THE IMPACT OF CAPITAL GAINS TAX TREATMENTS ON OPTIMAL LIVESTOCK ENTERPRISE SELECTION

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INCOME TAXATION AND CAPITAL GAIN PROVISIONS

Current income tax provisions bear little resemblance to those enacted by the original law, the Revenue Act of 1913. Because of the progressive nature of the federal income tax, a need for special provisions for capital gains was recognized. In 1921, gains from the sale or disposition of capital assets and certain other capital items were identified and taxed differently from income from other sources.[1] The capital gains provisions resulted in the separation of ordinary and capital gains income.

Gains and losses from the sale or exchange of a capital asset and other capital items are classified as either short- or long-term, depending on the period of time the property is held. Income from items held for less than the required period is taxed as ordinary income. Income from items held for longer than the required period receive preferential treatment only if the net long-term gain exceeds the net short-term capital loss. If long-term capital gains are realized, 60 percent of the excess gain is claimable as a deduction; the remaining 40 percent of the net gain is taxed at the taxpayer's ordinary tax rate. If the net short-term capital gain exceeds the net long-term loss, 100 percent of the excess is taxable at the normal rate.

Property used in farming is subject to a number of special rulings. Income from animals held primarily for sale may not be included in the capital gains or losses computation. However, long-term capital gains can be created from many kinds of commonly owned livestock (not including poultry) — livestock held for 24 months or more for draft, breeding, or dairy purposes, and certain livestock such as breeding sheep and swine which have been held for 12 months or longer (Internal Revenue Service, pp. 30-33; Bock, Griffin, and Royer, pp. CGL2-24; Commerce Clearing House, Inc., p. 341). Other items with special treatment include sale of farm real property, unharvested crops, and timber.

Special tabulations by IRS from the 1970 Sole Proprietorship Tax Model show that capital gains are an important source of income to many farmers. Of 2.9 million returns reporting farm earnings, 32 percent or 935,000 reported capital gains income (Woods and Sisson, p. 197). Not surprisingly, livestock farms file the highest number of returns with capital gains (41 percent) and animal specialty farms (such as horse farms, mink ranches, and some other farms) file the lowest (17 percent). Among farmers reporting capital gains, the ratio of capital gains to taxable income is relatively high for all income groups, ranging from 38 to 68 percent of taxable income for most income tax classes. Except for field crops, the ratio of capital gains to taxable income is similar among all crops for farmers reporting capital gains.

In many livestock enterprises such as dairy and hogs, breeding stock replacements are raised and sales of culled breeding animals are an important source of income. Because cash expenses incurred in raising replacements are considered "ordinary" but income from culled livestock often qualifies for capital gains treatment, the capital gains provisions have especially important implications for livestock replacement patterns, enterprise selection, and profitability on farms where cash accounting procedures are employed. We evaluate the impact of those provisions on the organization, future investment patterns, and gains in net worth of four typical Upper Midwest dairy and hog operations. Special consideration is given to the progressive marginal tax structure of state and federal income taxes and to federal taxation of capital gains from livestock.

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[1]Here a capital item is defined as all real and depreciable property owned by the taxpayer. The IRS (Section 1221 Assets) defines a capital asset much more narrowly and excludes many capital items used for business purposes. However, the IRS treats the income from some capital items, such as livestock and property, as capital gains (Sections 1231, 1245, and 1250 Assets; Section 1221 Involuntary Conversions; and Sections 1251, 1252, 1254 Transactions).

INVESTMENT AND GROWTH MODELS OF THE FIRM

Several models have been developed to study firm growth under various capital constraints and cash flow limitations. Martin and Plaxico specified a multiple-period linear program to analyze the capital accumulation and growth problems of farm firms in the Rolling Plains of Oklahoma and Texas.

Boehlje and White developed a 10-period linear programming model to test firm growth and capital accumulation under two alternative objective criteria: (1) maximization of net worth and (2) maximization of the present value of the disposable income over the planning horizon. The net worth criterion generated less disposable annual income because of the increased debt and resulting debt service payments. It was concluded that maximization of net worth generates a greater value of owned assets but farm family consumption must be sacrificed, and a more vulnerable debt position and therefore greater risk result. The income tax effect of net worth on realizable income was not studied in the Boehlje and White model.

