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# Land Prices: An Estimate Based on the Capitalized Value Approach

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# Land Prices: An Estimate Based on the Capitalized Value Approach

Brian H. Schmiesing and Julie Bleyhl

Producers, rural government officials, lenders and policy makers are all asking the question, "Have land prices hit bottom?" One approach to answering this question is to capitalize current returns to land ownership. The estimated land value can then be compared with actual land values to gain a perspective on whether current land prices reflect current returns. However, because of the large government payments associated with the Food Security Act of 1985, an additional question must be asked: "What portion of the current price of land is associated with government payments rather than the current market prices for grain?"

This paper estimates what the land bid price would be for a specified farm under different assumptions concerning crop yields, government program participation, and the level of fixed costs for the farm. Three crop yield scenarios are combined with a price scenario to project returns to land ownership. These returns are estimated with and without the farm program payments. Also, assumptions concerning the recovery of fixed costs by the land owner were altered to derive additional scenarios.

The paper provides a detailed discussion of how the land bid prices were estimated. First, a description of the farm and its cost structure is provided. Second, the implications of the federal farm program to the revenues and costs of the farming operation are discussed. Third, the development of the farming operation's fixed cost estimates are presented. The final section presents the estimated land values and a discussion of the possible outlook for agricultural farm prices.

## THE CASE STUDY FARM ANALYZED

The farm was a 640 acre cash grain farm with 600 acres of tillable land (Table 3). The ASCS base yields were assumed to equal the average yield for the farm. On average, the farm is expected to have yields per acre of 75 bushel for corn and oats, 30 bushel for soybeans, and 3 tons for alfalfa (Table 2). Three yield scenarios were specified. Bumper yields were yields 33 percent above the base yields, while poor yields were yields 33 percent below the base yields.

Because the 1985 farm program required acreage to be setaside for program crops, the total number of acres farmed will be less than 600 acres (Table 1 & 3). The farm program requirements for the 1986 crop were used in the analysis because the farm program for the 1987 crop has the potential for further alterations. Also, the actual land values are known for the summer of 1986.

TABLE 1: CROPS PRODUCED AND GOVERNMENT PROGRAM INFORMATION

| Description | Corn | Oats | Soybeans | Alfalfa |
|---|---|---|---|---|
| A. Setaside Percentage | 20.0% | 20.0% | 0.0% | 0.0% |
| B. Paid Diversion Percentage | 2.5% | 2.5% | 0.0% | 0.0% |

TABLE 2: BASE YIELD AND PROJECTED YIELDS UNDER THREE DIFFERENT YIELD SENARIOS

| Type of Yield* | Corn (bu.) | Oats (bu.) | Soybeans (bu.) | Alfalfa (ton) |
|---|---|---|---|---|
| A. Base Yield | 75 | 75 | 30 | 3 |
| B. Bumper Yield | 100 | 100 | 40 | 4 |
| C. Average Yield | 75 | 75 | 30 | 3 |
| D. Poor Yield | 50 | 50 | 20 | 2 |

*Base yield for the government program and the average yield for the farm were assumed to be equal.

TABLE 3: BASED ON YIELD SCENARIOS THE PROJECTED PRODUCTION WITH AND WITHOUT THE FARM PROGRAM FOR A 640 ACRE FARM WITH 600 ACRES TILLABLE

| Description | Corn (bu.) | Oats (bu.) | Soybeans (bu.) | Alfalfa (ton) |
|---|---|---|---|---|
| A. Base Acreage | 300 | 100 | 150 | 50 |
| B. Planted Acreage | 240 | 80 | 150 | 50 |
| **Bumper Yield** | | | | |
| C. Without Program | 30000 | 10000 | 6000 | 200 |
| D. With Program | 24000 | 8000 | 6000 | 200 |
| E. Difference | 6000 | 2000 | 0 | 0 |
| **Average Yield** | | | | |
| F. Without Program | 22500 | 7500 | 4500 | 150 |
| G. With Program | 18000 | 6000 | 4500 | 150 |
| H. Difference | 4500 | 1500 | 0 | 0 |
| **Poor Yield** | | | | |
| I. Without Program | 15000 | 5000 | 3000 | 100 |
| J. With Program | 12000 | 4000 | 3000 | 100 |
| K. Difference | 3000 | 1000 | 0 | 0 |

Participation in the farm program reduces the amount of grain the producer will have available to sell with each of the three crop scenarios (Table 3). Government participation also reduces the costs directly related to crop production, while not altering the fixed costs for the farming operation. The incentives for participation are the additional revenues resulting from the deficiency payments and the 9-month nonrecourse support loans.

