Construction of a "Green Box" Countercyclical Program

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Executive Summary

The United States Congress is currently devising the next farm bill. One of the many factors influencing the debate is the effect of trade agreements into which the United States has entered. Under the World Trade Organization's Agreement on Agriculture, government spending on trade-distorting agricultural policies (referred to as "amber box" policies) has been limited. However, if the policy is considered non-trade-distorting ("green box"), then spending on such a policy is not constrained under the agreement. We explore the possible construction of a green box policy that is countercyclical to factors related to agriculture. The policy is based on our interpretation of the green-box requirements; other interpretations are possible. The policy we construct would provide payments that are countercyclical to weather events and exchange rate movements (that is, the timing and size of the payments depends on weather events and exchange rate movements). Our model is but one of many possible configurations of such an approach and was chosen as an example of how such a program might be implemented. Given our construction, we also estimate the cost of the new program.

CONSTRUCTION OF A "GREEN BOX" COUNTERCYCLICAL PROGRAM

Introduction

ACCORDING TO THE WORLD Trade Organization (WTO) trade agreement, program payments can be put into the (non-trade-distorting) "green box" if payments are not related to current or past prices or production and if recipients are not required to produce anything to receive a payment. Countercyclical payments that increase when price, yield, or revenue decrease all fall into the (trade-distorting) "amber box." The WTO agreement places no limits on green-box spending. U.S. amber-box spending is limited to $19.1 billion per year.

Many in Congress want to support farmers at a level higher than the amber-box spending limits would allow. Thus, nearly all proposals made by and to Congress continue the green-box Agricultural Market Transition Assistance (AMTA) payments (now referred to as fixed decoupled payments). The greenness of AMTA payments makes them attractive despite their political drawback of supporting farm income even when farm income is high.

The House farm bill has been criticized because it seemingly contradicts U.S. agricultural trade policy proposals that aim to reduce program payments that distort trade. Both the new House countercyclical program and the continuation of marketing loans would put U.S. amber-box spending near or above the $19.1 billion limit.

One way to make U.S. farm policy more consistent with U.S. trade policy is to put a greater portion of payments into the green box. But farmers and politicians have said repeatedly that they prefer countercyclical programs to fixed decoupled payments. The trick is to devise a countercyclical payment program that meets the green-box criteria. To many, this would require a new definition of countercyclical. After all, if payments are to arrive when the well-being of farmers is low, and the well-being of farmers is determined by price and yield, how can a countercyclical payment program not be triggered by price, yield, or revenue? The key is to devise an index that is triggered by factors other than price, yield, or revenue but that is still countercyclical to factors important to agriculture.

In this paper we describe how an index that is not directly related to current price or production could be constructed. We also demonstrate how it could be used to trigger program payments. Our example is just one index that could be constructed. Other variables could be used, and other constraints could be imposed to construct other viable indexes. Our purpose here is not to advocate this particular policy approach. Rather, it is to demonstrate one solution to the puzzle of constructing a green-box countercyclical payment program.

Construction of a Green-Box Index

Let I be an index of conditions that would trigger a program payment. The index is constructed by making it a linear function of variables important to agriculture. The program would be countercyclical to the levels of the included variables. Define the index as

$$I = \alpha + \beta_1 X_1 + \beta_2 X_2$$

where X_1 and X_2 are the included variables, α is a constant, and β_1 and β_2 determine how changes in included variables change the index. To be classified as green box, X_1 and X_2 cannot be price, yield, or revenue. In addition, they cannot be variables that are directly related or determined by prices or yields, such as stocks-to-use ratios, production levels, or export levels. What might qualify as green box are variables such as exchange rates and weather, which have no one-to-one relationship with price, yield, or revenue.

Section 6, Annex 2 of the WTO Agreement on Agriculture sets out the criteria for when income support can be declared as decoupled income support and consequently qualify as falling within the green box. Subsection b states: "The amount of such payments in any given year shall not be related to, or based on, the type or volume of production (including livestock units) undertaken by the producer in any year after the base period." Subsection c states: "The amount of such payments in any given year shall not be related to, or based on, the prices, domestic or international, applying to any production in any year after the base period."

The key issue is what "related to" means. If "related to" means having a relationship such as revenue has to price and yield, then program payments based on weather and exchange rates should be green box. If, however, "related to" means having a relationship such as July rainfall in Iowa has to U.S. aggregate corn production, then program payments would not be green box.