Incorporation of income taxes was an important advance in the development of dynamic investment models. The capital budgeting techniques used by Wadsworth stress the relevancy of after-tax cash flows for farm investment decision making. In his model, separate income accounts are provided for taxable income and cash flows. The cash flow available to the farm business for capital expenditure and family living is the sum of income after taxes, depreciation, and value of livestock sales not subject to tax. The rate at which income is taxed is constant. Rodewald presents a method for analyzing the effects of taxes and debt financing on investment decisions. Because failure to include loan repayments from past commitments in the cash flows overestimates the repayment capabilities, the debt-carrying ability of the firm is overstated (Rodewald, p. 1181). Rodewald included income taxes and finance charges in the cash flows. Devino improved Rodewald's model by incorporating the effects of depreciation and capital gains.

THE MODEL AND PROCEDURE

The basic procedure used in our study was to optimize individually the future farm growth and investment patterns of typical Midwestern hog and dairy operations under 1978 U.S. and Wisconsin income tax rules with (1) the 50 percent capital gains provisions and (2) no special provisions for capital gains—all income treated as ordinary income. To measure the impact of the capital gains provisions, we constructed a multiperiod linear programming model which maximized the terminal net after-tax gain in wealth of the farm firm over a 10-year planning horizon. The relative importance of the capital gains was measured by comparing the resulting optimal net worth gains and return on equity capital.

Each representative farm was assumed to contain a limited amount of surplus resources including credit which would permit expansion of existing facilities or their conversion to alternative livestock use during a three-year period. Investments in alternative enterprises could be financed by the sale of existing livestock assets. The land base was not a decision variable and therefore was held constant. Included in the model were (1) the progressive marginal structure of both the federal and Wisconsin state income tax laws, (2) allowances for the capital gains treatment of income from various farm enterprises, (3) alternative sources of debt capital, and (4) alternative external and internal reinvestment possibilities. The model contained three life stages — growth, consolidation, and investment project maturation. The first stage consisted of three sequential periods, each one year long, representing the "growth" phase of the firm when new investments could be made and debt levels could be increased. The second stage consisted of two years of consolidation when neither new investment nor further borrowing were permitted. Together the first and second stages were transition stages to the third stage of investment project maturation. Crucial during both of these periods were the cash flow constraints to investment. The third stage represented five years of "steady state" or stable operation, but modeled as one period.

Terminal net wealth gains consisted of (1) accumulated net cash flows, (2) the remaining book value of new farm investments, and (3) the value of off-farm investments made during the planning period. Original investments in land and buildings were not considered, except in determining the original borrowing limits. A planning period of 10 years was selected which covered the useful life of most new equipment components. The remaining value of new investments was mostly due to buildings, which ranged from 20 to 30 percent of the original investment. The objective criterion can be stated as:

$$(1) \qquad \max \mathrm{TNV} = E^6 + \sum_{k=1}^{3} \sum_{j=1}^{3} (V_j^k I_j^k) + \sum_{k=1}^{6} H_2^k$$

where

TNV = terminal net value
k = time period of investment

n = number of investment possibilities
E^6 = net cash flow from the sixth and final period
V_j = remaining value of the capital asset
I_j = on-farm investment in capital assets, j = 1 (livestock), 2 (equipment), 3 (structures)
H_2 = amount invested in intermediate securities

The problem was constrained by a series of restrictions which can be divided into four categories: (1) annual cash flows, (2) capital funds, (3) tax accounting, and (4) land and labor use restrictions.

The cash flows were required to be greater than the fixed commitments which included family living, debt service from past commitments, and fixed cash expenses required to maintain the current operation. The cash flow constraints for period t is represented by equation 2.

$$(2)\quad \sum_{j=1}^{n} C_j^t X_j^t - \sum_{m=1}^{2} [(\sum_{k=1}^{t} P_m^{k-1} B_m^{k-1}) - B_m^t] - E^t + (1 + R_1) H_1^{t-1} + \sum_{k=1}^{t} R_2^k H_2^k - \sum_{b=1}^{3} M_{1b} T_{1b}^t - \sum_{b=1}^{7} M_{2b} T_{2b}^t \geq (F^t + S^t + L^t)$$

where

t = current time period; t = 1, 6
k = time period of the original borrowing or lending activity
b = tax bracket
C_j = net cash revenue generated by the j^{th} activity
R_j = net returns to the activity, j
X_j = activity level of j
P_m = debt repayment for the j^{th} source of borrowed funds
B_m = quantity of funds borrowed, short-term (1) and long-term (2) investment
E^t = equity surplus transfer for reinvestment in the farm firm
R_1 = return on short-term investments
R_2 = return on intermediate savings and bonds
H_m = funds invested externally to the farm business in (1) short-term investments and (2) intermediate investments
F = annual family living requirement
S = fixed debt service from past commitments
L = fixed cash expenses associated with maintaining the current operation
T_{jb} = taxable income in bracket b; 1 = state; 2 = federal
M_{jb} = marginal tax rate; 1 = state; 2 = federal

The cash flow stream consisted of the net inflows from the farm activities, less payment on previously incurred debt. Surplus funds were permitted to be reinvested either internally or externally. If cash flows were inadequate, operating and long-term loans were permitted. Farm investments could be internally generated from accumulated cash surpluses and current farm assets or debt-financed through operating and investment loans. Total additional farm debt was constrained to a prespecified level.