## Production Practices and Direct Costs

The production practices and direct production costs were based on the South Dakota Extension Service publication, Expected Production Costs for Major Crops in South Dakota (Pflueger). Background research was conducted by the authors to update the cost estimates to summer 1986 cost levels. These cost estimates are approximations to what would be expected from a "typical" farm manager. Actual production practices and direct costs will vary from producer to producer. Potential reasons for these cost differences are management, financing, procurement strategies and the type of equipment used.

The assumed seeding rates and associated costs per acre are given in Table 4. The seeding rates per acre for each crop were: corn (23,000 seeds), oats (2.01 bushels), soybeans (1.21 bushels), and alfalfa (8.0 lbs.). The seed costs used were the high cost or certified seed estimates indicated in the SDSU Extension Service publication.

Fertilizer rates are reflective of a typical application rate for East-Central South Dakota. Fertilizer prices used were actual price levels during July 1986 in Brookings, South Dakota.

For the analysis, the producer was assumed to use an operating loan to fund direct production costs. The loan terms were assumed to be for a 6 month period at 13.5% annual interest. If the producer does not borrow this money, the direct production costs would be lowered by between $2.35 to $5.78 per acre.

## Average Direct Costs and Prices

The average total direct production costs and their calculation are presented in Table 5. Herbicides for corn were assumed to be two applications of Lasso and Banvel. The soybean herbicide application was Treflan and Sencor. The crop insurance premium rate was for multiperil coverage at a 65% coverage rate through Federal Crop Insurance. This premium rate can be significantly higher for regions with higher historical levels of hail damage or crop failure. Since the fall of 1985, the cost of fuel and lubricants has dropped significantly. Thus, the cost of fuel and lubricants was specified as being 55 percent of the Extension Service estimate.

Used machinery rather than new machinery was assumed in the farming operation. Most producers have made management decisions

TABLE 4: BASIC CROP INPUT INFORMATION FOR CALCULATION OF DIRECT COSTS OF PRODUCTION FOR SPECIFIED CROPS

| Description | Corn | Oats | Soybeans | Alfalfa |
|---|---|---|---|---|
| A. Seeding Rate Per Acre* | 23 | 2.01 | 1.21 | 7 |
| B. Cost Per Unit | $0.80 | $3.70 | $9.50 | $3.00 |
| C. Seed Cost | $18.40 | $7.44 | $11.50 | $21.00 |
| D. Nitrogen (lbs) | 80 | 60 | 0 | 0 |
| E. Price per lb. | $0.19 | $0.19 | $0.19 | $0.19 |
| F. Phosphorus (lbs) | 25 | 30 | 20 | 30 |
| G. Price per lb. | $0.19 | $0.19 | $0.19 | $0.19 |
| H. Potassium (lbs) | 0 | 0 | 0 | 0 |
| I. Price per lb. | $0.09 | $0.09 | $0.09 | $0.09 |
| J. Fertilizer Cost | $19.95 | $17.10 | $3.80 | $5.70 |
| K. Interest Rate on Operating Loan | 13.50% | 13.50% | 13.50% | 13.50% |
| L. Length of Loan in Months | 6 | 6 | 6 | 6 |

*Seeding rates per acre were expressed in the following manner: corn in 1,000 of seeds, oats and soybeans in bushels, and alfalfa in pounds.

