AGRICULTURAL POLICY AND RISK:

CURRENT PROGRAMS AND FUTURE CONSIDERATIONS

by

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The final form of the commodity programs for the 1986-87 crop year still has not been determined. What is known, however, is that the Food Security Act of 1985 (85FSA) and the Food Security Improvements Act of 1986 (86FSIA), in conjunction with Gramm-Rudman-Hollings and proposed tax legislation, bode major changes in the ultimate source and magnitude of price risks which are important to agricultural producers. The changes wrought by these pieces of legislation will affect how we model and prescribe risk management strategies for agricultural producers.

In essence, certain features of this legislation will shift our focus of concern from short term price variability, and the attendant question of whether or not to participate in commodity programs, to inter-year price variability and revenue levels relative to cash and economic costs and their implications for planning over the long term. We will return to this point later.

Because of the confusion surrounding the implementation of commodity programs in the current policy environment, a substantial portion of this paper is devoted to describing relevant portions of current legislation and their impact on two example farms: a 1,000 acre corn farm and a 1,000 acre wheat farm. Let us start by looking at what makes the current policy environment different from that of any other in recent history.

The Policy Environment

The multiple goals of agricultural policy have never been without their inconsistencies. According to Tweeten (1979, pp. 53-56), these goals have included: a fair economic outcome for farmers as measured by a level of returns on resources, net income, or ratio of prices received to prices paid by farmers; a reasonable or fair stability in economic outcomes for farmers and prices for consumers; adequate quantity, quality, and variety of food for consumers; low treasury costs; equitable distribution of tax dollars; and efficient resource use and allocation. Tweeten (ibid, p. 57) points out that: "The most sobering overall reality is that no food and agricultural policy simultaneously provides high farm income, low food cost, and low taxpayer cost."

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In formulating past farm policy, Congress has been given freedom to respond to political pressures and economic realities in assigning weights to these different goals. In 1985, however, the nearly concomitant passage of the farm bill and Gramm-Rudman-Hollings explicitly weights the budgetary concerns as being paramount. In essence, what was formerly a multiattribute utility problem is now a lexicographic one, with the meeting of budget targets, in both the short run and long run, a binding constraint.

As agricultural commodity interests have become more specialized, political pressure on Congress has become splintered, with different commodity groups arguing for different approaches to agricultural legislation. The only point of consensus among commodity groups in the debate over the 85FSA seemed to be that the 1981 farm program was not working. A 17 state survey of farmers' views taken in late 1984 found, for example, that about a third of farmers favored keeping current voluntary programs in which farmers elect whether to participate, about a third called for government to play a larger role in the agricultural economy by enforcing such measures as production cutbacks and marketing controls, and about a fourth wanted government programs eliminated entirely. (Rauch, 1985, p. 2536) The same survey found that a few more than half of the farmers wanted to maintain target prices and deficiency payments, while a fourth to a third wanted them ended. About 40 percent wanted target prices to stay about the same, roughly a third wanted them raised and fewer than 10 percent wanted to see them reduced.

The major concern of the executive branch is budget control. Although the Congress' concern with income support for agricultural producers shaped the final form of farm policy embodied in 85FSA, budgetary concerns will mold the final commodity programs.

Four factors are, at first glance, the most different about 85FSA. These are:

1. For the first time, target prices are scheduled to decline.

2. The dairy herd buy-out program.

3. The conservation reserve program.

4. The use of world market prices, rather than some measure of cost of production, as the standard against which domestic prices are compared.

While these features are, indeed, different, two others will have much greater impact on agricultural producers and our work in risk management.

1. The divergence of goals of policy makers from those who are influenced by those policies.

2. At the same time, vast discretionary powers have been given to the Secretary of Agriculture for setting the rules for commodity program implementation.

Major Provisions of the 85FSA for Wheat and Corn

In addition to the standard provisions for loan programs, target prices, acreage reduction and the FOR, the 85FSA contains several important provisions which may be implemented at the Secretary's discretion.

Target prices for wheat and corn are specified for each year from 1986-1990. Loan rates are specified for the 1986-1987 crop year only. Outyear loan rates are to be between 75 and 85% of the simple average price received by producers during the five preceding marketing years after the high and low price years are dropped. In no case can this "basic" loan rate be lowered by more than 5% from the previous year's basic rate.

However, the Secretary has the authority to employ the Findley amendment, whereby the loan rate is dropped by up to 20 percent of the basic loan rate. The Secretary has used this amendment in setting loan rates for the 1986-87 crop year, bringing the loan rate for corn to $1.92 and for wheat to $2.40. It is assumed that, for at least the next three years, the Secretary will employ the Findley amendment, so that loan rates will be dropped an additional 20% beyond the mandated yearly reduction. The loan rate, after the Findley amendment is employed, is known as the "adjusted" or "announced" loan rate.

While the portion of the deficiency payment based on the difference between the target price and basic loan rate is subject to the $50,000 payment limit, that additional portion stemming from use of the Findley amendment is not.

An additional provision in the bill, known as the 50-92 provision, gives some producers additional flexibility in planning their production. Under this provision, producers who qualify for the commodity programs have the option of planting between 50 and 92% of their allowed program acreage in the program crop and receiving a full 92% of the deficiency payments they would have received if they had planted all of their allowed acreage in the program crop. According to the 85FSA, a producer can plant any non-program crop on the acreage not used for the program crop. Table 1 illustrates how the deficiency payments would be figured for someone with 1000 program acres planted with various levels of the program crop.

Two other provisions, which have not been called upon this year, are the marketing loan and the loan deficiency payment. Under the marketing loan provision, if prices are below the adjusted loan rate, the Secretary has the option of offering wheat and feed grain producers the option of repaying their loan at a yet to be determined "world market price" or 70% of the basic loan rate, whichever is lower.

Under the loan deficiency program, the Secretary has the discretion to offer deficiency payments to producers who are eligible to receive loans, but who elect not to do so. The payment rate per bushel is the announced loan level minus the repayment level used in the marketing loan.

Table 1: Acres planted and acres upon which deficiency payments are received on a 1000 acre base under the 50-92 provision of the 85FSA and 86FSIA

Planting options	Acres planted	Acres on which deficiency payments are received
percent	acres	acres
100	1,000	1,000
91	910	920
50	500	920
25	250	250

The Food Security Improvements Act of 1986

Corrections and technical amendments were being offered within a short time of the passage of the 85FSA. The first change came with cross-compliance requirements. A bill requiring limited cross-compliance for all program crops has already been signed into law.

Other changes which could have significant effects on producers are contained in the Food Security Improvements Act of 1986 (86FSIA) which was signed into law by the President on March 20, 1986. Several major changes are contained in the bill.

One is a recalculation of program yields. The method for computation of program yields in 85FSA is based on the average of the past five years' program yields, excluding the high and the low year. The program yield calculated for the 1986-87 crop year would be used for the life of the bill.

The method of calculation was apparently aimed at rice producers who have dramatically increased yields through the use of new technology. By holding program yields at a pre-1985 level, much of the incentive to use yield increasing technology is taken away if prices remain near or below the loan level.

The 85FSA method of calculating program yields would have had a particularly strong effect on corn producers, who had historically high yields last year. The average program yields for corn under 85FSA would be 102.83 bu/acre. The average actual yields last year were 116.6 bu/acre, over 3 bu/acre higher than the previous record level of 113.2 in the 1982-83 crop year.