A countercyclical program can be constructed that is countercyclical to factors that are important to agriculture, such as growing-region weather and exchange rates. Such a program could provide risk management benefits. Or, a countercyclical policy could be countercyclical to factors that are completely unrelated to price or yield, such as sunspot activities or the average daily winter temperature in Siberia. This latter program clearly would be green box and could provide

significant income support to farmers. But the payments would arrive randomly. In this paper, we construct an index for each program crop by including a relevant weather variable and a relevant exchange rate. (Whether such an index would be declared green box is as much a political decision as a legal decision because the administration would have to defend such a declaration in the court of world public opinion and to the WTO.)

To begin, we normalize the index so it has a value of 100 when the exchange rate is set at its 2001 value and when the weather variable is set at its historical mean value. Payments will be made if the value of the index falls below some trigger level, denoted as I^*. That is, if $I < I^*$ then program payments would be made. Under most policy proposals before Congress, program payments would be made under 2001 conditions. In this case I^* would be greater than 100. A pure safety net program that would pay off only when market revenue fell significantly below projected market levels could be simulated by setting $I^* < 100$.

Let $I^* = 100 + adj$ where adj denotes an adjustment factor that helps determine the expected size and frequency of program payments. Let $max\ payment$ be the maximum payment that can be made under the program, perhaps equaling expected market revenue. For a given value of I, the size of the payment is as follows:

$$Payment = \max\left[0,\ 1 - \frac{I}{I^*}\right]max\ payment$$

Given this formulation, if the ratio of I to I^* is 0.8, then a payment equal to 20 percent of the maximum payment would be made. If the ratio of I to I^* is 1.1, then no payment would be made.

Estimation of I

Table 1 presents the weather variables used to determine the level of I for each program crop. The values of the weather variables actually used in the index are the deviations of the variables from a given level deemed "optimum" in Table 2. This label is

TABLE 1. Definitions of weather variables used to construct the index

Crop	Weather Variable	"Optimum" Value
Corn, sorghum, and barley	Average July precipitation in Iowa and Illinois	5 in
Soybeans	Average August precipitation in Iowa and Illinois	5 in
Wheat	Average July precipitation in the United States	3 in
Oats	Average June precipitation in North and South Dakota	4.25 in
Rice	Average July temperature in Arkansas	82° F
Cotton	Average July precipitation in Texas and Mississippi	4.25 in

TABLE 2. Parameter values used to construct the index

Crop	Intercept (a)	Weather (b_1)	Exchange Rate (b_2)
Corn, sorghum, and barley	196.8	-9.3	-0.6
Soybeans	189.1	-11.7	-0.5
Wheat	207.9	-26.5	-0.8
Oats	196.4	-13.0	-0.6
Rice	203.9	-6.2	-0.7
Cotton	202.2	-11.8	-0.7

used because for a given value of the exchange rate, the index value is maximized at this level. The second variable used for each crop is the July value for the U.S. agricultural trade-weighted exchange rate, published by the U.S. Department of Agriculture's Economic Research Service (USDA-ERS).

Table 2 presents the values of α, β_1, and β_2. These values were obtained by imposing the following set of identifying restrictions. First, the value of the index equals 100 when the weather variable is set at its long-run average value (which is different than its "optimum" value reported in Table 2) and when the level of the exchange rate equals its July 2001 value. The second restriction is that the maximum value of the index is set at 140 and it is achieved at the "optimum" level of the weather variable and an exchange rate of 90, which represents a 30 percent depreciation in the dollar from July 2001 levels. The third restriction is that the minimum value of the index is set at 70 and it is achieved at the highest level of the weather variable observed (the greatest

deviation) in the historical data (since 1895) and an exchange rate equal to 140. This value of the exchange rate is above the maximum value observed since 1975, which just happens to be the July 2001 value of 129.

Historical Index Values

Figures 1–6 in the Appendix show the index values that would have occurred from 1975 to 2001. The figures show how the index responds to variations in the weather variables and the exchange rate. For example, all show some decline in recent years because of the strong dollar. The coarse grains index shows that drought or flood (1983, 1988, and 1993) in the Corn Belt also results in a decline. Figure 6 shows particularly well how drought in Texas and Mississippi (2000) affects the cotton index. Figure 6 also shows, however, that such an aggregate index can miss regional disasters. In 1980, Texas cotton production was hit hard by drought. But the rest of the Cotton Belt was not. Consequently, the index value for 1980 equals 120. Thus, the index

program just outlined shares a characteristic with other countercyclical programs based on national triggers in that regional disasters may not trigger payments. (See Hart and Babcock, "Countercyclical Agricultural Program Payments: Is It Time to Look at Revenue?" December 2000, CARD Briefing Paper 00-BP 28 [Revised].)