TABLE 5: DIRECT PRODUCTION COSTS WITH AND WITHOUT GOVERNMENT PROGRAM UNDER THREE CROP YIELD SCENARIOS

| | Production Costs | Corn | Oats | Soybeans | Alfalfa |
|---|---|---|---|---|---|
| | **Projected Crop Yields Under Scenarios** | | | | |
| A. | Bumper Crop | 100 | 100 | 40 | 4 |
| B. | Average Crop | 75 | 75 | 30 | 3 |
| C. | Poor Crop | 50 | 50 | 20 | 2 |
| | **Direct Costs Associated with Acreage Planted** | | | | |
| D. | Seed | $18.40 | $7.44 | $11.50 | $21.00 |
| E. | Fertilizer | $19.95 | $17.10 | $3.80 | $5.70 |
| F. | Herbicides | $19.00 | $2.40 | $11.70 | $0.00 |
| G. | Insecticides | $0.00 | $0.00 | $0.00 | $0.00 |
| H. | Crop Insurance | $4.46 | $2.13 | $4.08 | $0.00 |
| I. | Fuel & Lubricants | $4.98 | $3.99 | $4.13 | $2.37 |
| J. | Machinery Repairs | $13.35 | $9.70 | $11.00 | $11.95 |
| K. | Misc. | $5.50 | $5.00 | $5.00 | $5.00 |
| L. | Operating Interest | $5.78 | $3.22 | $3.46 | $3.11 |
| M. | Total Direct Costs Affected by Acreage | $91.42 | $50.98 | $54.66 | $49.13 |
| | **Direct Costs Affected by Yield** | | | | |
| N. | Drying (2 Cents per Point) | $0.20 | $0.00 | $0.00 | $0.00 |
| | **Total Direct Costs Per Acre by Yield Scenario** | | | | |
| O. | Bumper Yield | $111.42 | $50.98 | $54.66 | $49.13 |
| P. | Average Yield | $106.42 | $50.98 | $54.66 | $49.13 |
| Q. | Poor Yield | $101.42 | $50.98 | $54.66 | $49.13 |
| | **Average Direct Costs per Bushel** | | | | |
| R. | Bumper Yield | $1.11 | $0.51 | $1.37 | $12.28 |
| S. | Average Yield | $1.42 | $0.68 | $1.82 | $16.38 |
| T. | Poor Yield | $2.03 | $1.02 | $2.73 | $24.56 |

to reduce their farming operation's overhead costs. The assumption of used equipment is consistent with this management strategy. Also, decreased machinery costs imply a greater cash flow available for the purchase of land.

The value of the used equipment was assumed to be $43,430. The equipment and associated prices to derive this value are given in Appendix I. If the farmer did not participate in the farm program, the machinery repair costs were assumed to be $7220.50. With participation in the farm program, this expense was estimated at $6,127.50. Depreciation of $6,108 was allocated as a fixed cost towards the machinery component of the farming operation. If a higher level of investment in new machinery was specified, this would increase depreciation costs but reduce the machinery repair bill. Also, potential losses associated with machinery down time would be lower.

Drying costs were assumed to exist only for corn. The drying cost was 2 cents per moisture point per bushel. The corn was harvested at a moisture level 10 percentage points above the level required for storage. The analysis did not include a cost allocation associated with shrinkage resulting from storage. Shrinkage would reduce the volume of commodity available for sale.

Yield levels can drastically alter the average direct costs associated with the production of specific commodities (Table 5). For example, the average direct costs for corn production increased to $2.03 per bushel and oats to $1.02 per bushel under the poor yield scenario. This is an essential dimension of the business risk that producers are confronted with in their farming operations.

## Total Direct Production Costs

As expected, the total direct production costs were the highest for the production scenario where the farmer did not participate in the farm program (Table 6). A producer not participating in the farm program was assumed to be operating at 100 percent capacity.

Although a producer participating in the farm program is not operating at a 100 percent capacity, this producer still has to manage and maintain the setaside acreage. A cost of $15.00 per acre was allocated to the management of the setaside acreage. This cost would be directed towards controlling weeds, planting a cover crop and preparation of the field for next year's crop.