With the new calculation methods in 86FSIA, program yields in the 1986-87 crop year are the higher of (1) the 85FSA calculation, or (2) 97% of the 1985 program yield. For the 1987-88 crop year, (2) is dropped to 95% of the 1985 program yield. For the remaining years of the bill, (2) is 90% of the 1985 program yield. Using the second option this year increases average program

yields for corn producers from 102.83 bu/acre to 106.7 bu/acre; in 1987-88, they will be about 104.5 bu/acre. For wheat producers, the new method of calculation will increase average program yields from about 32.9 bu/acre to 34 bu/acre in 1986-87 and to around 33.25 in 1987-88.

Other provisions of 86FSIA limit the range of crops which can be planted on acreage not planted to a program crop under the 50-92 provision. The range of allowable crops is primarily restricted to crops which, in general, are not likely to provide and incentive to use this provision. The one possible exception is the use of sunflowers on underplanted wheat acreage in the north-central region.

Initial Impacts of 85FSA and 86FSIA on Producer Prices and Government Outlays

Any discussion of the impacts of the new farm legislation is incomplete without concomitant consideration of the new Balanced Budget Act of 1986, known to most of us as Gramm-Rudman-Hollings (G-R-H). Nevertheless, it may be important for analytic purposes to separate the influences of the farm legislation per se from those of G-R-H.

As the gap between the target price and loan rate (and hence, market price in an era of high stocks) increases, participation in commodity programs becomes increasingly attractive, to the point where virtually anyone without extenuating circumstances benefits from program participation.

Even producers who may not want to participate are likely to find themselves required to do so as a condition for receiving new, or refinancing old, short, intermediate, and long term loans.

With the gap between target and market prices widening, an increasing proportion of the revenue received by farmers will come from the government via deficiency payments. In 1985, when corn was between $2.35 and $2.55 per bushel, 10.97% of total corn revenues came from government payments. With wheat prices between $3.00 and $3.20 per bushel, 25.42% of wheat revenues came from government payments (U.S.D.A., 1986, p. 2). These figures do not, of course, indicate the additional effect that loan rates may have had on market prices. (The loan level for corn in 1985 was $2.55/bu; for wheat, it was $3.30.)

The proportion of receipts from government payments is expected to increase over the next two years. Market prices will continue to fall below the basic loan rate; at the same time Findley amendment related deficiency payments are not subject to the $50,000 payment limitation. Although the absolute level of payments may decline because of the effects of Gramm-Rudman-Hollings sequestrations, their proportion of receipts is expected to grow. The point at which the trend reverses is dependent upon the level at which commodity prices "bottom out". This, of course, will be determined by movements in world market demand and prices, stock depletion rates, and future use of the Findley amendment and G-R-H sequestrations.

The Balanced Budget and Emergency Deficit Control Act of 1985

Perhaps the most talked about feature of the Gramm-Rudman-Hollings Balanced Budget Act of 1985 (G-R-H) is the provision which outlines automatic

sequestration procedures when budget outlays surpass maximum levels allowed to meet specified deficit reduction goals. This feature creates uncertainty with regard to the level of commodity payments to be disbursed. It makes farmers' program payments for each crop year highly dependent on general U.S. and international economic conditions over which agricultural producers and agricultural-policy makers have little control.

However, equally important for the level of uncertainty faced by agricultural producers is the new budget resolution process set in motion by this bill. This will be discussed in more detail below.

This year's $11.7 billion mandatory reduction in outlays translates into a 4.3 percent across-the-board cut in most agricultural programs (food stamps, WIC, and FICN are exempt). The means by which the effects of these cuts can be calculated is the source of much confusion. Technically, target prices, loan rates, and the dairy price support will not be lowered. In addition, payments made in kind or by negotiable certificates will not be reduced. Payments to producers based on bids for the dairy buyout program and conservation reserve will not be reduced.

Payments of any kind for the 1985-86 crop year will not be affected by Gramm-Rudman-Hollings. Payments related to the 1986-87 crop year, whether they are received in 1986 or 1987, will be subject to the sequestration rates for the fiscal 1986 year. Although the target price and loan rate will not, themselves, be reduced, loan checks paid to farmers, 1986 advance and final deficiency and diversion payments, and payments for certificates that producers redeem for cash will each be reduced by 4.3%. This reduction will be taken after the $50,000 limit is applied.

How will this affect wheat and corn producers in 1986-87 crop year? Table 2 shows the returns/acre over cash expenses for various prices for wheat and corn producers. In calculating these returns, four cases were used. All of the calculations were based on a farm which has 1,000 program base acres for the program crop. The first case is one of a farmer who chooses not to participate in the program. The second case is one of a participant in the program, as announced under the provisions of 85FSA, who does not use the 50-92 provision. In addition, Gramm-Rudman-Hollings is assumed to not exist. The third case is of a farmer who is identical to farmer number two, but Gramm-Rudman-Hollings does exist. The fourth and final case is for a producer who participates in the program in the same manner as farmer number three, but his program yields are calculated according to the new method set forth in the 86FSIA.

Note that these returns/acre over cash expenses include only variable and fixed cash expenses which must be paid each year. These expenses include typical variable input expenses, general farm overhead, taxes and insurance and interest, as estimated by ERS for 1986. They do not include paid and unpaid labor, capital replacement costs, returns to owned inputs, or returns to management and risk. The implications of including these costs are discussed later.

The passage of the 86FSIA has ameliorated the impact of Gramm-Rudman-Hollings sequestrations for the 1986-87 crop year. Table 2 and figures 1 and 2 show that, when the market price is at or above the adjusted loan rate, net returns/acre based 86FSIA yield calculations are higher than those using 85FSA yield calculations even when the sequestration is in effect.

Table 2: 1986-1987 net returns/acre after cash expenses for wheat and corn producers on a 1,000 acre base

Commodity	Market price	Net returns after cash expenses: Case 1 no program	Case 2 85FSA no GRH	Case 3 85FSA 4.3% GRH	Case 4 86FSIA 4.3% GRH
	$/bu	$/acre	$/acre	$/acre	$/acre
Wheat	3.50	35.82	21.72	20.88	24.23
	3.00(a)	17.07	21.72	20.40	23.73
	2.40(b)	-5.43	21.72	19.83	23.14
	2.30(c)	-9.18	21.72	17.36	20.60
Corn	2.40(a)	65.81	58.56	56.63	64.11
	2.00	19.41	58.56	55.35	62.79
	1.92(b)	10.13	58.56	55.10	62.53
	1.84(c)	0.85	58.56	48.52	55.70

Case 1: A farmer who does not participate in the commodity program.
Case 2: A farmer who participates in the commodity program using 85FSA program yield calculations.
Case 3: A farmer who participates in the commodity program using 85FSA program yield calculations and has payments subject to Gramm-Rudman-Hollings reductions.
Case 4: A farmer who participates in the commodity program using 86FSIA program yield calculations and has payments subject to Gramm-Rudman-Hollings reductions.

(a) Basic loan level
(b) Adjusted loan level
(c) Effective loan level

The 1987 deficit limit is set at $144 billion. This effectively means that budget outlays under $154 billion will not be subject to sequestration. But if they are even one dollar over $154 billion, the budget will be subject to sequestration such that outlays are cut back to the $144 billion level. The "baseline" deficit (without policy changes) projected by CBO for fiscal 1987, is over $180 billion (U.S. Congress, Congressional Budget Office, 1986). Using the figure of $184 billion, the uniform reduction for non-defense programs, including agriculture, would be 16.3%.* [For each $10 billion increase in the excess deficit, the uniform reduction for non-defense programs is increased by about 4.5 percentage points.]