Determination of I^*

Actual implementation of this program requires determination of the values of I^* and *max payment.* Increases in the level of I^* raise the frequency with which payments would be made. Together, I^* and *max payment* determine the size of program payments and aggregate program cost. Second, who qualifies for such payments and how the payments would be distributed would have to be specified. To qualify for the green box, the payments would have to be made on a historical acreage base. For example, the AMTA payment base or an updated base from 1996 to 2001 could be used.

Total program cost would be determined by the probability distribution of the variables used to construct the index in combination with I^*, *max payment*, and the selected payment base. Program cost is also highly dependent on the identifying restrictions used to construct the index. For example, increasing the maximum value and decreasing the minimum value would increase program costs.

To implement such a program, a level of *max payment* would need to be specified. For purposes of discussion, suppose that *max payment* is set equal to the per unit value implied by the Adjusted Target Revenues

reported in Table 3 of Hart and Babcock ("Effects of Adding a Target Revenue Program and Soybean Fixed Decoupled Payments to Current Farm Programs," CARD Briefing Paper 01-BP 35, September 2001). Table 3 reports these values, as well as the number of production units on which per unit (bushel, hundredweight, or pound) payments would be made. Given these per unit values and the probability distributions of weather and exchange rates, total budget costs are determined by specifying a value for I^*.

Figure 7 shows the relationship between average program costs over 10 years and I^*. The critical maintained assumption in the Figure 7 results is that the mean of exchange rates is held constant over the entire program period. Exchange rates over time likely follow a random walk process, but we did not have adequate time to analyze this process. Including a random walk would likely leave average program costs unchanged, but increase the likelihood of both large and small 10-year program costs.

As shown in Figure 7, increases in I^* increase total costs at an increasing rate, much like increasing the coverage level on a crop insurance policy increases premium at an increasing rate. Given a budget level, one can solve for the value of I^* that achieves this program cost. For example, suppose that the 10-year available budget for the countercyclical payment program equals $110 billion, less the cost of the marketing loan program ($31.8 billion), less the cost of fixed decoupled payments ($52 billion), or $26.2 billion. As shown in Figure 7, this would imply an I^* value of about 100.

TABLE 3. Values for *max payment* and number of production units

Crop	max payment ($/Unit)	Production Units[a] (Million Units)	Crop	max payment ($/Unit)	Production Units[a] (Million Units)
Corn	2.49	9,504	Rice	10.56	191
Soybeans	6.69	2,688	Cotton	0.7202	8,215
Wheat	3.46	2,299	Barley	2.50	326
Oats	1.49	150	Sorghum	2.33	592

