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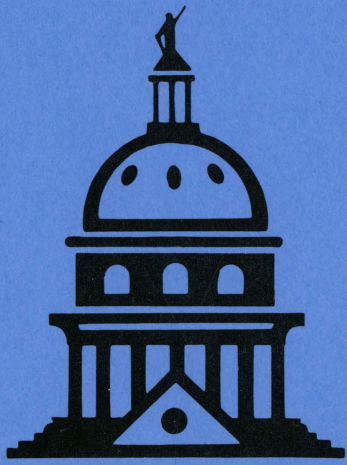
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AFPC POLICY WORKING PAPER

ARE FARM PROGRAM BENEFITS EQUITABLE
ACROSS PROGRAM COMMODITIES?

Department of Agricultural Economics
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ARE FARM PROGRAM BENEFITS EQUITABLE ACROSS PROGRAM COMMODITIES?

Recent administration requests for cuts in agricultural spending have policymakers busy deciding if and how reductions can be achieved. An issue that has emerged from this process concerns the allocation of direct farm program expenditures across commodity groups. In other words, is the current allocation equitable in meeting program objectives?

While this issue has surfaced as a result of the budget crisis, the elements of the debate extend further than taxpayer cost. The distribution of farm program benefits across commodities is a critical policy issue because of its effects on income distribution, production, prices, and export competitiveness. When the government sets the target price and loan rate, it affects producers' income and thus their production decisions. For example, it is currently argued that inflexible commodity programs have resulted in reduced soybean supplies. The result is a shorted export market for U.S. soybeans, with Brazil and Argentina filling the void. As another example, it has been argued that the Normal Cropland Acreage (NCA) program concept of flexible base was frozen in the late 1970's when large shifts to cotton production were threatened.

Fairness and impartiality are concepts not easily defined; therefore, the questions of equitability are not easily answered. There are several ways of approaching the issue, each involving different levels of economic sophistication. Three approaches were chosen for this paper.

- **Target prices relative to costs provide a direct measure of program benefits.**

This method is used to measure benefits of the target price relative to variable costs and total economic costs. Its main weaknesses include failure to directly recognize the costs and benefits derived from other program provisions such as acreage reduction requirements; however, this measure does take into consideration the opportunity costs of resources used in commodity production. A crop having a higher acreage reduction requirement may warrant increased direct subsidies as an incentive for participation. Alternatively, a higher target price may require higher levels of acreage reduction.

- **Comparison of target prices and loan rates to a proxy for the world market price.** While prices in the long run should reflect costs (and vice versa), this is not the case in the short run, particularly when subsidies are present. Comparing target prices and loan rates to world market prices provides an indication of the level of support relative to the prices indicated by market forces. A primary weakness of this method is that target prices and loan rates affect the level of market prices. That is, as a general rule the higher the target price, the lower the market price. On the other hand, since the loan rate tends to support the world price, the higher the loan rate, the higher the market price.
- **Target prices and loan rates are adjusted to reflect acreage reduction programs and then expressed as a fraction of production costs.** The adjusted target price reflects the costs and benefits of an acreage reduction program and is thus an *effective target price*. In other words, a modest target price with a low acreage reduction requirement may comprise more farm program benefits than a high target price with a high acreage reduction requirement. Costs used for this calculation can reflect either variable costs or total economic costs.

Methods Utilized

The analysis reported here measures the relative farm program benefits for corn, wheat, cotton, soybeans, and rice. Relative benefits attributed to the commodity are evaluated using five measures:

- Target price and loan rate divided by the variable cost of production,
- Target price divided by the total economic cost of production,
- Target price and loan rate divided by the world market price,
- Effective target price and loan rate divided by the variable cost, and
- Effective target price and loan rate divided by the total economic cost.

Two cost-of-production measures were used: variable costs, which vary with the level of production, and total economic costs, which are intended to encompass all fixed and variable costs associated with the production of the commodity. Both of these measures were obtained from

ERS/USDA cost-of-production estimates. Per unit costs are calculated using actual harvested yields as reported in the USDA Situation and Outlook reports. Variable costs reported by the ERS/USDA were modified to include estimates of all labor costs and operating loan interest payments. This method was chosen to be consistent with the 1988 through 1994 projections of variable production costs provided by the Food and Agricultural Policy Research Institute (FAPRI). Total labor costs reflect the cost of unpaid labor and management required for different crops. The operating loan interest is calculated as 75 percent of the variable cost multiplied by the interest rate on six-month commercial paper. Only 75 percent of the variable cost is used as the base because operating loans are typically utilized for less than 12 months. Total economic cost, as reported by the USDA, includes variable costs and full ownership costs such as capital replacement.

