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EFFECTS OF SELECTED TAX POLICIES ON MANAGEMENT AND GROWTH OF A CATFISH ENTERPRISE

Henry Kinnucan, Oscar Cacho, and Gregory D. Hanson

Abstract

A multiperiod programming model was used to simulate the effects of lower marginal income tax rates, the soil and water conservation deduction, and the cash tax accounting option on firm growth for a "representative" farm operating in the Alabama Black Belt region. Results show the lowered marginal income tax rates associated with the Economic Recovery Tax Act (ERTA) of 1981 provide a positive growth stimulus to the modeled firm as measured by accumulated net worth over a 10-year planning horizon. The soil and water conservation deduction in general provides greater tax relief to the modeled firm than either the ERTA income tax rate changes or the cash tax accounting provision. Important complementary and substitute relationships were found to exist between marginal income tax rates and the various tax provisions studied, implying care must be exercised when attempting to evaluate the impact on farm firms of changes in tax policy.

Key words: agricultural policy, catfish, soil and water conservation deduction, tax policy.

The southeast region continues to experience marked growth of aquacultural firms in a management environment made complex by the presence of dynamic production and policy issues. It has become increasingly recognized that tax provisions, including the soil and water conservation deduction as well as other credits, deductions, and exemptions more widely applicable to agriculture have begun to parallel the importance of farm

policy program provisions in terms of farm profitability (Davenport et al.; Hanson et al., 1986; Raup). This study attempts to address both tax policy and production issues of interest to economists and producers in interpreting growth processes of channel catfish enterprises. Objectives are to (1) develop key management, growth, and related tax policy issues in catfish farming and (2) quantify the impact of tax rates and important tax provisions on firm growth processes using a recently revised multiperiod mathematical programming model.

RECENT TAX STUDIES OF FARM FIRM BEHAVIOR

The Economic Recovery Tax Act of 1981 lowered marginal tax rates, generally increased depreciation tax savings (Accelerated Cost Recovery System—ACRS) and motivated a new series of economic analyses. The increase in maximum social security taxes to nearly \$4,000 in 1985 and the increasing importance of interest deductions, with high interest rates in recent years, added significance to debate of tax design.

Several tax modeling efforts have indicated the importance of post-1981 income tax provisions to farm decisionmakers; however, the findings of the following parallel studies are not notable for their consistency. First, Doye and Boehlje found that two 20 percent flat rate tax versions lowered Federal income taxes for large hog and grain farms in Iowa. In contrast, Hanson (1983) found Federal income taxes increased for large Minnesota farms with each of four versions of flat or

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modified flat rate taxes. Second, while Nixon and Richardson estimated that President Reagan's tax reform proposal (Treasury I) would lower income taxes for three types of relatively large farms, Grizzly and Jenkins estimated that the President's proposal would increase taxes for several types of Pennsylvania farms (small tobacco farms were the one exception). Third, with respect to the Economic Recovery Tax Act (ERTA), Richardson and Nixon determined that taxes on Texas rice farmers would decline markedly; however, Hardesty and Carman determined that ERTA would markedly increase income taxes of a large California farm. While data and methodologies differ among studies, the mentioned contradictory findings suggest a need for additional consideration of tax issues (which at a minimum have achieved a consensus view as to their perceived importance in agriculture).

BACKGROUND AND MODELING APPROACH

A diversified Black Belt farm with catfish as a potential enterprise was analyzed because of the growing importance of catfish among Alabama and other southeastern farmers as an alternative farm enterprise. Between 1980 and 1984 pond acreage in Alabama alone expanded 36 percent (Jensen). Industry output of commercially processed fish (primarily from Mississippi, Alabama, and Arkansas) has more than quadrupled since 1980 (USDA, CRB). In early 1985, a national fast food chain contracted with the industry to purchase up to 56 million pounds (liveweight equivalent) of fish over a 15-month period (*Aquaculture Digest*). Given an industry base of 154 million pounds in 1984, this action alone represented a 28 percent annualized increase in demand. The effect in recent years of improved markets for catfish combined with lower feed prices has increased the profitability of catfish production and industry output has expanded accordingly, Table 1. Moreover, rapidly rising prices of ocean fish, an apparent desire on the part of American consumers to increase fish consumption, and likely improvements in efficiency of aquaculture suggest continued growth in catfish as a viable farm enterprise

for farmers located in the Southeast. Recent survey findings support this view: while 78 percent of respondents indicated unawareness of farm-raised catfish, upon tasting the product 94 percent indicated they would purchase it on a regular basis if made available (Dillard and Waldrop).