[a]Rice units are hundredweight, cotton units are pounds, and all other units are bushels.
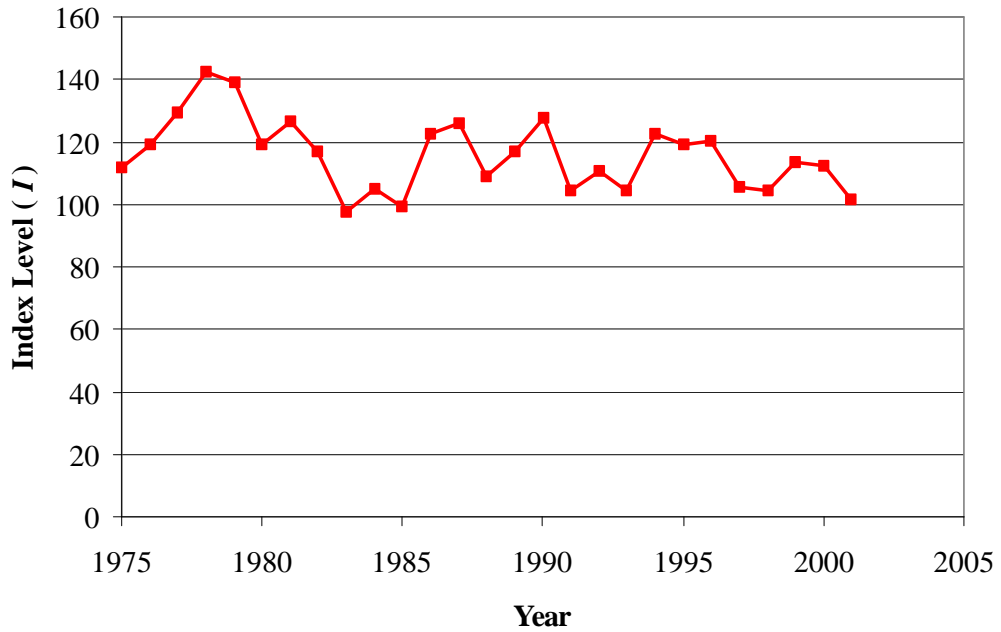
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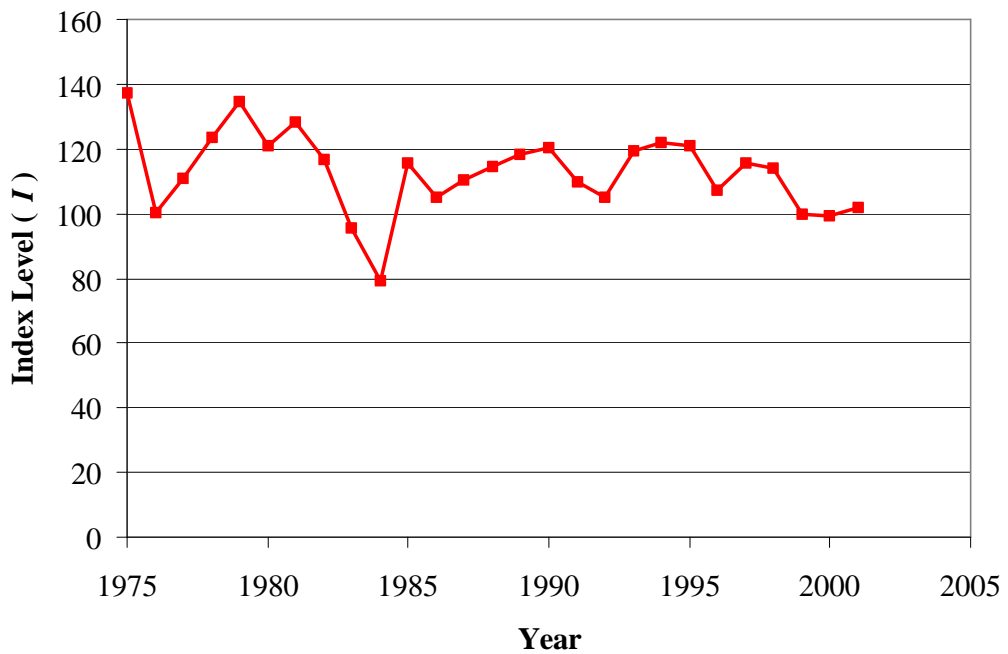