World market prices used in this analysis for U.S. No. 3 yellow corn, U.S. No. 2 hard winter wheat with ordinary protein content, and U.S. No. 2 yellow soybeans reflect F.O.B. major port prices, reported by the Foreign Agricultural Trade of the United States (FATUS). The world market price for rough, long-grain rice is approximated by one-half the F.O.B. Arkansas milled rice price, compiled by Rice Market News. The cotton world market price is represented by an average spot price for strict low middling 1-1/6 inch cotton in designated U.S. markets, reported by the Agricultural Marketing Service.

The target price for upland cotton is adjusted for returns from cottonseed. For projection purposes, a regression relating the price of cottonseed to the price of soybean oil and meal and cotton production is used to adjust the target price or loan rate to a level that reflects full producer returns. (See Appendix A, Equation 3).

The effective target price, loan rate, and variable and total economic costs are calculated taking into consideration acreage reduction rates, maintenance cost of idle acres, net loan rates, and storage costs. (See Appendix A, Equations 1 and 2).

Results

Table 1 presents the relative program benefits as a ratio of the target prices (TP) and the loan rates (LR) to the variable costs and the world market prices (WMP) for 1987 and 1989. These two base years were chosen because 1987 reflects the latest published USDA cost-of-production data, and 1989 reflects the FAPRI projected production costs and policy variables.

Target price relative to variable cost

Based on both the 1987 and 1989 relationship of target price to variable cost, wheat enjoys the highest level of program benefits relative to variable costs, followed by cotton in 1987 and corn in 1989 (Table 1). Rice producers received the lowest level of farm program benefits relative to variable cost in 1987 as well as the projection for 1989.

Figure 1 indicates the relative benefits calculated as a ratio of the target price to the variable cost received by producers of corn, wheat, cotton, and rice using FAPRI cost-of-production and target price projections through 1994. When using this measure, wheat producers have consistently received the greatest benefits. Over time, relative benefits for all commodities experience decreases after 1987, indicating the lower target prices and loan rates prescribed in the farm bill.

Assuming that target prices are frozen at 1990 levels, projected data indicate that relative higher benefits to wheat and corn producers will continue through 1994; relative benefits to rice producers would remain consistently lower than those received by the other commodities. FAPRI projections assume fixed target prices in 1991 through 1994 at 1990 levels and predict an increase in variable costs during the same period, which results in decreased relative benefits.

Loan rate relative to variable cost

In terms of the loan rate relative to variable costs, soybeans have the highest level of benefits in both 1987 and 1989 (Table 1), followed by cotton, corn, wheat, and rice. This is not surprising, since all price and income support for soybeans is encompassed in the loan rate.

Figure 2 displays the relative benefits received by producers of corn, wheat, soybeans, rice, and cotton from 1974 through 1994, in terms of the loan rate relative to variable cost. Prior to 1986, relative benefits were variable, with corn, soybean and wheat producers enjoying the highest relative benefits. Since 1986, relative benefits have remained fairly constant for these commodities. Based upon FAPRI's projected data, the decade of the 1990's will provide lower relative benefits to producers of all commodities. For example, the 1993 predicted loan rate for rice is less than the variable cost.

Target price and loan rate relative to world market price

The ratio of the target price to the world market price varies from year to year for each crop (Table 1). Rice received the highest benefits in terms of the target price/world market price ratio in 1987 but not in 1989. The effectiveness of the rice marketing loan and expanded export enhancement program on the world market price distorts this measure of rice program benefits relative to the other crops. A similar relationship holds for the loan rate/world market price ratio for rice.

Target price relative to total economic cost

Figure 3 illustrates the relative benefits received by producers as a ratio of the target price (TP) to the total economic costs (TEC) from 1980 through 1987. During this period, rice producers realized the highest relative benefits in relation to total economic costs. In contrast, rice producers received the lowest benefits in relation to variable costs (Figure 1). This can be explained by the proportionally higher variable cost associated with rice production. Over time corn, wheat, and cotton producers appear to have received equivalent relative benefits using this measure. Projected data (TEC) beyond 1987 for total economic costs were unavailable.