This study builds upon a multiperiod linear programming model initially developed by Reid et al., with major design changes to include the channel catfish enterprise by Flynn and further modifications to analyze production, price, and risk factors by Hanson et al., 1984.¹ Minor deficiencies and several previously unrecognized errors in the programming model have been corrected in the validation process of this study. The tax component in the model has been expanded to include both cash and accrual accounting as well as the ERTA provisions currently in effect. The soil and water conservation deduction, generally viewed to be applicable to fish pond construction costs, is also incorporated in the tax structure of the model.

The model is designed to provide "representative" behavior of a farm firm located in the Black Belt region of Alabama. The firm considered is viewed to have a typical resource base for that region as described in the U. S. Agricultural Census (USDC). It includes 440 acres of total land, with 124 acres being considered suitable for crops and pond construction and the rest being appropriate for pasture. A complement of row-crop machinery and a cattle herd were owned by the firm. Cotton and soybeans were primary enterprises at the beginning of the planning period. Again, catfish production importantly competes with these enterprises for limited tillable acreage (for construction of ponds).

TABLE 1. ESTIMATED ANNUAL RETURNS TO CATFISH PRODUCTION AND INDUSTRY GROWTH, 1983-85

Year	Estimated net returns ^a (dollars/acre)	United States production of catfish ^b (mil. lb. live-weight)
1983	293	137
1984	739	154
1985	872	192

^aEstimates are for Alabama. A stocking rate of 3,500 fingerlings per acre and a 20 acre pond size are assumed. Source: Crews and Jensen.

^bSource, USDA, CRB.

¹An important objective of aquacultural economics work at Auburn University is to continue the process of integrated model development. Brake and Melichar have generally referred to this as "analytical follow-up" in a "second-stage project" (p. 472). Advantages of continued research with a specific model include model improvement, validation/correction (which is not a minor task), and more timely analyses of current policy issues occur.

The feasibility of intensive firm growth through construction of earthen ponds for catfish production and the impacts of selected tax provisions were explored under three different initial debt alternatives: (1) no initial debt, (2) medium initial debt (\$40,000), and (3) high initial debt (\$80,000). Three pond size options were available in the model: large (20 acres), medium (10 acres), and small (5 acres).² The limit on borrowed capital was 30 percent of the current market value of total assets. A stocking rate of 4,500 fish/acre was assumed and the price of catfish was set at \$0.65 per pound. The objective function in this model is the maximization of whole farm after-tax net worth at the end of a 10-year planning horizon. Consumption expenditures of \$12,000 in constant dollars were provided and it was also assumed that the firm continues in operation after the 10-year planning horizon. Because cost and other model assumptions provided in the Appendix of Hanson et al., 1984 are viewed to be generally applicable to current conditions, they are unchanged.

The resource situation, assumptions, and mechanics of the original model are explained in detail elsewhere (Flynn; Hanson et al., 1984).³ Relevant details regarding the three tax issues considered in the study are as follows.

1. Lower marginal tax rates were studied by incorporating the tax rates of the 1981 Economic Recovery Tax Act (ERTA) into the model.⁴ The effect of lower marginal tax rates were then studied by simulating the model using the tax rates in place prior to 1981 and tax rates applicable under current law. Rates used were those applying to a married couple filing a joint return (Schedule Y) with four personal exemptions. Other special features of the tax law such as

the marginal income tax rate applicable when adjusted gross income exceeds the top bracket (.7 for income above \$215,400 under pre-ERTA and .5 for incomes above \$162,400 under ERTA) were incorporated into the program as additional activities.