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* However, even this projection may be too optimistic. In developing their projection, CBO used several fairly optimistic economic assumptions. Among them were that GNP growth would continue to rise at a 3 to 3.5 percent level throughout the next five years. [The flash estimate of GNP growth for the first quarter of 1986 is 2%.] Inflation is assumed to hold at about 4.3%. Interest rates are expected to continue to decline.

FIGURE 1: 1986-1987 WHEAT CROP NET RETURNS/ACRE AFTER CASH EXPENSES BASED ON A 1,000 ACRE PROGRAM BASE

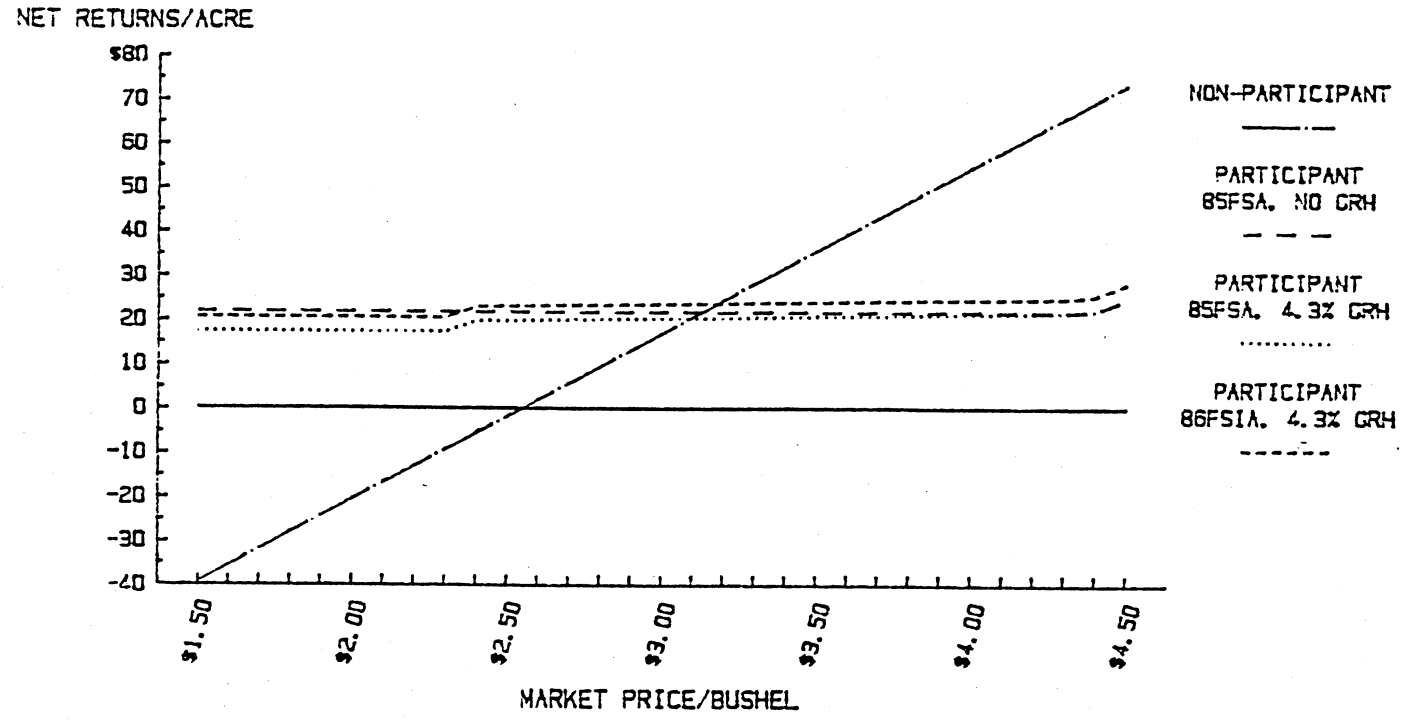


FIGURE 2: 1986-1987 CORN CROP NET RETURNS/ACRE AFTER CASH EXPENSES BASED ON A 1,000 ACRE PROGRAM BASE

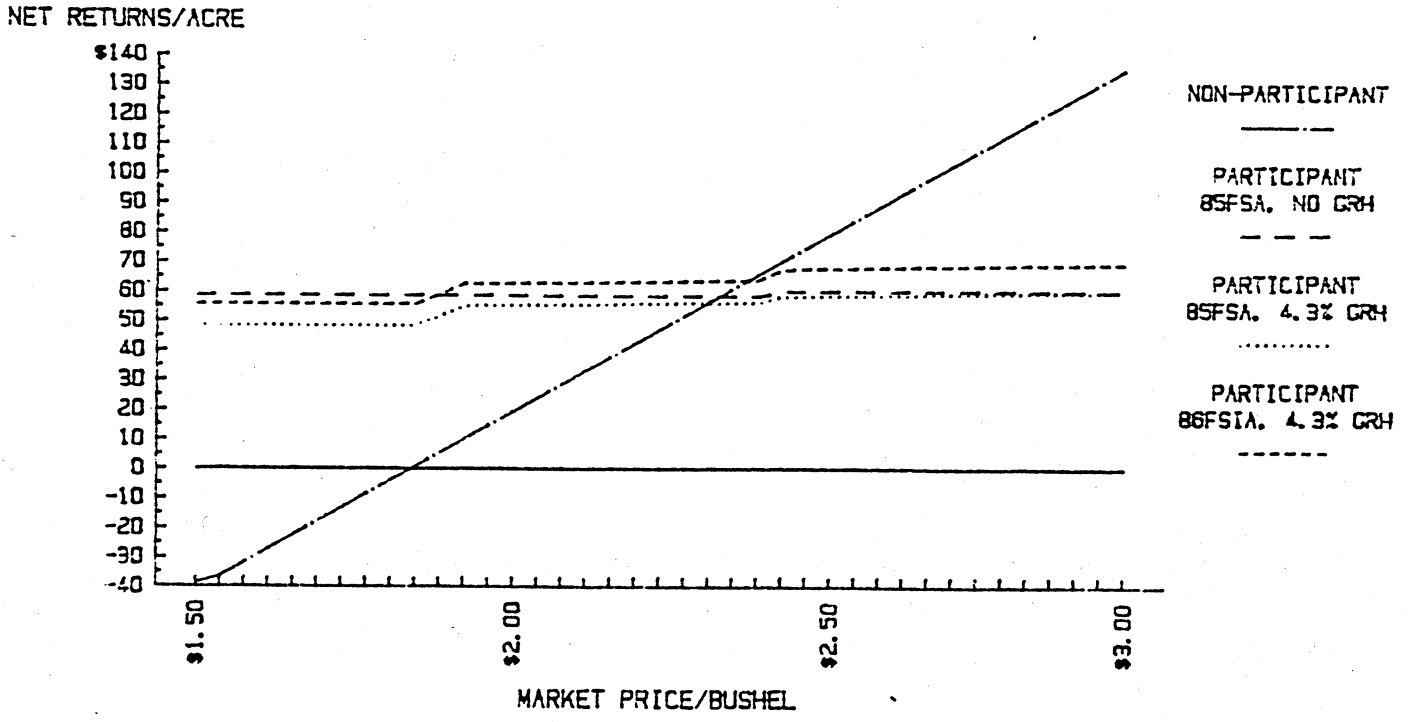


Table 3 shows the effect on net returns/acre for the 1987-88 crop year for the same set of cases used in table 2 (for the 1986-87 crop year). The differences in net returns/acre in the two tables reflects legislated changes in the farm program parameters (basic and adjusted loan levels, program yields under 86FSIA) and Gramm-Rudman-Hollings sequestrations.