## Price and Revenue Outlook

The price scenario assumed that there would be no further cuts in the government support prices. The analysis did incorporate the recent cut in the soybean support price (Table 7). The reductions associated with Gramm-Rudman were not part of this analysis. These reductions reduce government payments and 9-

TABLE 6: TOTAL DIRECT COSTS FOR CROP PRODUCTION WITHOUT AND WITH PROGRAM UNDER THREE YIELD SCENARIOS

| Type of Crop | Corn | Oats | Soybeans | Alfalfa | Total Direct Costs |
|---|---|---|---|---|---|
| | | | Without Program | | |
| A. Bumper Yield | $33,426 | $5,098 | $8,199 | $2,456 | $49,180 |
| B. Average Yield | $31,926 | $5,098 | $8,199 | $2,456 | $47,680 |
| C. Poor Yield | $30,426 | $5,098 | $8,199 | $2,456 | $46,180 |
| | | | With Program* | | |
| D. Bumper Yield | $27,641 | $4,378 | $8,199 | $2,456 | $42,675 |
| E. Average Yield | $26,441 | $4,378 | $8,199 | $2,456 | $41,475 |
| F. Poor Yield | $25,241 | $4,378 | $8,199 | $2,456 | $40,275 |

*Direct costs of idle acres to meet program requirements are assumed to be $15.00 per acre.

month nonrecourse loan prices. The reductions in producer revenues would cause capitalized land market prices to decline below those indicated in this analysis. A more detailed discussion of the implications of the farm program to producers may be found in the referenced Economic Newsletter by Schmiesing and Shane.

The average cash price received by the producer wass based upon specific expectations concerning producer marketing of the grain produced. The expectation is that the producer will not market all the crop in the fall so that the price received will be above the seasonally low prices. Also, producers are expected to be receiving slightly less than the largest feasible deficiency payment for this year's production. This implies that the national average price was assumed to be slightly above the support price for the year. If the current expectations for the 1987 corn and soybean crop become reality, the actual price scenario for the 1986 crop should be close to the one specified in the analysis.

The farming operation's total revenues were assumed to equal the crop revenues plus the government payments. To simplify the analysis, the timing of receipts and expense payments was ignored so cash flows were not calculated on a present value basis.

The government program was found to provide a superior cash income in all the yield scenarios (Table 7). This result implies that the government program causes the land price to be higher than what would exist without the government program.

Also, the government program reduces the business risk for the producer. A major proportion of the farming operation's revenues is associated with deficiency payments. Deficiency payments are tied to base yields, and these base yields are not affected by a producer's actual production level. Therefore, the deficiency payments are independent of the actual yields received by producers.

Although the difference between total revenues and cash expenses gives some indication of the potential cash flow available in the short-run, the fixed costs of the operation must also be paid.

## Treatment of Fixed Costs

Fixed costs are those costs that in the short-run, do not vary with changes in yield levels or acreage planted (Table 8). Depreciation utilities, insurance and real estate taxes were considered to be the minimum level of fixed costs for the farming operation. Depreciation was estimated to be $6,108 for the farm machinery. Insurance and utilities are also basically fixed costs for the farming operation. Real estate taxes also do not vary with the level of production or proportion of acreage planted. No matter what the equity position of the farmer, these fixed costs have to be paid.

