of capital accumulation over time. The quantity to be maximized is the present value of the net cash family income over the planning horizon. Total income generated minus variable costs (except family labor) minus family living expenses and fixed obligations represent the net cash family income.

The Data

Different sources of data from Extension and the USDA were used. Detailed farm record information regarding land use, land types, labor requirements, input-output prices, production and capital requirements, as well as family living expenses and fixed obligations were pulled from available data (budget) and USDA report. Agronomists, agricultural economists, producers and state statistics were relied on to determine the typical farm and resource availability.

Based on the 1982 Census of Agriculture for farms with $10,000 or over in annual sales, the average farm size in the study region was 435 acres. Given this, a 450 acre farm was used as the typical farm. The case farm consists of 300 acres of tillable cropland suitable for the common crops in the region, 140 acres of pasture and hay production, and 10 acres of wasteland and farmstead area.

Land (buildings included) was valued at $1,500 per acre for a total real estate value of $675,000. It was assumed that the farmer can obtain a long term loan (30 years) on the real estate at an interest rate of 12 percent with annual principal and interest payments. Family living expenses and other fixed obligations (e.g., household consumption and expenses, taxes, insurance and others) were established at $20,000 each year.

The farm was assumed to be operated primarily with family labor with additional labor hired as needed. Operator management ability was considered to be average for the area with good working knowledge of farming practices and technology. Cash markets were readily available for feedgrains, soybeans and livestock enterprises while forage crops can only be marketed through livestock enterprises.

Debt Situations Evaluated

To compare D/A ratio impacts, four real estate D/A levels of 100, 75, 50 and 25 percent were imposed on the farm. The four situations are as follows.

Situation I: The farmer owns all real estate and has no mortgage on real estate.

Situation II: The farmer owns 75 percent of the real estate and mortgages the other 25 percent with a 30 year long term loan at 12 percent annual interest rate.

Situation III: The farmer owns 50 percent of the real estate and mortgages the other 50 percent with a 30 year long term loan at an interest rate of 12 percent annually.

Situation IV: The farmer owns 25 percent of the real estate and mortgages the other 75 percent with a 30 year long term loan at an annual interest rate of 12 percent annually.

In all situations, the farmer can get a short term operating loan at 10 percent payable at the end of the year. For each D/A level, the interest rate on the short term loan was further evaluated at three additional levels; 15, 20 and 25 percent to see the effects of these changed on farmer income, enterprises and survival. For the different situations, operating capital could not exceed $100,000 per year.

RESULTS

The impact of D/A levels and interest rates is presented below and in the following tables.

Situation I (0 percent real estate debt)
Interest Level 1 (10 percent)

For Level 1, the farm plan with a short term interest rate of 10 percent, borrowed capital in the fist four years of the plan was $374,270 (Table 1). The

TABLE 1   THE RESULTS OF SITUATION I AT THE FOUR LEVELS OF INTEREST RATES

| | | Interest Rate | | | |
	Unit	Level 1 (10%)	Level 2 (15%)	Level 3 (20%)	Level 4 (25%)
Income[1]	Dollars	175,300	159,584	144,214	127,409
Capital Borrowed[2]	Dollars	374,270	314,320	314,320	314,320
O.F.I.[3]	Dollars	182,740	159,480	159,480	159,480
Corn[4]	Acres	100	100	100	100
Soybeans[4]	Acres	200	200	200	200
Hay and Pasture[4]	Acres	140	140	140	140
Livestock[5]	Head	2,575	2,250	2,250	2,250
MVP of B.C.[6]					
Period 1	Dollars	0.42	0.37	0.32	0.28
Period 2 to 4	Dollars	0	0	0	0
Period 5 to 10	Dollars	-0.05	-0.10	-0.15	-0.20

[1]Discounted cash farm income from the whole plan.
[2]Capital borrowed in the first four years.
[3]Off-farm investment in the whole period.
[4]Acres each year.
[5]Total livestock raised during the 10 years.
[6]Marginal value product of borrowed capital.

farm plan started with cash crops and included 121 head of steers on hay and pasture in the first year. Steers increased each year until reaching 344 head in year nine. In this situation, the farmer stopped borrowing in year five and started to invest in off-farm investment in year eight. The present value of total net cash family income generated in the ten year period was $175,300. The marginal value product (MVP) of borrowed capital started at $0.42 in the first year, then dropped to zero in year two ($1.10). In year 5, the MVP became negative when the model was forced to continue borrowing (i.e., less than $1.10). The shadow price of cropland started at $298.21 in the first year and dropped to $123.80 by year 10.