2. Farm businesses generally are permitted to use cash basis accounting procedures for tax purposes. Under cash accounting, income is taxable only in the year it is received as cash, credited to the taxpayer's account, or made available for use. Expenses are generally tax deductible in the year they are actually paid regardless of when the item is purchased or used.⁵ By manipulating the timing of expenditures and receipts, cash accounting can be used by the farm business to substantially lower tax liabilities. For this reason cash accounting is viewed to be an important tax "preference" for agriculture (Davenport et al.; Volding and Boehlje; Hanson et al., 1986).

The accrual method of accounting requires the farmer to maintain more extensive inventory records. The value of crops and livestock in inventory at the end of the tax year is included in taxable income for that year, as well as any cash income received. The cost of items purchased for resale, e.g., catfish fingerlings or feeder calves, can be deducted in the year of purchase even if they have not been resold. Such costs are offset for tax purposes by the higher value of ending inventory. Accrual accounting effectively limits farmer ability to reduce tax liabilities by manipulating the timing of expenditures and receipts.

3. The soil and water conservation deduction permits some expenses, often in-

²Larger ponds represent greater risk because losses are greater when disease or low dissolved oxygen occurs in a pond. Although risk is not directly incorporated into the model, extra equipment for emergency pond aeration entered into the solution when the larger pond size was selected. It is recognized that some apparently strictly tax-motivated results, such as to overwinter fish (discussed in some detail later in the article), may not often occur because of the risks associated with the decision.

³Details regarding the method in which provisions of the 1981 tax law were incorporated into the model are in a mimeo available upon request from the authors.

⁴Because tax brackets themselves remained unchanged in the 1981 legislation, modification of the model only required changing the rates applicable to each bracket and not the income brackets themselves. Because ERTA tax rates were phased in over a 3 year period, the 1981 law is sometimes referred to in this article as the "1984 law." This is done to alert the reader to the fact that tax rates and provisions in effect as of 1984 forms the basis for this analysis.

⁵An exception to this rule is in the cost of items purchased for resale in which case expenses can be deducted only in the taxable year in which the items are sold. To account for this, the cost of buying catfish fingerlings is deducted from the revenue in the year in which the fish are sold.

terpreted to include the cost of constructing earthen ponds, to be treated as currently deductible expenses (*Farmer's Tax Guide*). The deduction in any one year is limited to 25 percent of gross income from farming, but expenses exceeding this limit can be carried forward to future years with the limitation of 25 percent of gross income in any such year.⁶

An important modification made to the model relates to the cost of fish carryover. The original model permitted fish to be kept in ponds during the winter months to be sold the following spring when ponds are restocked with fingerlings to start the new production cycle (Flynn). However, it assumed that the cost of fish carryover is zero. To relax this assumption, "feed" and "no feed" alternatives were incorporated into the model based on growth studies of winter feeding of catfish (Lovell and Sirikul). Under the "no feed" alternative, fish are carried over to the next year without feed, resulting in a 9 percent loss in body weight. Under the "feed" alternative, fish are assumed to consume an amount equal to 1 percent of body weight on alternate days during the winter. Assuming a winter conversion rate of 3.2 (each 3.2 pounds of feed produces 1 pound of fish), a 20 percent weight gain is realized under this alternative.

RESULTS

Management decisions analyzed with respect to their impact on firm net worth included construction of ponds, catfish sold in the current year or carried forward, acres of cotton and soybeans produced, cotton lint and soybeans carried forward, cattle produced, and short- and long-term debt incurred. Cattle produced remained constant because no alternative existed in the model for the use of pasture land.