FIGURE 1. Corn, sorghum, and barley
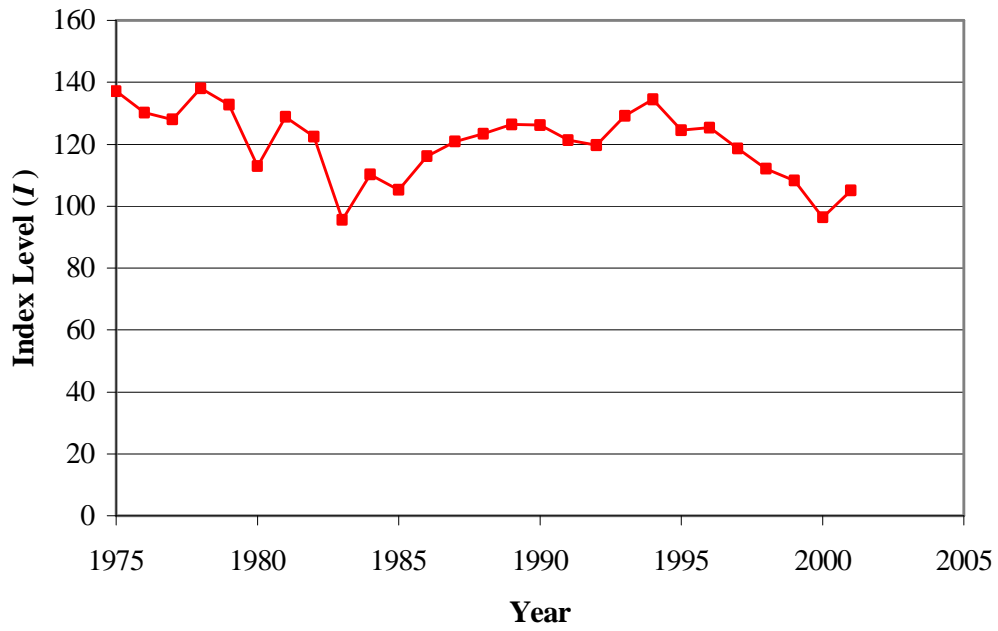
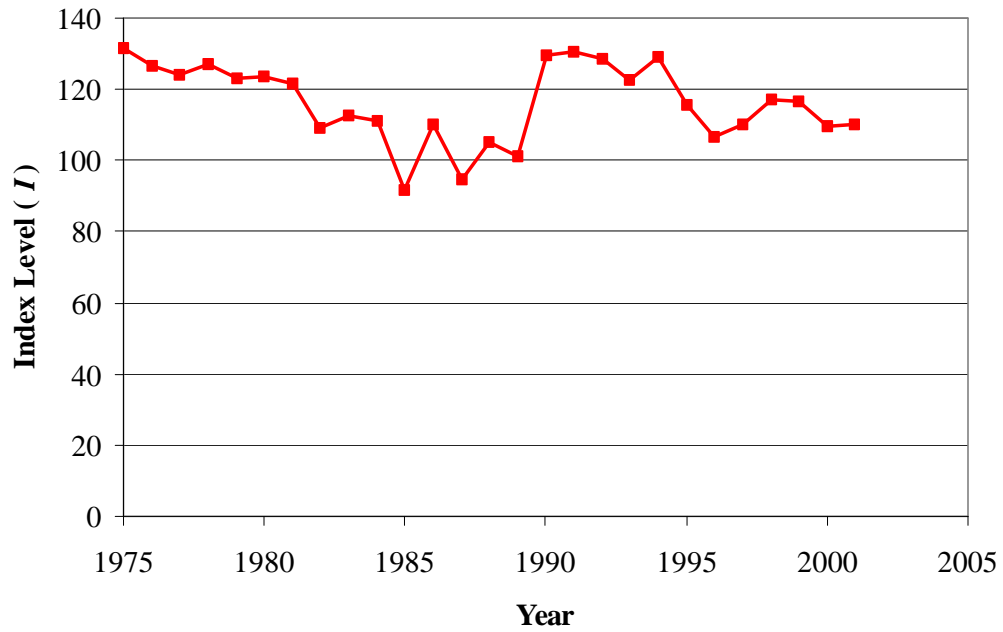