Interest Level 2 (15 percent)

With an interest rate of 15 percent, the farm plan used $314,320 as borrowed capital in the first four years (Table 1). The MVP of borrowed capital started at $0.37 in the first year, dropped to zero years two to four, and then become negative in year five when the model was forced to continue borrowing. The plan started with off-farm investments in year nine and included less livestock than the plan with an interest rate of 10 percent. The farm plan generated $159,584 as a discounted net cash family income, $15,716 less than in Level 1 when the interest rate was 10 percent. The shadow price of cropland started slightly higher than when the interest rate was 10 percent. However, by year six it had reached the same level.

Interest Level 3 (20 percent)

With an interest rate of 20 percent, the farm plan was similar to that of Level 2. It included less livestock and used the same amount of borrowed capital. The MVP of borrowed capital started at $0.32 in year one, dropped to zero years two to four, and become negative after that. The farm plan generated

$144,214 of discounted net cash family income. The shadow price of cropland started slightly higher, but by year four was equal to reached Level 2.

Interest Level 4 (25 percent)

At an interest rate of 25 percent, $314,320 of borrowed capital was used in the first five years of the farm plan. It included the lowest number of steers. The total discounted cash family income generated was $127,409 which was $47,890 lower than the net return of the plan Level 1. The MVP of borrowed capital started at $0.28. The shadow price of cropland started at $307, but by year four was equal to Level 3.

The impact of interset rates in this situation influenced not only the farm income, but the number of steers included in the plan, the amount of capital invested in off-farm investment, and the shadow price of land and borrowed capital.

Situation II (25 percent real estate debt)

In Situation II, the farmer owns 75 percent of the real estate and mortgages the other 25 percent for a long term loan for 30 years at an annual interest rate of 12 percent. In the first year the total obligations were $45,875, which included $20,000 for family living expenses and other fixed obligations, $5,625 for loan principal payment, and $20,250 for interest on the long term loan.

Interest Level 1 (10 percent)

With a short run interest rate of 10 percent, the farm plan continued to include borrowed capital until the last year. It started with cash crops and 111 head of steers raised on hay and pasture. Steer numbers increased each year until they reached 219 head in year 10. This compares with 344 head for the no-debt situation. The farm plan ended with $30,422 of discounted net cash farm

income for the whole period (Table 2). This compared to $175,300 for the no-debt situation. In the first seven years the farmer borrowed less than $100,000 per year, but in years eight, nine and 10 he borrowed up to the limit of $100,000 and still needed more capital to generate enough income to meet the payments on the long term loan and family living expenses. The MVP of borrowed capital started at zero years one to seven ($1.10) then become negative (i.e., less than $1.10). The shadow price of cropland started at $305 in the first year, dropped to $125 in the last year, but was slightly higher than for the no-debt situation.

Interest Level 2 (15 percent)

At an interest rate of 15 percent, the farm plan used less borrowed capital than in Level 1 and continued to be a cash grain farm plan plus 111 head of steers raised each year on hay and pasture. Over time, this plan included a lower number of steers and used less borrowed capital than did the farm plan with 10 percent interest. The discounted cash farm income generated from the whole plan was $10,000 which was more than $20,000 lower than in Level 1, and $150,000 less than the comparison with no-debt.

Interest Level 3 (20 percent)

With an interest rate of 20 percent, the farm plan followed a similar pattern as in Level 2. The borrowing limit was not reached while cash crops continued with 111 head of steers raised each year on hay and pasture. This farm plan, because of the high interest rate, ended with more than $19,450 of net cash losses and did not reach the limit in borrowing or in livestock numbers.