Results in terms of acres of ponds built, final net worth of the firm, and income taxes paid during the 10-year planning horizon are shown in Table 2.⁷ Under 1984 tax law, final net worth of the firm was higher and total

income tax paid during the 10-year planning horizon was lower than under 1980 tax law in all cases considered. Cash accounting yielded higher final net worth and less total income tax paid than accrual accounting. Use of the conservation deduction increased net worth and reduced income tax liabilities, except for the high debt situations where no ponds were built and therefore the deduction did not apply. Twenty-acre ponds were always selected over 5- and 10-acre ponds (confirming a result in Hanson et al., 1984), except in one case where insufficient land was available and a 10-acre pond was built.

Overall, the various tax provisions studied were found to exert the strongest influence on firm net worth under the no initial debt assumption. For example, elimination of the conservation deduction, requiring the use of accrual accounting procedures and a reversion to pre-ERTA tax rates had the combined effect of reducing ending net worth from \$650,000 to \$515,000, Figure 1. Elimination of the conservation deduction alone decreased ending net worth 8.3 percent (\$50,000). Isolated impacts of each provision are discussed below.

Effects of Lower Marginal Tax Rates

Substituting 1984 tax law for 1980 (pre-ERTA) tax law resulted in greater growth in net worth and a lowering of tax liabilities over the 10-year planning horizon by as much as 20 percent depending on initial debt and accounting procedures used, Table 3. Tax relief due to the lower 1984 tax rates benefited the high debt firm more so than the low debt firm (assuming cash accounting procedures are used). On average, lower marginal tax rates were shown to have a greater positive impact on the firm with accrual accounting practices than when the more flexible cash accounting was utilized. The general magnitudes of the impact of the 1984 law on net worth (3.2 percent increase) and 10-year tax liability (13.5 percent decrease) closely agree with findings of the Richardson and Nixon study of Texas rice farmers.

⁶Depreciable items such as structures, appliances, or facilities are not deductible under this provision. If the conservation deduction is not used, the IRS permits the expenses to be added to the basis of the land. Since the firm is assumed to remain in operation at the end of the 10-year planning horizon, the gain in land value was not incorporated into the objective function. Because the earlier versions of the model did not permit unused conservation deductions to be carried forward, conservation deduction effects are more prominent in this study than in Hanson et al., 1984.

⁷Results presented in the following are in nominal terms. In initial analyses, tax liabilities were discounted to account for the time value of money. Because conclusions based on the discounted figures did not differ from those based on nominal values, only the latter are presented.

TABLE 2. EFFECTS OF TAX POLICIES ON POND CONSTRUCTION, TAX LIABILITY, AND NET WORTH, "REPRESENTATIVE" BLACK BELT FARM, ALABAMA, 10-YEAR PLANNING HORIZON

Item	Conservation deduction	Initial debt	Ponds built (Acres)	Income tax liability	Final net worth	Change in net worth over the 10-year period*
1980 Tax law:						
Cash accounting:						
	Not taken	None	100	46,943	576,904	240,849
		Medium	60	31,563	438,327	142,272
		High	0	12,075	259,335	3,280
	Taken	None	100	23,696	641,404	305,349
		Medium	100	22,430	483,401	187,346
		High	0	12,075	259,335	3,280
Accrual accounting:						
	Not taken	None	100	121,334	515,758	179,703
		Medium	60	62,488	409,000	112,945
		High	0	12,146	259,274	3,219
	Taken	None	110	104,847	569,119	233,064
		Medium	100	50,682	445,286	149,231
		High	0	12,146	259,274	3,219
1984 Tax law:						
Cash accounting:						
	Not taken	None	100	43,473	599,811	263,756
		Medium	60	28,598	451,205	155,150
		High	0	10,306	267,768	11,713
	Taken	None	100	23,646	650,111	314,056
		Medium	100	18,914	492,928	196,873
		High	0	10,306	267,768	11,713
Accrual accounting:						
	Not taken	None	100	99,390	554,848	218,793
		Medium	60	50,461	428,150	132,095
		High	0	10,306	267,768	11,713
	Taken	None	100	88,965	601,487	265,432
		Medium	100	40,568	460,810	164,755
		High	0	10,306	267,768	11,713

*Computed as the difference between final net worth and net worth in year "zero."