Table 3: 1987-1988 net returns/acre after cash expenses for wheat and corn producers on a 1,000 acre base

Commodity	Market price	Net returns after cash expenses			
		Case 1 no program	Case 2 85FSA no GRH	Case 3 85FSA 16.3% GRH	Case 4 86FSIA 16.3% GRH
	$/bu	$/acre	$/acre	$/acre	$/acre
Wheat	3.50	35.82	21.72	18.58	19.56
	3.00	17.07	21.72	16.72	17.73
	2.85(a)	11.45	21.72	16.18	17.18
	2.28(b)	-9.93	21.72	13.86	14.84
	1.91(c)	-24.00	21.72	5.12	6.04
Corn	2.40	65.81	58.56	51.23	54.46
	2.28(a)	51.89	48.69	41.36	44.43
	2.00	19.41	48.69	37.98	40.99
	1.82(b)	-1.47	48.69	35.52	38.50
	1.52(c)	-36.27	48.69	11.40	13.98

Case 1: A farmer who does not participate in the commodity program.
Case 2: A farmer who participates in the commodity program using 85FSA program yield calculations.
Case 3: A farmer who participates in the commodity program using 85FSA program yield calculations and has payments subject to Gramm-Rudman-Hollings reductions.
Case 4: A farmer who participates in the commodity program using 86FSIA program yield calculations and has payments subject to Gramm-Rudman-Hollings reductions.

(a) Basic loan level
(b) Adjusted loan level
(c) Effective loan level

While the 86FSIA calculations of program yields again improve returns/acre for corn and wheat producers, the improvement is small relative to the effect that Gramm-Rudman cuts have on payments. At a market price equal to the basic loan rate, wheat producers who are using the 86FSIA yield calculations have net returns/acre of $14.84. Corn producers' net return/acre when the market price is equal to the basic loan rate ($2.28/bu) are 44.43. At a more probable price of $2.00/bu, net returns/acre are $40.99. Net returns to wheat and corn producers in the 1987-88 crop year are shown in figures 3 and 4, respectively.

FIGURE 3: 1987-1988 WHEAT CROP
NET RETURNS/ACRE AFTER CASH EXPENSES
BASED ON A 1,000 ACRE PROGRAM BASE

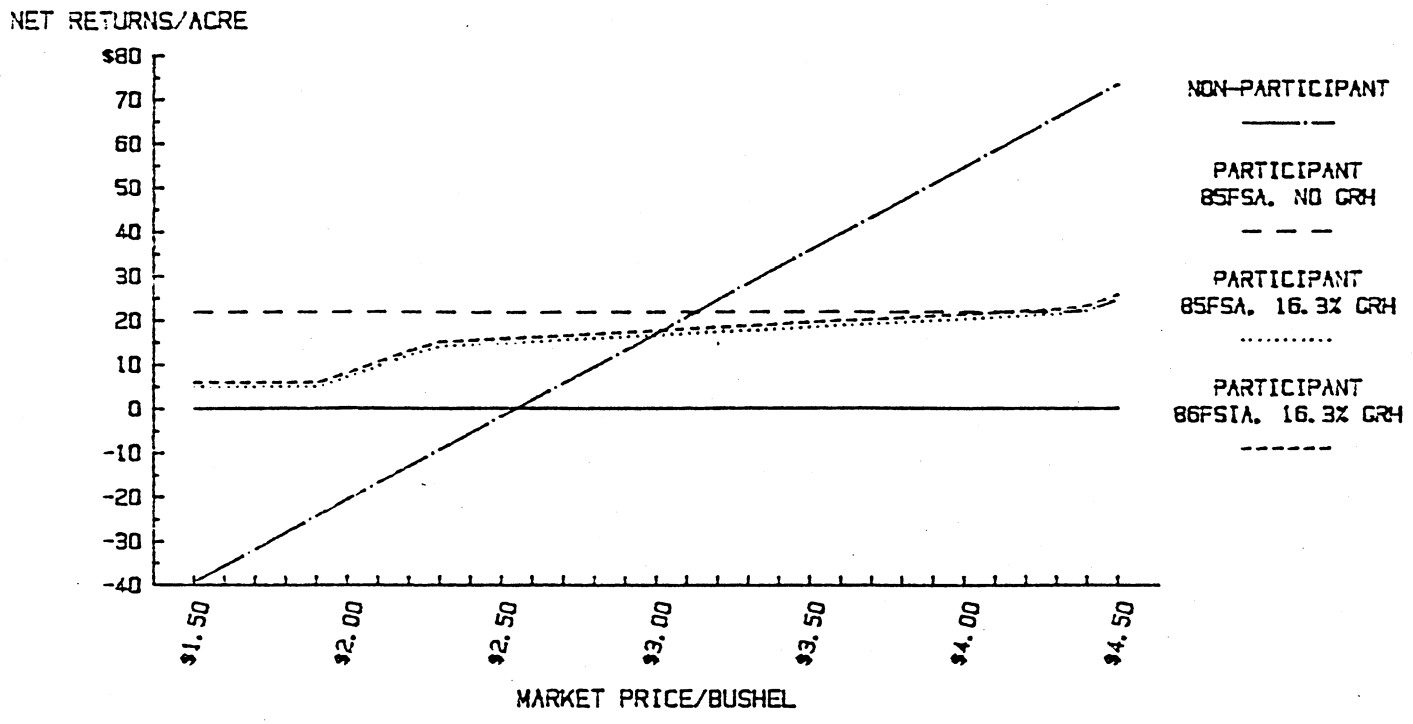
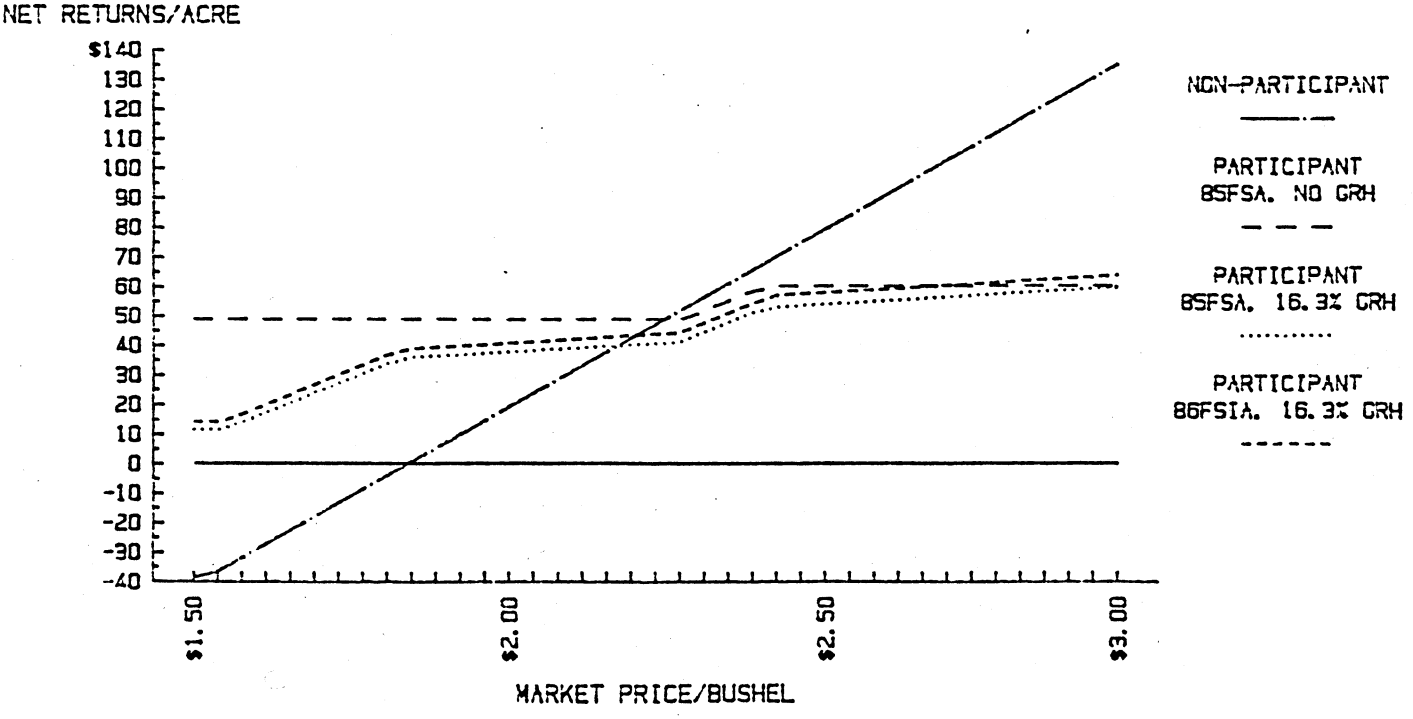