In addition to farm investments, surplus capital could be invested off the farm. Off-farm nonfarm investment possibilities included intermediate-term savings and taxable bonds, and short-term government securities or prime commercial paper. Intermediate-term savings generated an annual interest income with the principal returned to the objective function at the end of the terminal period. Short-term savings opportunities were available for reinvestment every period.

An important aspect of the model was the income tax submodel. Income tax accounts were based on cash basis accounting for a sole proprietorship form of business. To model the progressive income tax structure, we provided seven brackets for federal income taxes and three brackets for Wisconsin state income taxes. The lower Wisconsin state income tax brackets were omitted because they were well below the lowest taxable income of current farming operations. In addition, current taxable income was above that required for the maximum self-employment tax. Income tax rules were based on 1978 laws; the capital gains provisions of that time provided for 50 percent exclusion. The federal income tax constraint is:

$$(3)\quad \sum_{j=1}^{n} (C_j^t + .5\, G_j^t) X_j - \sum_{k=1}^{t} [(\sum_{j=1}^{n} D_j^t I_j^k) - \sum_{m=1}^{2} P_m^{b'} B_m^k) + (\sum_{m=1}^{2} R_m H_m^k)] - \sum_{b=1}^{7} T_{2b}^t - N_{b+1} \leq EX + (L^t + S^{t'} + O^t)$$

where

b = tax bracket
G = capital gains income
D^t = annual depreciation deduction
$P^{k'}$ = tax deductible portion of the loan
N_{b+1} = transfer to the next tax bracket
EX = standard level of exemptions
S' = tax-deductible portion of the pre-expansion loan commitments
O = other current tax-deductible expenses associated with the pre-expansion farm firm

$$(4)\quad T_{2b} \leq BRACK_b$$

where

$BRACK_b$ = taxable income for bracket b

The 1978 Wisconsin state income tax submodel is similar except that capital gains are treated as ordinary income.

Each period of the model incorporated a series of land use and labor constraints. Because of the variable topography of many soils associated with livestock farms, three soil classes were incorporated in the model. The soil classes differed in use limitations, productivity, and days available for tillage. A series of yield penalties were incorporated for untimeliness in planting of corn and harvesting of corn, oats, and alfalfa. In addition, a limited amount of labor could be hired on an hourly basis.

REPRESENTATIVE FARMS

To examine the potential impact of the capital gains provisions on Midwest dairy and hog operations, we defined four representative operating farms, each based on 240 acres of land and two man-equivalents of available labor. We defined six livestock enterprises, three of which formed the basis for existing representative farms (Table 1): (1) a 48-cow dairy operation (Farm D-A), (2) a 75-sow confinement farrow-to-finish operation (Farm H-A), and (3) a 100-gilt pasture farrow-to-finish operation (Farm H-B). In addition to the three existing enterprises, three new enterprises were available for investment: (1) feeder pig, (2) confined finishing, and (3) modified open-front finishing. Growth on each of the three representative farms could be directed toward the current enterprise or shifted to one of the five other enterprises. The fourth representative farm (Farm D-B) served to determine the impact of capital gains on new dairy enterprises.

Two of the representative farms were nominal dairy farms, Farms D-A and D-B. For both farms, the dairy enterprise was based on a 14,000-pound-per-cow herd production average and a 30 percent dairy culling rate. Dairy replacements could be raised or purchased with the appropriate adjustments made for investment tax credit and depreciation (purchased livestock) or capital gains (raised livestock). Capital investment requirements and net annual returns of dairy and other enterprises are specified in Table 1. Farm D-A was based on a 48-cow dairy herd operation and the associated physical plant, and could expand the dairy enterprise or shift to the alternative hog enterprises in Table 1. The other dairy farm (Farm D-B) served as a control and was nearly identical to D-A but lacked an existing herd and the associated facilities and was limited to future expansion in dairy.