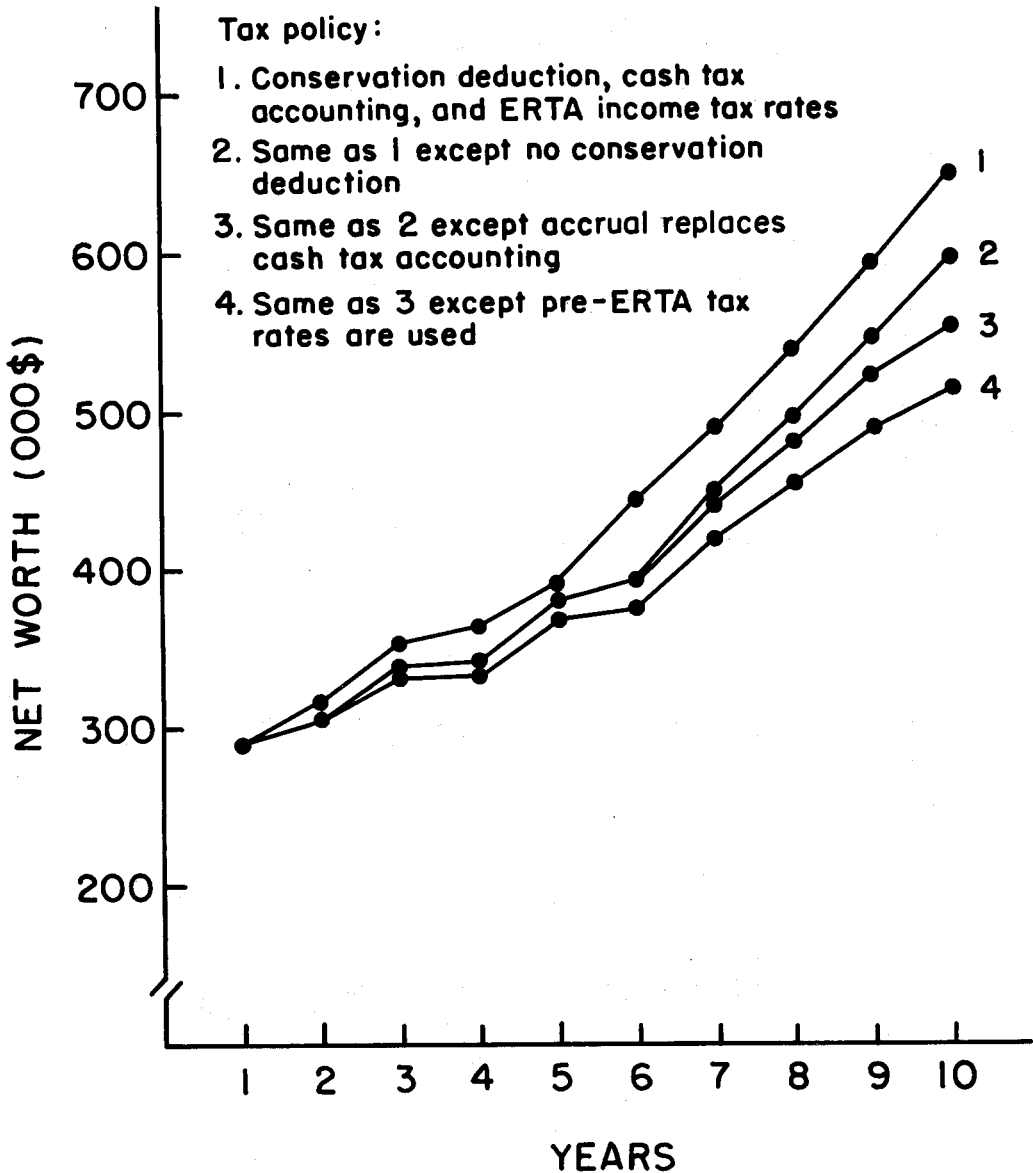


Figure 1. Effects of Alternative Tax Policies on Growth in Net Worth of a Catfish Farm.*