FIGURE 4: 1987-1988 CORN CROP
NET RETURNS/ACRE AFTER CASH EXPENSES
BASED ON A 1,000 ACRE PROGRAM BASE



Changes in the economic outlook as well as changes in specific sectors can significantly affect the estimates of outlays, deficits, and required sequestrations. For example, the largest change in 1986 outlay estimates came from changes brought about by the farm bill. The farm bill added between $2 and $3 billion in estimated 1986 outlays while lower commodity prices led to sharp upward revision of CBO estimates by an additional $7 to $8 billion. (ibid, p. 94)

Use of the 50-92 Provision

Under the 50-92 provision of the Food Security Improvements Act of 1986, the Secretary has the discretion to authorize producers to plant rye, triticale, sunflower, safflower, flaxseed, crambe, castor beans, mustard seed, sesame, sweet sorghum, guar, and plantago ovato. Preliminary analysis shows that only sunflower, and possible some safflower will be used extensively as an alternative crop under the 50-92 provision. The likelihood of short term substitution of safflower for program crops is below that of sunflower because the safflower is very difficult to harvest.

Use of sunflower on underplanted acreage appears to be attractive for some wheat growers. Table 4 shows the price of sunflower/cwt that would be required for the net returns after cash expenses per acre to be greater using 50% wheat and 50% sunflower under the 50-92 option rather than planting all allowed acreage to wheat. These calculations were based on 1984 cost of production and yield data (U.S.D.A., 1984, p. 74).

Table 4: Selected wheat and sunflower prices at which, based on net returns after cash expenses, producers would consider use of the 50-92 provision

	Sunflower price		
Wheat price	1986 Crop 85FSA & 4.3% GRH	1987 Crop 86FSIA & no GRH	1987 Crop 86FSIA & 16.3% GRH
$/bu	$/cwt	$/cwt	$/cwt
3.00	10.45	11.20	9.70
2.70	10.35	11.20	9.40
2.40	10.25	11.20	9.10
2.10	10.25	11.20	8.95

The range of prices received per hundred weight of sunflower during the 1982-1984 period ranged from $8.76 to $12.23. Thus, at first glance, the prices required so that the ratio of net returns after cash expenses for the 50-92 wheat/sunflower option vs. the wheat option is greater than one, seems within reach. Yet unknown is the effect of large scale switching on prices. To give some idea of the relative magnitudes involved, if 1% of the acreage planted to wheat in 1985 were planted to sunflowers this year, the acreage planted to sunflowers would increase by 25% over its 1985 level.

Gramm-Rudman-Hollings' Broader Effects on the Economy

Even if the automatic sequestration process is ruled unconstitutional by the Supreme Court, major effects of Gramm-Rudman-Hollings will still be felt in agriculture as well as in the rest of the economy. First of all, even if targets are no longer mandatory, they can be seen as an important goal and used as a performance measure by congressional constituencies. Therefore, the goal of budget control is likely to still be weighted quite heavily.

The new structure of the budget resolution process will continue even if the targets are no longer mandated. The new budget process mandates that both the Congressional Budget Office (CBO) and the Office of Management and Budget (OMB) estimate the deficit for the next fiscal year and calculate the spending reductions necessary to eliminate the excess deficit. It is anticipated that, because of different goals and perspectives, the OMB and CBO projections will not be identical. If they are not, the economic assumptions used in the two models are averaged and a new prediction is made. Since this compromise is almost inevitable, it may be in the interest of OMB and CBO to initially overstate their case so that their beliefs have more weight in the long run.

In addition, because cuts are made on a uniform percentage basis across all non-defense departments, there are added incentives for each agency to argue for a large appropriation during preliminary budget negotiations. Even with possibly larger uniform percentage reductions resulting, the absolute amount received may still be larger for any given department than if they'd initially tried to maintain requests within deficit reducing bounds.

Both of these processes push policy compromise and settlement to the last possible moment. It has been noted that the rational expectations model indicates that the period of policy debate imposes additional risk on the farmer since the scope of possible future events is quite large. As decisions are made about policies, the farmers subjective risk will be greater than with some or all of the individual policy alternatives. However, once the new policy is decided upon, the level of risk may be reduced, particularly if the farmer can count on the new policy for a significant length of time. However, we do not have to take recourse in a strict interpretation of the rational expectations model to surmise that extension of the period before policy coalescence under the spector of sequestrations will create uncertainty for decision makers.

Because of this budget process, uncertainty is increased not only with regard to sector or program specific outlays, but also with respect to general macro-economic conditions. Thus, Gramm-Rudman-Hollings introduces a quantum leap in the level of uncertainty in the macro-economy. What are fiscal and monetary policies really going to look like?

Take, for example, the issue of interest rates, which are of particular concern to the agricultural sector.

The short term T-bill rate is now at 7%. Preliminary econometric analyses have shown that if the interest rate is lowered to 5.5% or 6% through an increase in the money supply, the effects of this year's Gramm-Rudman-Hollings sequestration on the economy would be, on average, eliminated (Monaco, 1986). So, why are we concerned?

First of all, reduction in the T-bill rate would not necessarily bring interest rate relief to the farm sector.

Secondly, these results are predicated on assumption that decision makers will continue to act as they have in the past even though the level of uncertainty they face has increased dramatically. The continued growth in GNP at pre-Gramm-Rudman-Hollings levels presumes that, with lower interest rates, investment will increase rapidly. However, because of (1) uncertainty regarding the general response of the economy to fiscal restraint, and (2) uncertainty regarding the final budget's form and, therefore, its impact on different sectors of the economy*, decision makers may decide that, even though money is relatively "cheap", returns are so uncertain that they will forego investment opportunities.

Implications for Agriculture

The numerical examples which have been used have relied on aggregate price and cost of production data and been applied to only one size, presumably mono-cultural, crop farm. No reference has been made to the firms' financial condition prior to the 1986-87 crop year. Thus, no claims can be made that the conclusions reached are representative of the position of all farmers, or that we can discern anything about the distribution of impacts. Nevertheless, the numbers still portend that the current farm bill, in conjunction with Gramm-Rudman-Hollings, will have a major impact on many firms.

For the example firms used, tables 2 and 3 showed that, under realistic price assumptions, both corn and wheat producers would be able to cover their cash expenses over the next two crop years. [Note: an "average" interest obligation was assumed under the fixed cash expenses included in this analysis.] In the short run, that is all that is required for firm survival.