The other five enterprises were based on either parts or the entire sequence of hog production. The existing confinement and pasture farrow-to-finish systems represented different degrees of capital intensiveness (Table 1). Farm H-A represented a 75-sow farrow-to-finish hog operation. It was based on a moderate-investment confinement operation with two litters farrowed per year. Farm H-B represented a 100-gilt, pasture farrow-to-finish system. Only one farrowing per year was permitted under this system. Variations in finishing hogs were represented by the confined

TABLE 1. CURRENTLY EXISTING AND NEW ENTERPRISE INVESTMENT REQUIREMENTS, 1979

	Enterprise	Livestock Unit	Capital Investment Requirement[a]	Net Annual Returns[b] (Periods 1-5)[c]
			($/unit)	
Currently Existing:				
1.	Dairy	cow	$1840	$1249.00
2.	Confinement Farrow-to-Finish	sow capacity	$836	$957.00
3.	Pasture Farrow-to-Finish	gilt	$420	$407.00
New:				
4.	Feeder Pig	sow capacity	$563	$351.00
5.	Confined Finishing	pig capacity	$150	$111.70
6.	Modified Open-Front Finishing	pig capacity	$101	$100.70

[a]Net of investment tax credits.

[b]Based on $8.50 per cwt for milk; $35 per head for feeder pigs; and $40 per cwt for market hogs. Net returns are defined as gross returns less direct operating costs but not including labor or feed produced.

[c]Net returns were increased for the years 6-10 by 36% over years 1-5 due to inflation.

TABLE 2. FINAL LIVESTOCK ENTERPRISE ORGANIZATION BY REPRESENTATIVE FARM AND TAX PROVISION, 1979

Enterprise	Dairy Farm "A"		Dairy Farm "B"[a]		Hog Farm "A"		Hog Farm "B"	
	Capital Gains	No Capital Gains	Capital Gains	No Capital Gains	Capital Gains	No Capital Gains	Capital Gains	No Capital Gains
	(Units)							
Dairy (Cows)	0	31	53	52	0	0	0	0
Farrow-to-Finish:								
Confinement (Sow Capacity)	124	104	--	--	127	157	124	126
Pasture (Gilts)	141	0	--	--	131	0	141	100
Feeder Pigs	0	0	--	--	0	0	0	0
Finish:								
Confinement (Pigs)	0	0	--	--	0	0	0	0
Modified Open-Front (Pigs)	0	0	--	--	0	0	0	0

[a]Expansion was limited solely to dairy.

and modified open-front finishing facility systems.

With the exception of representative Farm D-B, all farms could expand current operations to include the hog and dairy enterprises already defined. In addition to these enterprises, three new enterprises were available: feeder pig, confinement hog finishing, and modified open-front finishing. The capital investment requirements for these enterprises are shown in Table 1.

In addition to the operating capital requirements and capital investment requirements for funding expansion, a total of $42,851 was required annually to meet full-time hired labor costs (paid as annual wages), family living costs, debt service on past commitments, real estate taxes, insurance premiums, and miscellaneous fixed expenses. Current debt levels were approximately $104,672 on an original debt of $125,000. An additional $75,000 could be borrowed for operating and investment capital. This plus the initial farm debt resulted in approximately a 70 percent debt-to-equity ratio. Operating loans were made on an annual basis at 13.0 percent. Intermediate loans were made at 9.0 percent and amortized over 10 years. Two nonfarm investment alternatives were permitted: a short-term investment returning 6.3 percent per year and intermediate-term investment returning 7.5 percent.

RESULTS

Farm organization, growth, and investment of each representative farm were optimized with and without the 1978 federal capital gains provisions. Optimal livestock organization is shown in Table 2, the increase in net worth is shown in Table 3, and the return on equity capital (ROEC)[2] on an after-tax basis is shown in Table 4.

TABLE 3. INCREASE IN NET WORTH BY FARM TYPE, BY REPRESENTATIVE FARM TYPE, 1979-1980

Farm Type	Terminal Net Worth		Difference	Change
	Current Tax Codes	Excluding Capital Gains		
	(Dollars)			(Percent)
Dairy Farm A	284,858	200,764	84,094	-30
Dairy Farm B	242,406	190,609	51,798	-21
Hog Farm A	300,503	219,233	80,290	-27
Hog Farm B	281,591	187,230	94,361	-34

TABLE 4. RETURN ON INVESTMENT CAPITAL[a] AFTER INCOME TAXES, BY FARM TYPE, 1979-1988

Farm Type	Current Tax Codes	Excluding Capital Gains	Difference	Change
	(Percent)			
Dairy Farm A	8.2	4.5	3.7	-45
Dairy Farm B	7.8	5.2	2.6	-33
Hog Farm A	8.7	5.4	3.3	-38
Hog Farm B	8.0	3.7	4.3	-54

a Average rate of return on beginning net worth.