Tax rate levels became more important with accrual accounting. This was demonstrated under accrual accounting as, e.g., the low initial debt firm's net worth increased 5.7 percent and its tax liability declined 15.1 percent with the lower 1984 tax rates in effect, Table 3. By comparison, under cash accounting, the changes were 1.4 percent and 0.2 percent, respectively. Requiring the farm sector to use accrual accounting procedures could affect the behavior of low debt farm firms by encouraging them to acquire

more debt. While the tax deduction advantage of expanded debt use is apparent in this discussion, the increased risk associated with higher levels of financial leverage has become quite evident in U.S. agriculture in the 1980's. A final observation in this regard is that implementation of lower marginal tax rates would substantially offset the tax effects of requiring broader use of accrual accounting.

The impression of an inverse relationship between tax liabilities and net worth suggested by Table 3 is perhaps sharpened by

TABLE 3. EFFECTS OF THE 1984 TAX LAW AND CASH TAX ACCOUNTING ON NET WORTH AND TAX LIABILITIES, "RESPRESENTATIVE" BLACK BELT FARM, ALABAMA, 10-YEAR PLANNING HORIZON

Item	Increase in final net worth when debt level is:			Decrease in total income tax when debt level is:			Net worth/tax liability elasticities* when debt level is:		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
 percent								
Effect of replacing 1980 law with 1984 law assuming:									
Cash tax accounting	1.4	2.0	3.3	0.2	15.7	14.7	-7.00	-.13	-.22
Accrual tax accounting	5.7	3.5	3.3	15.1	20.0	15.1	-.38	-.18	-.22
Effect of substituting cash basis for accrual accounting:									
1980 tax law	12.7	8.6	0.0	77.4	55.7	0.6	-.16	-.15	0.00
1984 tax law	8.1	6.7	0.0	73.4	53.4	0.0	-.11	-.12	0.00

*Obtained by dividing percent change in net worth by percent change in tax liability using corresponding numbers in the first six columns of this table.

expressing this relationship in elasticity terms. Defining the net worth/tax liability elasticity as the percent change in net worth divided by the percent change in tax liability and using the results of Table 3, an elasticity value of -7.0 to 0 emerges depending on assumptions regarding initial debt level, accounting procedure used, and tax rates. Considering the medium initial debt assumption, this elasticity value converges to $-.15$, suggesting that, on average, a 1 dollar reduction in tax liability would be associated with a 2 dollar rise in net worth for the modeled firm.⁸

The lower marginal tax rates of the 1984 law had little effect on resource utilization in the modeled farm. A slight increase in the number of acres used as cropland occurred under the new legislation. However, in the medium debt case with accrual accounting, pond acreage was reduced from 110 to 100 under the 1984 law. Marginal tax rates were higher under accrual accounting and the building of one additional 10-acre pond permitted a \$15,000 conservation deduction to be taken in an otherwise high tax year. Building this pond is an example of a tax-motivated investment as revealed by the model.

Fish carryover is positively related to tax rates because under cash accounting the firm can reduce income in high tax years by delaying the sale of fish. This phenomenon was demonstrated in the medium initial debt case since under 1984 tax law 7.8 percent fewer fish are carried forward than under 1980 law. Moreover, the time distribution of fish carryover was significantly affected by tax rates: in years one through eight of the planning horizon, 3.8 percent of production was carried forward under the 1980 tax law compared to 1.8 percent under 1984 law (assuming medium initial debt and cash accounting, comparable results were obtained

in the other cases). Thus, marginal tax rates, working in concert with cash tax accounting, appear to play an important role in farm marketing decisions.⁹

Overall, differences in net worth and income tax paid between the two tax laws were caused primarily by reduced tax rates rather than by differences in management decisions. However, the model implicitly assumes that the farmer made "optimal" decisions with respect to the timing of catfish sales, pond construction, and other key factors. In reality, the farmer cannot precisely predict the level of income from one year to the next and hence is uncertain of the best timing of these events in terms of net worth maximization. These limitations must be borne in mind when interpreting results.