How does this picture change if we also include capital replacement costs and the imputed cost of labor? Estimated capital replacement costs per acre of corn in 1986 are $41.26 while corn labor costs are estimated to be $15.06. For wheat, the figures are $24.57 for capital replacement costs and $10.34 for labor. (U.S.D.A., March 1986, p. 18) Table 5 shows that our example corn producers can cover capital replacement costs in 1986. In 1987-88, these costs can not be covered.

Wheat producers will have trouble covering their capital replacement costs in both the 1986-87 and 1987-88 crop years.

For comparison to current prices, the market prices required to cover full ownership costs for our example farms are shown in table 6. The ownership costs are based in the predicted 1986 economic (full ownership) costs published by U.S.D.A. (ibid, p. 18).

Even if the T-Bill rate drops to 5.5%, this may not help producers who are currently under financial stress or who have a record of net returns/acre of the magnitude shown in table 5. As we saw, under Gramm-Rudman-Hollings cuts,

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For example, for fiscal 1987, if the President's budget is passed, the defense industry will fare well; if the budget is not passed, this same industry may be greatly affected.

Table 5: Net returns/acre after cash expenses and net returns/acre after cash expenses, capital replacement and labor costs for example producers

Crop year	Commodity	Market price	Net returns/acre: Case 1 no program	Case 2 85FSA no GRH	Case 3 85FSA GRH	Case 4 86FSIA GRH
		$/bu	$/acre	$/acre	$/acre	$/acre
1986-1987	Wheat	3.00(a)	17.07(c)	21.72	20.40	23.73
			-17.34(d)	-13.19	-14.51	-11.18
		2.40(b)	-5.43	21.72	19.83	23.14
			-40.34	-13.19	-15.08	-11.77
1987-1988	Wheat	2.85(a)	11.45	21.72	16.18	17.18
			-23.46	-13.19	-18.73	-17.73
		2.28(b)	-9.93	21.72	13.86	14.84
			-44.84	-13.19	-21.05	-20.07
1986-1987	Corn	2.40(a)	65.81	58.56	56.63	64.11
			9.49	2.24	0.81	7.79
		1.92(b)	10.18	58.56	55.10	62.53
			-46.19	2.24	-1.22	6.21
1987-1988	Corn	2.28(a)	51.89	48.69	41.36	44.48
			-4.48	-7.63	-14.96	-11.89
		1.82(b)	-1.47	48.69	35.52	38.50
			-57.79	-7.68	-20.80	-17.82

Case 1: A farmer who does not participate in the commodity program.
Case 2: A farmer who participates in the commodity program using 85FSA program yield calculations.
Case 3: A farmer who participates in the commodity program using 85FSA program yield calculations and has payments subject to Gramm-Rudman-Hollings reductions.
Case 4: A farmer who participates in the commodity program using 86FSIA program yield calculations and has payments subject to Gramm-Rudman-Hollings reductions.

(a) Basic loan level
(b) Adjusted loan level
(c) Net returns/acre after cash expenses
(d) Net returns/acre after cash expenses, capital replacement and labor costs

Table 6: Price/bushel required for producers to cover economic (full ownership) costs.

Crop year	Commodity	Market price/bushel required			
		Case 1 no program	Case 2 85FSA no GRH	Case 3 85FSA GRH	Case 4 86FSIA GRH
		$/bu	$/bu	$/bu	$/bu
1986-1987	Wheat	3.75	5.25	5.35	5.15
1987-1988	Wheat	3.75	5.25	5.60	5.55
1986-1987	Corn	2.46	3.18	3.26	3.14
1987-1988	Corn	2.46	3.18	3.48	3.42

Case 1: A farmer who does not participate in the commodity program.
Case 2: A farmer who participates in the commodity program using 85FSA program yield calculations.
Case 3: A farmer who participates in the commodity program using 85FSA program yield calculations and has payments subject to Gramm-Rudman-Hollings reductions.
Case 4: A farmer who participates in the commodity program using 86FSIA program yield calculations and has payments subject to Gramm-Rudman-Hollings reductions.

neither wheat nor corn producers will have returns/acre sufficient to cover both capital replacement and labor, much less yield a return on owned resources, during the 1986-87 crop year. At prices which are currently expected to prevail during the 1987-88 crop year, producers will not earn a return on owned resources with or without Gramm-Rudman-Hollings cuts.

Implications for Research

Kenneth Boulding has likened this period in economic history to that faced by physical scientists when they moved across the boundary between land and sea. Although the fundamental assumptions about the behavior of matter still held in the ocean environment, new models and methods were needed to study and understand the new system. Unfortunately, unlike the physical scientists who had observable phenomena on either side of the land/sea boundary or discontinuity, we can observe the past, but not the future.

In our efforts to model, predict, and prescribe reactions to risk in agriculture, we normally focus on the agricultural producer or, less frequently, the agricultural-policy maker. For instance, when focusing on the producer's decision, we often assume that policy is exogenous and somewhat stable over time and that policy makers' goals and objectives are broadly consistent with those of the farmer. When focusing on policy making processes,

we often treat the response of agricultural producers as some simple, well defined reaction function.

In the new policy environment, we may find that neither policy makers' nor farmers' reactions fit within the value bounds of our models' parameters. At the same time that the governments' ability and flexibility to assume risk are severely curtailed, the policy process itself has become a major source of uncertainty for producers. Commodity programs continue to truncate the lower tail of price and income cumulative density functions. However, they may be doing so at a level which makes our conventional methods of deciding on risk management strategies inappropriate.

From the producers' perspective, new concerns include the specific form that commodity programs will take during the next crop year. The wide range of discretionary powers accorded the Secretary of Agriculture by 85FSA make this concern a relevant one. But, perhaps more important is the question of Gramm-Rudman-Hollings sequestrations. Commodity program participants are not only affected by how well their specific commodity places within intra-agriculture priorities and how agriculture as a whole fares within inter-agency priorities, but also general budget and deficit levels. The linkage of agriculture with the rest of the economy has, at once, become more explicit and the source of much risk.

From the policy makers' perspective, continuing concerns include the lack of knowledge about producers most likely behavioral responses to changes in policy, the continuity of patterns of behavior as the source and level or risk changes, and the lack of specific knowledge about how programs affect subsectors of the agricultural economy and the sector as a whole. In addition, agricultural-policy makers, like producers, are faced with uncertainty about more general policies that affect the agricultural sector (i.e. Gramm-Rudman-Hollings) and the interaction between these policies and ones more specific to the sector.

In this environment, public and private decisions are heavily dependent upon expectations about each others' behavior. Many farm and policy decision makers are caught in a double bind in that they must make major strategic as well as tactical decisions to adjust to a changing environment at the same time that the information needed to form expectations about future events is at a premium. Although we, as researchers, can not necessarily surfeit their needs, we can contribute to both groups of decision makers' understanding of the new environment. This can be done through related efforts requiring continued cooperation between those interested in theoretical concepts and those interested in empirical investigation and analysis.

Dillon (1971) and others have argued that expected utility theory and its derivatives are predictive models and should be judged on their predictive ability alone; they are not meant to be descriptive of how decision makers select action choices. Dillon makes this distinction through the analogy that catching a ball requires the intuitive solution of complex differential equations. The fact that the ball is caught does not imply that the differential equations were actually solved by the catcher, only that he behaved <u>as if</u> he had solved the equations.

Nevertheless, if we are to be able to predict how decision makers are likely to respond in new environments, certain aspects of their decision

making processes must be made more transparent to us. Our discussion will focus on four major conceptual issues:

1. Over what are we measuring utility?

2. Do our previously obtained coefficients of attitudes towards risk still reflect decision makers' preferences when the source, type, magnitude, and consequences of risk change?