TABLE 7: TOTAL REVENUES FOR CROP PRODUCTION WITHOUT AND WITH THE GOVERNMENT PROGRAM

| Type of Crop | Corn | Oats | Soybeans | Alfalfa | Total Revenues |
|---|---|---|---|---|---|
| A. Average Cash Price for Crop | $1.75 | $0.89 | $4.65 | $35.00 | |
| | | | Without Program | | |
| B. Bumper Yield | $52,500 | $8,900 | $27,900 | $7,000 | $96,300 |
| C. Average Yield | $39,375 | $6,675 | $20,925 | $5,250 | $72,225 |
| D. Poor Yield | $26,250 | $4,450 | $13,950 | $3,500 | $48,150 |
| | | | With Program | | |
| E. Bumper Yield | | | | | |
| Crop Revenues | $42,000 | $7,120 | $27,900 | $7,000 | $84,020 |
| Government Payments | $18,599 | $2,783 | $0 | $0 | $21,382 |
| Total Revenues | $60,599 | $9,903 | $27,900 | $7,000 | $105,402 |
| F. Average Yield | | | | | |
| Crop Revenues | $31,500 | $5,340 | $20,925 | $5,250 | $63,015 |
| Government Payments | $18,599 | $2,783 | $0 | $0 | $21,382 |
| Total Revenues | $50,099 | $8,123 | $20,925 | $5,250 | $84,397 |
| G. Poor Yield | | | | | |
| Crop Revenues | $21,000 | $3,560 | $13,950 | $3,500 | $42,010 |
| Government Payments | $18,599 | $2,783 | $0 | $0 | $21,382 |
| Total Revenues | $39,599 | $6,343 | $13,950 | $3,500 | $63,392 |

TABLE 8: TOTAL FIXED COSTS TO FARMING OPERATION

| Description of Fixed Cost | Without Program | With Program |
|---|---|---|
| A. Machinery Investment | $43,430 | $43,430 |
| B. Estimated Depreciation | $6,108 | $6,108 |
| C. Interest Rate on Capital Invested | 13.50% | 13.50% |
| D. Interest on Machinery | $5,863 | $5,863 |
| E. Real Estate Rate per $100 | $1.50 | $1.50 |
| F. Real Estate Value | $259,154 | $259,154 |
| G. Real Estate Taxes | $3,887 | $3,887 |
| H. Insurance | $1,000 | $1,000 |
| I. Utilities | $1,000 | $1,000 |
| J. Return to Management | $20,000 | $20,000 |
| Fixed Cost Analysis | | |
| K. Fixed Costs: No Allocation to Machinery Investment or Management | $11,995 | $11,995 |
| L. Fixed Costs: No Allocation to Management | $17,858 | $17,858 |
| M. Fixed Costs: No Allocation to Machinery Investment | $31,995 | $31,995 |
| N. All Fixed Costs are Allocated | $37,858 | $37,858 |

When paying fixed costs, producers differ significantly in their level of managerial discretion. For example, the producer's investment in machinery represents a substantial investment of capital. Assume s/he uses only equity capital to finance the machinery component. The producer could have invested in an alternative investment and earned a positive rate of return on this equity capital. This rate of return represents the opportunity cost of using that equity capital within the farming operation.

The opportunity cost of capital is not a cash expense in this example. Rather, the producer has discretion concerning the level of the rate of return s/he is willing to accept for the use of equity capital in the farming operation. The potential rates of return could be as low as zero or even negative.

However, if the producer has borrowed capital to finance the machinery, the level of managerial discretion on the treatment of this fixed cost is extremely limited. The interest expense and principal payments are clearly a fixed expense that must be paid. These payments result in cash exiting from the farm. This cash is not available to the producer to manage within the farming operation or allocate to land payments.

In this example, the producer is assumed to require a 13.50 percent rate of return on the machinery investment. This was specified as being the second level of fixed cost recovery. The producer requires a land investment to have adequate cash flow to pay the previously specified fixed costs, plus a positive return on the machinery investment.

A producer may desire to have a return for the management and labor invested in the farming operation each year. What a farmer requires in terms of salary is again a discretionary item. A spouse may have an off-farm job which has life, health and dental insurance, plus a reasonable salary. This producer would have considerably more discretionary cash flow for a land purchase than a producer with a non-working spouse. In the example, a fee of $20,000 for management and labor costs was assumed. The higher this cash recovery requirement, the lower the level of cash flow available for a land purchase.

Therefore, a third and fouth level of fixed cost recovery can be specified. The third level would be that a farmer not require any return to machinery but would require a return for labor. The fourth and final level would be full cost recovery for the machinery investment and management.

## The Return to Land Ownership per Acre

The total available current returns to land ownership are reported for all four levels of possible fixed cost recovery by the producer (Table 9). The bumper yield scenario indicates a positive cash flow in all four of the fixed cost assumptions.