Effects of Cash Accounting

Model results show cash accounting reduced 10-year tax liability up to 77.4 percent and increased net worth by as much as 12.7 percent depending on levels of initial debt and marginal tax rates, Table 3. This result is consistent with the statement by Davenport et al. that "...farms appear to have grown more rapidly than they could have if cash accounting were not used." (p. 21). Model results suggest that benefits from cash accounting are strongly related to farm debt with the greater benefit accruing to low debt farms. In fact, the model shows cash accounting provided essentially no advantage to "high" debt farmers under existing tax law. Apparently, the deductibility of interest payments had the effect of offsetting the tax advantages of cash accounting. As expected, model results indicate cash accounting will become a more important tax preference as marginal tax rates rise. Taking the medium initial debt situation as an example, cash

⁸This conclusion is based on the following calculations. First, define the elasticity as:

$$\frac{\Delta NW}{\Delta T} \frac{T}{NW} = -.15,$$

where NW = ending net worth, T = tax liabilities, and Δ is the discrete change operator. Rearranging the above expression yields:

$$\Delta NW = \frac{-.15 NW \Delta T}{T}$$

Using model "averages" for NW and T of \$400,000 and \$30,000, respectively (see Table 2), setting $\Delta T = \$1$ and solving, yields $\Delta NW = \$-2$.

⁹The risk of losing overwintering fish to disease or freezing was not incorporated, but it can be an important issue. Specific detail about the effects of taxes on the timing of catfish sales, inventories, and other variables is available upon request from the authors. For additional analysis of risk factors in catfish production, see Hanson et al., 1984.

accounting permitted greater relative growth in net worth under the 1980 law than under the 1984 law, Table 3.

Cash accounting was found to have a substantial effect on fish inventory.¹⁰ Catfish ponds stocked in the spring are usually ready to be harvested the following fall. If prices are not acceptable at that time, the farmer has the option of overwintering the fish. In the model, fish were shown to be carried forward into the next year because of the tax advantages provided by cash accounting. Moreover, depending upon the effective marginal tax rate facing the firm, the carryover can be quite large—up to one-third of total production in later years of the time horizon. This carryover is primarily tax-motivated because marginal tax rates are highest in these years due to the exhaustion of the conservation deduction.

Effects of Conservation Deduction

The costs of constructing fish ponds can be effectively reduced by use of the soil and water conservation deduction. In the model, this deduction alone enhanced the firm's growth in net worth by as much as 11.2 percent and reduced 10-year tax liabilities up to 49.5 percent depending on initial debt, the accounting method used, and marginal tax rates, Table 4. Cash accounting makes better use of the deduction because it gives the firm more flexibility in managing cash flow for tax purposes. For example, the firm takes advantage of the pond deduction available in year four by carrying fish over from year three to year four. More fish are sold in that year but the extra taxable income is offset by the pond deduction.

The conservation deduction tended to encourage expansion of catfish production facilities. The most notable example of this is

in the medium initial debt situation where pond acreage is expanded 67 percent (from three 20-acre ponds to five 20-acre ponds) because of the tax benefits provided by the pond deduction, Table 2. Also affected was the timing of pond construction: ponds tended to be built earlier in the 10-year planning horizon because of the availability of the conservation deduction.

Land use was altered by the pond deduction. In general, if the conservation deduction was not available, crop production was decreased to make increased pond construction financially feasible. This occurred because higher taxes associated with the omission of the deduction restricted the operating capital available to the firm.

Accumulated long-term debt was less with the conservation deduction. Under cash tax accounting, no initial debt simulations which forbade the use of the conservation deduction, long-term debt was 54 percent higher under the 1980 tax law (69 percent higher under the 1984 tax law) compared to the corresponding simulations which permitted the conservation deduction to be taken. (Under accrual accounting, differences in final long-term debt were very small under both tax laws, 3 percent or less.)