3. How do we incorporate the effect of uncertainty about events in a future period into decisions made now?

4. Is our current understanding of the formation of expectations and subjective probability distributions sufficient?

Advances in these areas will provide important tools for researchers and policy makers. However, policy makers are also hampered by a lack of knowledge as to the actual effects of risk and policy on the agricultural sector. The last section of this paper will discuss some of the gaps in this area and what can be done to close them.

Objects over which utility is measured

Eidman (1983, p. 161) notes that in risk management models of the farm firm, numerous alternative performance indicators have been used, including the maximization of gross margins, the maximization of after tax net income, the maximization of ending net worth, and minimizing the probability of being forced out of business.

The corresponding measure of risk for each of these performance indicators would be different. In addition, the form of the consequences over which preferences are elicited should differ with each performance goal. Much of the applied work in eliciting utility functions and measuring attitudes towards risk has been done using consequences from one-period income or some measure of lifetime wealth.

The appropriateness each of these measures is based, in part, on our answers to questions about the stability of a utility function defined over ultimate levels of wealth and the relationship between preferences over income in a given period and preferences over lifetime wealth. These questions are particularly germane to the problem faced by many agricultural producers today, where net worth or wealth may be important in the long run, but where short run risk associated with cash flow variation may be of more immediate import.

Robison and Lev (1986) have suggested one approach to this problem. They argue that, in order to more properly relate choices made under risk to the decision makers' risk attitudes, one must carefully distinguish between indirect outcome variables and direct outcome variables. Direct outcome variables describe outcomes over which the decision maker defines his or her preferences. Indirect outcome variables, on the other hand, describe outcomes which influence or are mapped into a direct outcome variable, but which are not the outcome over which the decision maker defines his or her preferences. Thus, they argue, the direct outcome variable should appear as the argument of von Neumann-Morgenstern utility functions.

They illustrate their point by considering preferences for income versus wealth in a situation where liquidation costs are high. They argue that, because, at or below the level of income at which liquidation is required, a change in income does not correspond to an equivalent change in wealth, the appropriate consequence to the decision maker is change in final wealth. In these forced liquidation situations, the change in wealth between periods will be greater than the simple change in income.

However, use of a single attribute utility function implies that there is only one consequence of concern to the producer. This approach does not deal adequately with the dichotomous cash flow versus net worth problems faced by many producers today. Producers may be concerned with both the short run, or initial consequence of income and the longer run or final consequence of wealth. Depending on many tangible and intangible factors, an individual farmer may attach different weights to the importance of wealth and current period income.

Although there has been little applied work in agriculture using multiattribute utility theory, the current problem seems to be an good area in which to apply this method. Because of the interdependence of current period income and next period's wealth, multiplicative or multilinear rather than additive multiattribute utility models would be most appropriate. Use of algebraic multiattribute models (where the utility function for each consequence is determined individually and then combined in weighted form to obtain the multiattribute model) would allow for the assignment of explicit weights to the different consequences of concern. Perhaps more importantly, the weights could be changed as circumstances or expectations about future circumstances change. For example, a producer who anticipates continued low prices may willingly choose to substantially decrease his wealth by liquidating a portion of his assets in order to generate the cash flow to cover current expenses, decrease his debt load, and reorganize a base upon which to guarantee sufficient cash flow in future periods. On the other hand, another producer who expects the current situation to be a passing phenomenon may explicitly weight current period income much less heavily, choosing instead to put more emphasis on preservation of assets.

It has been suggested that the weighting process used in multiattribute utility analysis is but an explicit modeling of the pre-maximization process that takes place prior to the application of single attribute expected utility analysis. While this suggestion is open to empirical investigation, it appears that, in the current situation, use of multiattribute utility analysis has advantages beyond its ability to predict preferred action choices. Specifically, use of multiattribute utility analysis can make decision processes more transparent to researchers trying to predict preferred action choices in new situations. It may also aid in the determination of why different individuals in seemingly similar situations, including similar risk attitudes, make different decisions. In addition, multiattribute utility analysis can be used to make the decision process more transparent to decision makers by allowing them to explicitly consider and/or alter the weights which they assign to different attributes of the outcomes of concern.

The stability of attitudes towards risk

Regardless of the attribute or attributes over which utility functions are defined, we need to pay more careful attention to the stability of attitudes towards risk across situations and over time.

If utility over wealth is to be the consequence of concern in modeling decision makers' behavior, we need to know more about the stability of this function over time, particularly if we are concerned with strategic as well as tactical planning. The independence axiom, in conjunction with the other axioms of expected utility theory, implies that an individual's ranking of action choices corresponds to the expectation of a fixed utility function defined over ultimate levels of wealth. Markowitz (1952) has noted, however, that the assumption that a utility function is defined over ultimate wealth levels is not consistent with observed behavior. Instead, he hypothesized that changes in wealth cause the utility function to shift horizontally so as to keep the inflection point in a utility function, such as the Friedman-Savage utility function, at or near the current or usual level of wealth.

Early experimental evidence also suggested that individual behavior at different wealth levels is more indicative of a shifting utility function than of movements along a fixed utility function. Davidson, Suppes, and Seigel (1957) found that even when participants' wealth levels had changed significantly during the period between experimental gambling situations, they gave responses which were consistent with original game preferences, sometimes duplicating them exactly. Kahneman and Tversky (1979) have also concluded that the preference order of prospects is not greatly altered by variations in asset situations.

The decision to accept or reject Markowitz's hypothesis affects what we can assume about the stability of individuals' preferences over changes in wealth from period to period.

Fleisher (1985) and others both inside and outside of the discipline of economics have suggested that the apparent instability across situations of measured coefficients of attitudes towards risk risk are a function of the measure used rather than the object being measured. Their argument is that the utility function, and measures of attitude toward risk derived from it, include information about both the individuals' preferences for the objects involved, i.e. income, land, or fodder reserve, and preference orderings over lotteries which involve one or more of these objects. Unless three conditions are met, the von Neumann-Morgenstern utility function, and measures of risk attitude derived from it, i.e. the Arrow-Pratt coefficient of absolute risk aversion, should be expected to exhibit instability across situations, even when actual risk attitudes are constant. The conditions required for stability are that: individuals have constant marginal value for money, preferences are homogeneous, and that preferences remain invariant between certainty and uncertainty, other things being equal. If individuals' preferences meet the first and second conditions, their indifference curves for any two goods, or any one good and money, are straight lines with slope of negative one. If both the von Neumann-Morgenstern utility function and the utility function for the goods under conditions of certainty are underlain by such indifference curves, then the von Neumann-Morgenstern utility function must be a positive linear transformation of the utility function derived under certainty. This mathematically ensures that preferences are invariant under certainty and

uncertainty. Preliminary empirical work demonstrates that these conditions are not commonly met by decision makers' preferences.

Another cause for examining the degree to which we can assume correspondence between previously measured and current attitudes towards risk is a change in the level of real or or perceived risk faced by the individual. Underlying any utility function, and hence, measured attitude towards risk, is a specific set of cdf's for the consequence or consequences of concern. Thus, if we were to be precise in reporting Arrow-Pratt coefficients, we would need to specify the coefficient, the level of the consequence (such as income or wealth) at which it was taken, and the moments of the distribution of consequences over which the utility function was elicited. Since the definition of "G(x) is riskier than F(x)" is inexorably tied to the risk attitude of the decision maker of concern (Meyer, 1982), it would be expected that a risk attitude derived from a utility function defined over a riskier set of cdf's would indicate a higher degree of risk aversion.