Effective target price relative to total economic cost and variable cost

The ratios in Table 1 fail to reflect differences in acreage reduction levels across commodities. This deficiency is remedied in Table 2 by the presentation of the ratios of *effective* target price to both variable and total economic cost. Equations 1 and 2 in Appendix A were used

to estimate effective target prices. When considering differences in acreage reduction levels in 1987, cotton producers received the highest level of benefits relative to the effective target price; however, wheat producers are projected to receive the highest level of benefits in 1989 due to low acreage reduction levels (Table 2). Again, in terms of the loan rate divided by effective variable cost, soybean producers receive the highest level of benefits followed by cotton, corn, rice, and wheat.

Figures 4 and 5 display the relative benefits in terms of the ratio of *effective* target price to effective variable cost and total economic cost. (See Equations 1 and 2 in Appendix A).

Although a more complex formula is used to determine the relative benefits, the results for Figure 1 are comparable to Figure 4, and the results for Figure 5 are comparable to Figure 3.

Conclusions

While differences in the level of farm program benefits appear to exist across commodities, there is no consistent pattern of relative benefits. Differences in the level of program benefits suggest that production patterns would shift if farm programs provided greater flexibility. Available evidence relative to variable costs of production suggest that on a per-unit basis, wheat producers enjoy the highest level of program benefits. When total economic cost of production is considered, however, rice producers receive the highest level of program benefits.

When acreage reduction requirements are considered, wheat still appears to consistently have the highest level of program benefits relative to variable cost and the lowest level of program benefits relative to total economic cost. There is little evidence to suggest that corn is receiving more than its share of the benefits. Problems associated with relatively low benefits for soybean producers are more a function of an inflexible base than a high corn target price.

Table 1. Target Price and Loan Rates Versus Total Economic Cost, Variable Cost, and World Market Price.¹

Ratio ²	Corn		Wheat		Upland Cotton		Soybeans		Rice	
	1987	1989	1987	1989	1987	1989	1987	1989	1987	1989
	(dollars)									
TP/TEC	1.44	N/A ³	1.43	N/A	1.42	N/A	N/A	N/A	1.57	N/A
TP/VC	2.62	2.18	2.91	2.41	2.70	2.08	N/A	N/A	2.25	1.92
LR/TEC	0.86	N/A	0.75	N/A	0.97	N/A	0.95	N/A	0.97	N/A
LR/VC	1.57	1.23	1.51	1.21	1.85	1.49	2.44	2.04	1.39	1.18
TP/WMP	1.21	1.18	1.30	0.95	1.26	N/A	N/A	N/A	1.75	N/A
LR/WMP	0.73	0.66	0.68	0.48	0.83	N/A	1.00	1.00	1.08	N/A

¹ World market price treated as F.O.B. major port or market.

- U.S. No.3 Yellow corn. (FATUS)

- U.S. No.2 Hard winter wheat, ordinary protein. (FATUS)

- Average spot price for strict low middling 1-1/6" cotton. Agricultural Marketing Service.

- U.S. No.2 Yellow Soybeans

- Rough, long-grain rice approximated by one-half F.O.B. Arkansas milled rice price. Rice Market News.

² TP/TEC - Target price to total economic cost

TP/VC - Target price to variable cost

LR/TEC - Loan rate to total economic cost

LR/VC - Loan rate to variable cost

TP/WMP-Target price to world market price

LR/WMP-Loan rate to world market price

³ N/A = not available

Table 2. Relative Benefits of Effective Target Price and Loan Rate to Total Economic Cost and Variable Cost in 1987 and Projected in 1989.

Ratio ¹	Corn		Wheat		Upland Cotton		Soybeans		Rice	
	1987	1989	1987	1989	1987	1989	1987	1989	1987	1989
	(dollars)									
ETP/ETEC	1.21	N/A ²	1.09	N/A	1.17	N/A	N/A	N/A	1.26	N/A
ETP/EVC	2.41	2.09	2.46	2.29	2.55	1.99	N/A	N/A	2.07	1.74
LR/ETEC	0.76	N/A	0.59	N/A	0.83	N/A	N/A	N/A	0.81	N/A
LR/EVC	1.52	1.20	1.33	1.17	1.80	1.45	2.44	2.04	1.34	1.19

¹ETP/ETEC - Effective target price to effective total economic cost
 ETP/EVC - Effective target price to effective variable cost
 LR/ETEC - Effective loan rate to effective total economic cost
 LR/EVC - Effective loan rate to effective variable cost

²N/A = not available

Figure 1. Relative Benefits:
Target Price to Variable Costs, 1974-94.