SUMMARY AND CONCLUSIONS

The 23 percent ERTA reduction in marginal income tax rates increased the final net worth of the modeled farm firm from 1 to 6 percent, depending on initial debt and tax accounting assumptions. Cash accounting was found to be an important source of tax savings for the modeled farm firm, reducing the 10-year tax liability as much as 77 percent. The soil and water conservation deduction increased net worth of the modeled farm up to 11 percent. The conservation deduction tended to in-

TABLE 4. EFFECTS OF THE SOIL AND WATER CONSERVATION DEDUCTION ON NET WORTH AND TAX LIABILITIES, "REPRESENTIVE" BLACK BELT FARM, ALABAMA, 10-YEAR PLANNING HORIZON

	Increase in final net worth due to the conservation deduction when debt level is:			Decrease in total income tax paid due to the conservation deduction when debt level is:		
	Low	Medium	High	Low	Medium	High
	percent					
1980 Tax law:						
Cash tax accounting	11.2	10.3	0.0	49.5	28.9	0.0
Accrual tax accounting	10.3	8.9	0.0	13.6	18.9	0.0
1984 Tax law:						
Cash tax accounting	8.4	9.2	0.0	45.6	33.9	0.0
Accrual tax accounting	8.4	7.6	0.0	10.5	19.6	0.0

¹⁰This finding is consistent with recent survey results indicating that farmers in Iowa and Alabama strongly agree with the notion that marketing decisions such as when to sell crops are importantly influenced by tax considerations (Hanson et al., 1986).

crease net worth more than either the cash accounting provision or the change to lower marginal income tax rates. This illustrates the potential importance of particular tax provisions to certain farm enterprises.

Important interactions existed among the various tax effects studied. The conservation deduction provided a greater tax benefit under the more flexible cash accounting than under accrual accounting. Tax benefits associated with cash accounting were minimized in a high debt situation because of the deductibility of interest payments. Also, the tax management flexibility of cash accounting neutralized the effect on firm growth of lower marginal tax rates. These findings suggest that care must be exercised in analyzing and interpreting the effects of tax policy changes when substitute or complementary relationships exist among tax rates and provisions.¹¹

High tax rates, combined with cash tax accounting, provided a strong incentive to overwinter fish as a means of reducing tax liability (indicating a useful issue for further research). This effect was pronounced in the

later years of the planning horizon as tax benefits realized from the conservation deduction were exhausted.

This study focused on how selected tax provisions affect the management and growth of a diversified catfish farm. Other factors to consider include: (1) stocking rates, (2) economies of size in pond construction, (3) farm price of catfish, (4) level of withdrawals for family living expenses, (5) production risks, and (6) marketing risks. The importance of items (1)-(4) are discussed in Hanson et al., 1984. Recent studies by Cacho et al. and Kinnucan and Sullivan identify and quantify production and marketing risks faced by Alabama Black Belt catfish farmers. Because these other factors can sometimes overshadow tax effects, they deserve careful consideration when attempting to assess the economic viability of catfish production.

Finally, conclusions drawn from mathematical programming models must be interpreted with caution because results are highly conditional on embedded assumptions and on the "perfect hindsight" vision of deterministic models.

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¹¹For example, simulations of the model using a "flat" tax of 20 percent showed a narrowing in the difference between cash and accrual tax accounting results. This occurred because in high income years the flat tax tended to reduce benefits of cash tax accounting while at the same time reducing the tax liability (via lower marginal tax rates) of the firm using accrual accounting. An exception was the high initial debt case. Here, 10-year tax liability increased 140 percent and ending net worth decreased 10 to 13 percent regardless of tax accounting procedure. (With the flat tax, tax liability during low income years was higher than under current law.) As a general rule, a 20 percent flat tax resulted in greater tax liability and reduced final net worth relative to either existing or pre-ERTA law. The same general conclusion emerged from an analysis of the "Senate Plan" announced in late April 1986 (Murray); however, results were not as negative for the modeled catfish farm (compared to the 20 percent flat tax.)

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