TABLE 9: AVAILABLE TOTAL CASH FLOW FOR FARM LAND UNDER THE THREE CROP SCENARIOS WITH AND WITHOUT THE FARM PROGRAM

| Description of Fixed Costs and Yield Assumptions | Without Program* | With Program* |
|---|---|---|
| **No Allocation to Investment in Machinery or Management** | | |
| A. Bumper Yield: | $35,125 | $50,732 |
| B. Average Yield: | $12,550 | $30,927 |
| C. Poor Yield: | ($10,025) | $11,122 |
| **No Allocation to Management** | | |
| D. Bumper Yield: | $29,262 | $44,869 |
| E. Average Yield: | $6,687 | $25,064 |
| F. Poor Yield: | ($15,888) | $5,259 |
| **No Allocation to Machinery Investment** | | |
| G. Bumper Yield: | $15,125 | $30,732 |
| H. Average Yield: | ($7,450) | $10,927 |
| I. Poor Yield: | ($30,025) | ($8,878) |
| **Allocations to Machinery Investment and Management** | | |
| G. Bumper Yield: | $9,262 | $24,869 |
| H. Average Yield: | ($13,313) | $5,064 |
| I. Poor Yield: | ($35,888) | ($14,741) |

*Numbers in parentheses are negative numbers.

The poor crop scenario has a negative cash flow in all the fixed cost assumptions without the farm program. Even with the government program, the available cash flow for a poor crop was negative in the "no return to machinery" and "full cost recovery" scenarios.

The average returns to land ownership were found by dividing total current returns by 640, i.e., the number of total acres in the farm (Table 10). For South Dakota's East-Central region, the 1986 cash rents were in the range of $37.40 to $48.00 for the type of farming analyzed (Janssen & Peterson). When this level of cash rent combined with a poor crop, the potential losses could be substantial. Also, an average crop with lower government support would provide evidence that the rental rates would be under pressure for further declines.

If a producer is going to have a return to machinery and management, the net cash flow available for land with an average crop and the government program is $7.91 per acre. The analysis would appear to indicate that cash rents in the region will be under considerable downward pressure during 1987. Further reductions in cash rents will imply a lower bid price by nonfarm investors. Also, the potential for further cuts in farm program payments will place additional downward pressure on the cash rents.

## CAPITALIZATION APPROACH TO LAND VALUES

The estimated capitalization value of the land was found by dividing the estimated cash flow available for land by a capitalization rate of 10.5 percent (Table 11). This interest rate level is the approximate rate currently being charged by the Federal Land Bank to their customers with superior credit ratings.

This interest rate is relatively high compared to the rates of return currently available for other types of investments. However, the higher the investment's risk level, the higher the rate of return required by investors. Investments in savings accounts, money markets and certificates of deposits have a lower risk level than farmland. The possibility of further declines in land values implies the loss of the investor's principal. Therefore, we would expect investors to use a higher capitalization rate for land purchases than the rates of return available on less risky investments.

Also, this simple method of capitalizing the available cash flow for land does not require an adjustment of either the cash flow or capitalization rates for the investor's tax bracket. If the investor has a limited planning horizon for agricultural land investment, adjustments should be made for impact of income taxes on the capitalized value of the land.

Rather than using budgeting to determine the capitalized value of the land, the "net cash rent" approach can be used. With

TABLE 10: AVAILABLE CASH FLOW PER ACRE FOR THE 640 ACRE FARM UNDER THE THREE CROP SCENARIOS WITH AND WITHOUT THE FARM PROGRAM

| Description of Fixed Costs and Yield Assumptions | Without Program* | With Program* |
|---|---|---|
| **No Allocation to Investment in Machinery or Management** | | |
| A. Bumper Yield | $54.88 | $79.27 |
| B. Average Yield | $19.61 | $48.32 |
| C. Poor Yield | ($15.66) | $17.38 |
| **No Allocation to Management** | | |
| D. Bumper Yield | $45.72 | $70.11 |
| E. Average Yield | $10.45 | $39.16 |
| F. Poor Yield | ($24.83) | $8.22 |
| **No Allocation to Machinery Investment** | | |
| H. Bumper Yield | $23.63 | $48.02 |
| I. Average Yield | ($11.64) | $17.07 |
| J. Poor Yield | ($46.91) | ($13.87) |
| **Allocations to Machinery Investment and Management** | | |
| K. Bumper Yield | $14.47 | $38.86 |
| L. Average Yield | ($20.80) | $7.91 |
| M. Poor Yield | ($56.08) | ($23.03) |