TABLE 2   THE RESULTS OF SITUATION II AT THE FOUR LEVELS OF INTEREST RATES

	Unit	Interest Rate			
		Level 1 (10%)	Level 2 (15%)	Level 3 (20%)	Level 4 (25%)
Income[1]	Dollars	30,422	10,000	-19,450	-58,348
Capital Borrowed[2]	Dollars	895,336	777,950	777,950	777,950
Corn[3]	Acres	100	100	100	100
Soybeans[3]	Acres	200	200	200	200
Hay and Pasture[3]	Acres	140	140	140	140
Livestock[4]	Head	1,382	1,100	1,100	1,100
MVP of B.C.[5]					
Period 1 to 7	Dollars	0	0	0	0
Period 8	Dollars	-0.003	-0.008	-0.013	-0.018
Period 9	Dollars	-0.006	-0.011	-0.016	-0.021
Period 10	Dollars	-0.009	-0.014	-0.019	-0.024

[1]Discounted cash farm income from the whole plan.
[2]Capital borrowed in the whole plan.
[3]Acres each year.
[4]Total livestock raised during the whole plan.
[5]Marginal value product of borrowed capital.

Interest Level 4 (25 percent)

An an interest rate of 25 percent, the farm plan was similar to that of Level 3, but because of the higher interest on the short term loan, it ended with more than $58,348 in losses, $38,898 greater than in Level 3.

Situation 3 (50 percent real estate debt)

In this case, the farmer owns 50 percent of the real estate and mortgages the other 50 percent with a long term loan at 12 percent interest. The long term loan was $337,500 for 30 years. Principal payment each year was $11,250, while interest for the first year was $40,500. By adding the family living expenses and fixed obligations of $20,000, the farmer has to make at least $71,750 as a net cash income in the first year just to meet these obligations.

At interest rates of 10 percent, the farm plan ended with $150,000 in losses and negative capital accumulation. The plan did not reach the full limit of borrowing and included only cash crops and steers raised on hay and pasture. Because of the high cash requirement to meet the yearly commitment, the model was infeasible at the other interest rates.

Situation 4 (75 percent real estate debt)

In Situation 4, the farmer owns only 25 percent of the real estate and mortgages the other 75 percent which results in a long term loan of $506,250 for 30 years. The interest rate is again 12 percent. Fixed obligations during the first year were $97,625 including a principal payment on the loan of $16,875, a $60,750 interest payment on the long term loan, and $20,000 for family living expenses and fixed commitments.

A feasible solution was not obtained because of the high cash requirements. The model ended with more than $210,200 in losses and negative capital accumulation. The first year was faced with a cash flow shortage of $24,625 to

meet the yearly cash requirement. The model was infeasible for all short term interest rates.

CONCLUSIONS

A comparison of the four debt levels clearly shows the impact of real estate debt on the net cash family income. Short term interest rates also impacted net cash family income but to a much smaller degree than did debt levels. Further, as debt levels and interest rates increased, the enterprise mix concentrated more on cash crops. The level of livestock production declined.

Due to the high fixed obligations on the long term loan, family living expenses and other fixed obligations, most plans for a farmer with 25 to 50 percent equity (50 to 75 percent debt) were infeasible. They ended with income losses and negative capital accumulation making survival impossible. Even farmers who need to mortgage 30 percent of their real estate cannot meet all cash requirements if they need to borrow operating capital at interest rates higher than 15 percent. Any shortfalls will need to be me with off-farm income.

Farmers with less than 70 percent equity will face cash flow problems with net losses occurring as short term interest rates go above 15 percent. The higher interest rate and reduced asset values of the 1980s make the farmer's net worth vanish and lead to bankruptcy.

These analyses indicate that in todays agricultural economics, farmers with debt levels exceeding 50 percent are having difficulties in surviving their debt. In some cases, these debt servicing problems are felt with debt as low as 40 percent. For producers in these debt levels, other income is needed to meet their farm debt service.

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