FIGURE 2. Soybeans

FIGURE 3. Wheat
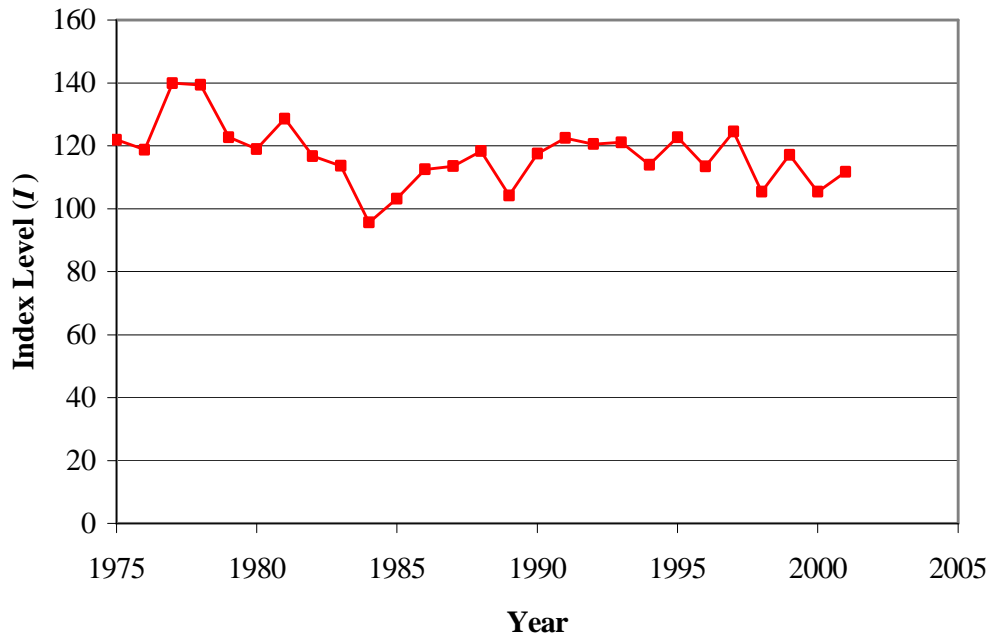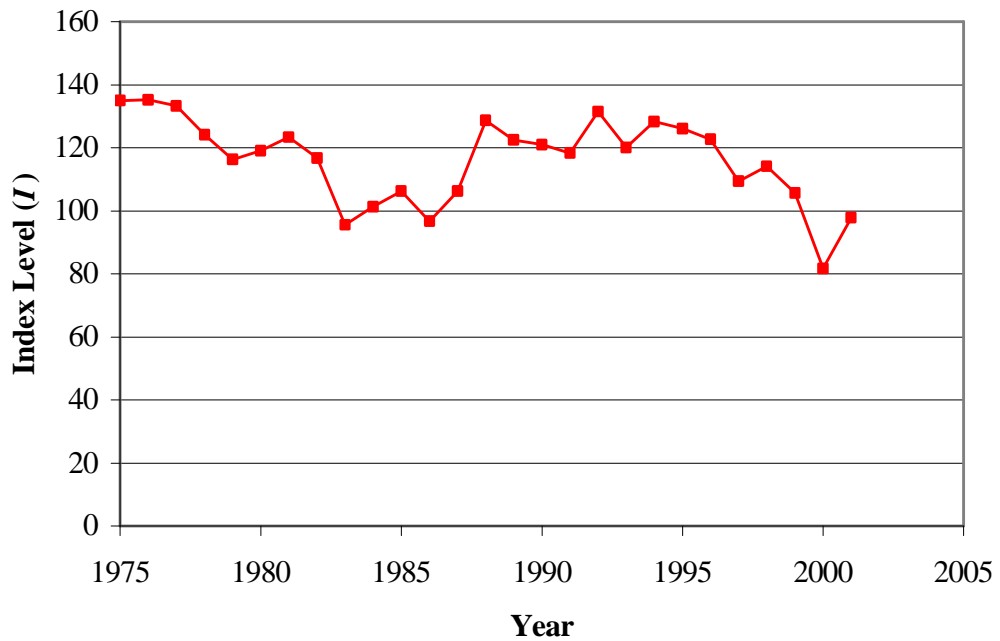

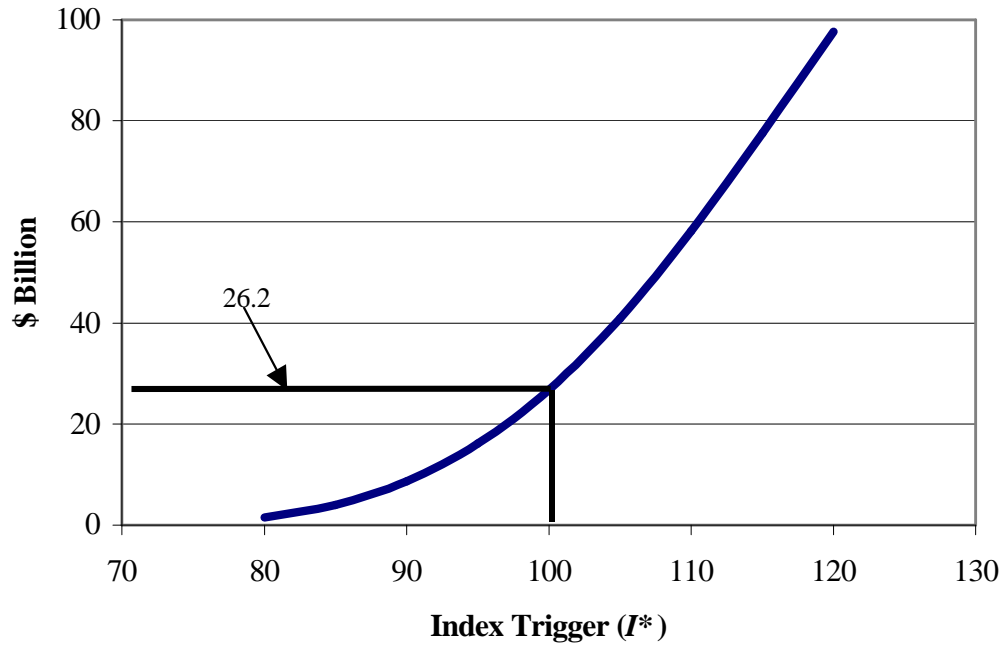**FIGURE 4. Oats**

FIGURE 5. Rice

FIGURE 6. Cotton

FIGURE 7. Effect of increasing *I** on 10-year program costs