*Numbers in parentheses are negative numbers.

this approach current cash rents being paid by producers for the farmland is adjusted for ownership costs. Ownership costs, such as real estate taxes and insurance, are subtracted from the cash rental rate. The resulting "net cash rent" is then capitalized by the capitalization rate.

Also, an alternative source of capital for a land purchases is contracts for deed. This is major capital source for land purchases in South Dakota. Currently interest rates for contracts for deed are typically at 9 percent. This lower capitalization rate would increase the capitalized land value.

## Limitations of the Analysis

The main limitation of this approach is that this a BID PRICE concept under alternative management practices and fixed costs assumptions. This approach does not take in account local supply and demand conditions that influence agricultural land markets. Do local buyers have the necessary equity and cash flow to purchase the land? Are the current land owners willing to sell at the currently depressed prices? What are the buyers and land owners expectations concerning the future profitability of agriculture? These are major factors that influence the actual price at which transactions will take place.

Also, the capitalization formula is based on the concept of a perpetuity. The investor has an infinite (unlimited) planning horizon. Also, both the cash flow available for land and the capitalization rate will stay constant over this period. Although this assumption is unrealistic, the question being asked is "What would be the land price if current available cash flow for land continued with current interest rates?" If the expectations are further reductions in cash flow levels and increases in interest rates, the resulting estimates would be overly optimistic. If the reverse is true, then the estimate will be overly pessimistic.

Another limitation is that the capitalization approach does not incorporate the cash flow requirements for principal payments on debt capital. Therefore, the capitalized value of the land implies the available cash flow equals the capitalization rate only. If the interest rate on debt capital is higher than the capitalization rate, the land investment would not be able to even meet the interest payments on debt capital.

A third limitation is the large number of assumptions concerning the cost structure of the farming operation. For example, the analysis incorporates used equipment prices. Evidence exists that the cost of used equipment has started to rise. This implies a higher level of fixed costs than estimated in the analysis. Different cost estimates imply different results.

Also, the crop mix given for the farm may be altered. For example, the farm may have a larger or smaller crop base for corn and oats. More base acres for program crops would increase the

capitalized value, while fewer base acres would decrease the capitalized values. Also, an additional program crop such as wheat would alter the results of the analysis.

Finally, the analysis used all 640 acres in the capitalization. If 100 percent of the acreage was tillable, the capitalized value would be higher.

## The Estimated Capitalized Value

Currently, land of the productive quality discussed in this analysis is selling in the range of $282 to $375 per acre (Janssen). If the capitalized value is greater than this land value, the specific scenario would imply that the current land market price is not excessive based on the capitalization approach. If the capitalized value is less, the potential for further declines would appear to exist.

Have land prices bottomed? If the producer could expect a bumper yield every year and continued funding of the federal farm program at current levels, the answer would be yes (Table 11). With full cost recovery the capitalized value of the land was $370 per acre. The capitalized value of the land per acre was above the current market values for the three other fixed cost recovery assumptions.

If the expectations are for average yields and reduced government support, the answer would be no. Without the government program and average yields, the available cash flows imply land values below $200 in the four fixed cost recovery assumptions. Even with the government program, the capitalized land values are only consistent with current land prices if the producer is willing to accept no return to management.

The parentheses in Table 11 imply a negative land value based on the capitalization approach. In such cases, the losses may be minimized by not farming the land. Agricultural land with poor productivity may be simply abandoned. Although productive land may suffer the loss of additional value, less productive land may result in the investor having an investment that is essentially worthless.