Incorporating the effect of uncertainty about events in future periods into decisions made now

The above discussion has implicitly assumed that current period decisions are based on both short run and long run considerations. McCarl and Musser (1985) raise many interesting points about the treatment of long run risk in decision analysis. Of particular importance here is their discussion of the specification of possible forms of stochastic events which cause risk. They distinguish between stationary or foreseen risk and nonstationary or unforeseen risk. In their classification system, foreseen risk processes involve a continuation of previously observed variation in parameters influencing profits; these risks include variations in output prices, quantities and costs in a pattern consistent with recent observations. Unforeseen risk, on the other hand, arises from a set of unexpected future events that influence prices and outputs and shifts the parameter probability distributions. According to McCarl and Musser, with the passage of time, the potential occurrence of a sequence of these unforeseen events suggest that long run risk will be greater than short run risk. It also makes the short run distributions nonstationary.

With increasing uncertainty about both policy and producers' reactions to policy, more emphasis needs to be put on the nonstationarity of distributions even during the short run. The implications of this for increasing perceived risk and the measurement of attitudes towards risk were discussed above.

I would also modify McCarl and Musser's definition of unforeseen or long run risk to include the presence of anticipated, but unpredictable, changes in the parameter probability distributions. The current policy environment, for instance, is one in which agricultural producers can anticipate that probability distributions related to market prices and income from the combination of market receipts and government payments will not remain stationary. However, they do not necessarily have the information necessary to anticipate the precise parameters of the new distribution. Nevertheless, to make decisions in the current period, they must form some expectation about the form of this new distribution, even if it is only to increase the dispersion of likely consequences using some sort of simple spreading rule.

The degree to which uncertainty about future distributions of parameters or consequences affects the way in which individuals weight the attributes of concern in current time periods is a relatively unexplored topic. Robin Pope (1983) argues that to address this issue, we must recognize the flow dimension of uncertainty and model the (dis)utility of not knowing the final outcome as well as the utility we receive from the outcome itself. Unfortunately, a discussion which would give justice to the complexity of her prescription for this problem is too long for this forum. However, one implication of her argument is particularly germane; if uncertainty is a flow extending over several time periods, individuals expectations about what is going to occur between the current time period and the one in which the uncertainty is resolved are critical to predicting the choices they will make now.

Understanding of the formation of expectations

Haneman and Farnsworth (1980) found that cotton farmers' subjective perceptions of outcomes, rather than the type of choice criterion or the farmers' attitudes towards risk, explained why different farmers chose integrated pest management or conventional chemical control for pests. Although economists have recognized the importance of subjective probability in shaping individuals choices, we still know little about how these subjective probabilities are formed. Several hypothesis exist: Kunruether and Slovic (1978) argued that individuals would consistently underweight the probability of low probability, high loss events. Kahneman and Tversky (1979) argue that low probabilities are commonly overweighted while intermediate and high probabilities are underweighted relative to certainty. The underweighting of intermediate and high probabilities reduces the attractiveness of possible gains relative to sure ones and reduces the threat of possible losses relative to sure ones. Machina (1981), Hagen (1979), and MacCrimmon and Larsson (1979) have used the Allais Paradox to demonstrate that some individuals are oversensitive to changes in the probabilities of low probability, outlying events.

Empirical verification of these hypotheses is important but will provide only part of the answer to the question of how expectations are formed. The subjective probability distributions explored in many of the cited studies are based, in some loose sense, on personal interpretation of historical information or data. The formation of expectations also involves the revision of probability density functions based on new information or lack of information about possible future events.

Even a cursory comparison of noted economists' expectations about the economy in the coming year would lead one to conclude that the formation of expectations is not simply the Baysian revision of existing probability density functions. On a less heady note, Francisco and Anderson (1972) tested Australian farmers' ability to fully use new information related to the price of wool, lamb markings as a percentage of ewes joined, and annual rainfall in inches. Using a measure of accuracy* which is equal to one when the subjective

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* The Phillips-Edwards accuracy ratio is the observed log likelihood ratio divided by the Baysian log likelihood ratio where the log likelihood ratio is the difference between the observed log posterior odds and the observed log prior odds. The accuracy ratio is equal to one when the subjective revision is identical to the Baysian revision.

revision of probabilities is identical to the Baysian revision, Francisco and Anderson found that, in all of the tested cases, the accuracy ratio was less than 0.55.

Other attempts to address the issue of expectations have not been directed at understanding how individuals, at the firm or household level, react to fundamental changes in their environment. Both rational and adaptive expectations models are applied at the aggregative micro level and implicitly assume that behavior in the future is conditioned only by what has happened in the past.

The potential payoff to further work in understanding how individuals form expectations is great in an era where agricultural producers' and agricultural policy makers' decisions are increasingly interdependent and rely on subjectively formed expectations about the likelihood of certain behaviors on each others' part. And when, in addition, there are many possible events for which no "objective" probabilities exist.

What types of information do policy makers need?

Agricultural-policy makers face many of the same problems faced by producers when making decisions in an uncertain environment. However, their task is complicated by a lack of information, not only about future policies and macro-economic events which will directly or indirectly affect the agricultural sector, but also about the current state of the system, the reaction of decision makers to changes in policy variables, and the interactive effects of various policy instruments.

In discussing uncertainty and the effectiveness of policy, Brainard (1967) clearly demonstrates that the effectiveness of policy depends on the predictability of response to policy actions. According to Brainard, the policy maker faces two kinds of uncertainty. The first is that at the time the policy decision must be made, the policy maker is uncertain about the impact of exogenous variables on the policy variable being manipulated. This may reflect the policy makers' inability to forecast perfectly either the value of exogenous variables or the policy variables response to them. Second, the policy maker is uncertain about the response of the policy variable to any given policy action.

When Baum and Harrington addressed this group in 1983, the essence of their argument was that policy makers do not have the background information necessary to predict producers' likely response even to small changes in the economic and policy environments. They argued that the literature on risk and risk management related primarily to optimization strategies for an individual or type of producer given exogenously specified policy and economic environments, rather than on predicting producers' most likely behavior. It is knowledge of this likely behavior which is needed to evaluate the feedback from farm firm behavior (the micro-level) to public policies (the aggregate level).

While the ensuing three years have seen some important contributions in this area (i.e. Just and Zilberman, 1984), many gaps are still left to be bridged. The current state of the system and its reaction function need to be known before we can, as researchers and policy makers, try to predict its future path. Basic questions which remain unanswered include: what are the

economic effects of different commodity program structures on the firm? are they the same across commodities? are they they same for different sizes of operations? are there particular threshold levels or switching responses with which we must be concerned? what non-pecuniary factors affect the decision to use government programs? what is the substitutability or complementarity of specific government programs with other, "private", risk management strategies? what are the effects on other participants in the economy?

As part of the discussion of the new farm and budget legislation, we were able to determine the short run financial impact of the policies and their implementation on two example farms. However, even though our intuition may suggest that this legislation will have broad implications for firm and sector structure and performance, our current state of knowledge about how producers will react to the changed economic and political environment limits our "risk analysis" to relatively simple comparative statics. To move beyond this level of analysis, we need more background information about past states of the system and producers' reaction functions. This is but one part of the information needed to formulate expectations about likely behavior in the future. Also needed are clarification of conceptual issues such as the objects over which utility is measured and the stability of risk attitudes, and the development of a more transparent model of decision making under uncertainty. Together, they can take us a long way towards building the new tools and methods needed to keep us from floundering in Boulding's economic sea.

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