[2]Return on equity capital is defined as the average annual rate of return on original net worth.

The capital gains provisions had considerable impact on future investment patterns and profitability of Farm D-A, the existing dairy unit. Under the price ratios studied, off-farm hay marketing, and current tax rules, the dairy Farm D-B shifted from dairy to a combination of pasture and confinement farrow-to-finish operations. The 48 dairy cows were sold and the funds used to purchase sows, gilts, and facilities. Where the special capital gains provisions were excluded, Farm D-B dairy herd size dropped to 31 and facilities were erected for a 104-sow farrow-to-finish confinement system. Removing the current capital gains provision had considerable impact on the increase in net worth over the 10-year period. The increase in net worth was $284,858 and $200,764, respectively, for capital gain and no capital gain treatments, a difference of $84,094. The ROEC was reduced from 8.2 to 4.5 percent by removing the capital gains provisions.

On both representative dairy farms where future growth included dairy production, all replacements were raised. In the case of Farm D-B, where expansion was limited to the dairy enterprise and no external market for hay was provided, the dairy herd expanded slightly from 48 to 53 and 52 cows for the capital gains and no capital gains treatments, respectively. Although the exclusion of capital gains provisions reduced the final net worth by 21 percent, the reduction was the smallest among those of the four representative farms. By comparing Farm D-A and Farm D-B, we examined the bias of the capital gains treatment toward the hog enterprises. Current capital gains provisions provided considerable incentive to shift from dairy to hogs. Not only was the entire dairy herd eliminated, but the final net worth was increased by $42,452 under current tax codes. When the capital gains provision was removed, the optimal dairy herd size decreased from 48 to 31 cows and final net worth was increased by only $10,155, or about 5 percent.

Hog Farms H-A and H-B represented farms with currently operating confinement and pasture farrow-to-finish hog systems, respectively. Farm H-A expanded the existing confinement operation from 75 to 127 sows and added a 131-gilt pasture system. All of the debt capacity was utilized, and considerable outside labor was employed. Removing the capital gains provisions eliminated the tax advantages of an all-gilt system; all expansion was redirected toward the existing confinement system and capacity was increased from 75 to 157 sows. Terminal net worth was reduced by $80,290 or 27 percent when the capital gains provisions were removed.

As expected, the terminal net worth of Farm H-B was the most influenced by removal of the capital gains provisions because the farm was based on an all-gilt system and therefore had the most potential for capital gains. On this farm, removal of the capital gains reduced terminal net worth by $94,361 or 34 percent, and reduced ROEC from 8.0 to 3.7 percent. Under current provisions, the 100-gilt pasture system was expanded to 141 gilts and a 124-sow confinement farrow-to-finish operation was added. Removal of the capital gains provisions deterred future expansion in the direction of gilts but left the optimal size of the confinement system almost unaffected.

The direction of bias of the capital gains for hogs over dairy is likely to be relatively stable over time. Because butcher sow prices are determined largely by market hog prices, changes in market prices are likely to generate corresponding changes in capital gains. However, the price of cull cows is related closely to beef prices and is largely independent of milk prices. Thus, the degree of bias may shift as price ratios shift.

If profitability is measured as return on equity capital, stability is likely to differ somewhat on hog and dairy farms. Because of the relationship between market hogs and butcher sows, the impact of capital gains on profitability of hogs may be relatively stable as long as positive, taxable incomes are generated. The impact of the capital gains on dairy profitability may not be nearly as stable because of the relative independence of the beef and dairy markets.

Though our results are based on the 1978 rules, which permitted a 50 percent deduction, the 1979 rules which permit a 60 percent deduction would tend to enhance the impact of capital gains treatment, further increasing its role in livestock enterprise selection and breeding stock replacement patterns.

CONCLUSIONS

Capital gains provisions for livestock can have a significant impact on livestock profitability and enterprise selection. Removing the capital gains provisions reduced the gains in terminal net worth by $51,798 for the dairy farm (Farm D-B) and by $94,361 for the hog farm (Farm H-B). Current capital gains provisions favored the gilt-based farrow-to-finish operations over confinement systems which are primarily based on sows. However, expansion to the gilt system is limited by the high labor requirements. Where the capital gains provisions were excluded, the all-dairy and hog/dairy operations generated approximately

the same gains in net worth, indicating they were almost equally profitable. Capital gains provisions strongly shifted the advantage to hogs because of the higher turnover in breeding livestock. Where hay could be sold off the farm, the dairy herd was sold and the resulting funds used to help finance expansion into hog operations.

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