The argument can be made that farmland during the late 1970's and early 1980's was unable to be capitalized to levels equal to the land values that existed. There is a critical difference between that period and the current situation. During the previous period, the inflation rate was high and there were expectations for increasing cash flows to land ownership and capital gains. This type of environment created a situation where current returns only partially indicated the rate of return to land ownership. Therefore, the expectations of growth in returns and capital gains were capitalized into the land values.

The current environment is one of deflation and a lower rate of return to land ownership. In this environment, land prices

TABLE 11: ESTIMATED LAND BID PRICE PER ACRE USING A PERPETUITY MODEL WITH THE SPECIFIED INTEREST RATE

| Description of Fixed Costs and Yield Assumptions | Without Program* | With Program* |
|---|---|---|
| A. Capitalization Rate | 10.50% | 10.50% |
| **No Return to Investment in Machinery or Management** | | |
| B. Bumper Yield | $523 | $755 |
| C. Average Yield | $187 | $460 |
| D. Poor Yield | ($149) | $166 |
| **No Return to Management** | | |
| E. Bumper Yield | $435 | $668 |
| F. Average Yield | $100 | $373 |
| G. Poor Yield | ($236) | $78 |
| **No Return to Machinery Investment** | | |
| H. Bumper Yield | $225 | $457 |
| I. Average Yield | ($111) | $163 |
| J. Poor Yield | ($447) | ($132) |
| **Return to Machinery Investment and Management** | | |
| K. Bumper Yield | $138 | $370 |
| L. Average Yield | ($198) | $75 |
| M. Poor Yield | ($534) | ($219) |

*Numbers in parentheses are negative numbers.

must reflect the negative expectations concerning returns to land ownership. These negative expectations imply that current returns overestimate the returns to land ownership. The inability to capitalize the current returns to the current land market values implies the market still has potential downward pressures.

A poor crop in South Dakota and excessive national production would imply significant downward pressure on local land prices. Even with the current level of government support, a producer using newer equipment and having a moderate leverage level would experience potential cash flow difficulties.

## THE FUTURE OF LAND VALUES

Agricultural land is the residual holder of the profitability of agriculture. The lack of profitability implies weak land prices. Also, farmers are probably going to be less willing to invest a significant proportion of their reserve investment capital in agricultural land. The desire to diversify their investments may limit any upward producer buying pressure on land values.

Interest rates and agricultural input prices have all been declining in the past two years. These trends have reduced the cost squeeze on farmers because of declining grain prices. If interest rates or agricultural input prices start to increase, the profitability of land ownership will decline further.

Most importantly, the Food Security Act of 1985 contains clear indications of lower government support for agriculture in the future. The Act contains provisions for reducing target prices in 1988. Also, the potential exists for further reductions in support loan prices. If the grain surplus is not reduced, this will imply further reductions in the cash grain prices received by producers.

In summary, anyone purchasing agricultural land is betting that the federal government is going to develop a farm program which will improve market prices above current levels or maintain current payment levels. Also, they are betting that the U.S. government and other governments will achieve a coordinated economic policy that will result in real growth in the world economy during the 1990's and increased international trade for agriculture.

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APPENDIX I: DESCRIPTION AND PRICE OF THE FARM MACHINERY USED IN THE ANALYSIS

| Description | Price |
|---|---|
| Chisel Plow 15 ft. | $ 1,900 |
| Combine | 8,500 |
| Corn Planter | 1,500 |
| Corn Head | 3,800 |
| Cultivator 6-30 | 1,200 |
| Disk 16 ft. | 900 |
| Field Cultivator 18 ft. | 1,050 |
| Grain Drill 12 ft. | 2,100 |
| Gravity Box 185 bu. | 600 |
| MB Plow 5-16 | 1,350 |
| Mower 9 ft. | 1,200 |
| Pickup | 3,000 |
| Soybean Head | 1,750 |
| Sprayer 30 ft. | 900 |
| Springtooth Drag 30 ft. | 180 |
| Tractor 140 HP | 13,500 |
| TOTAL | $43,430 |