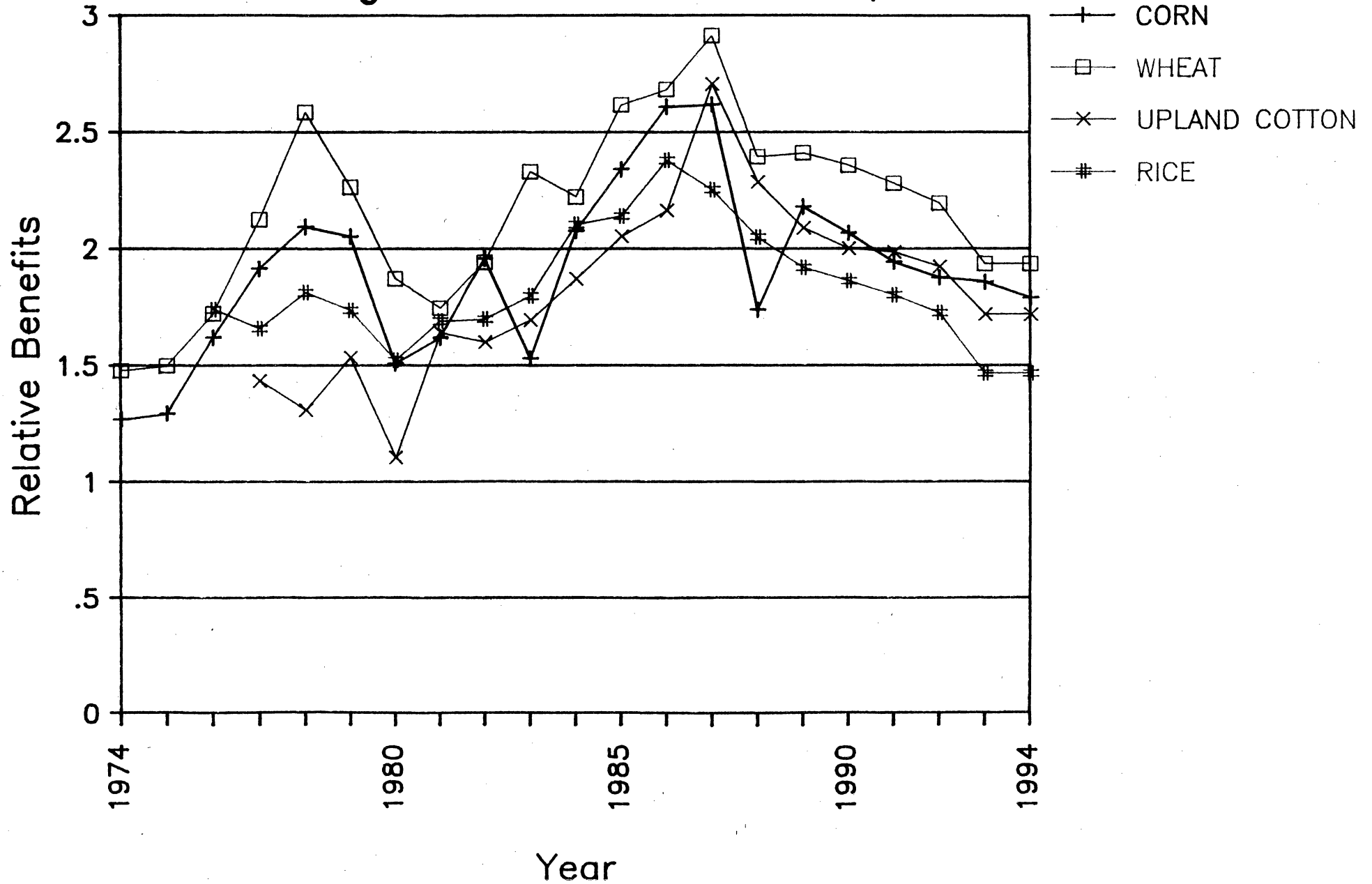


Figure 2. Relative Benefits:
Loan Rate to Variable Costs, 1974-94.

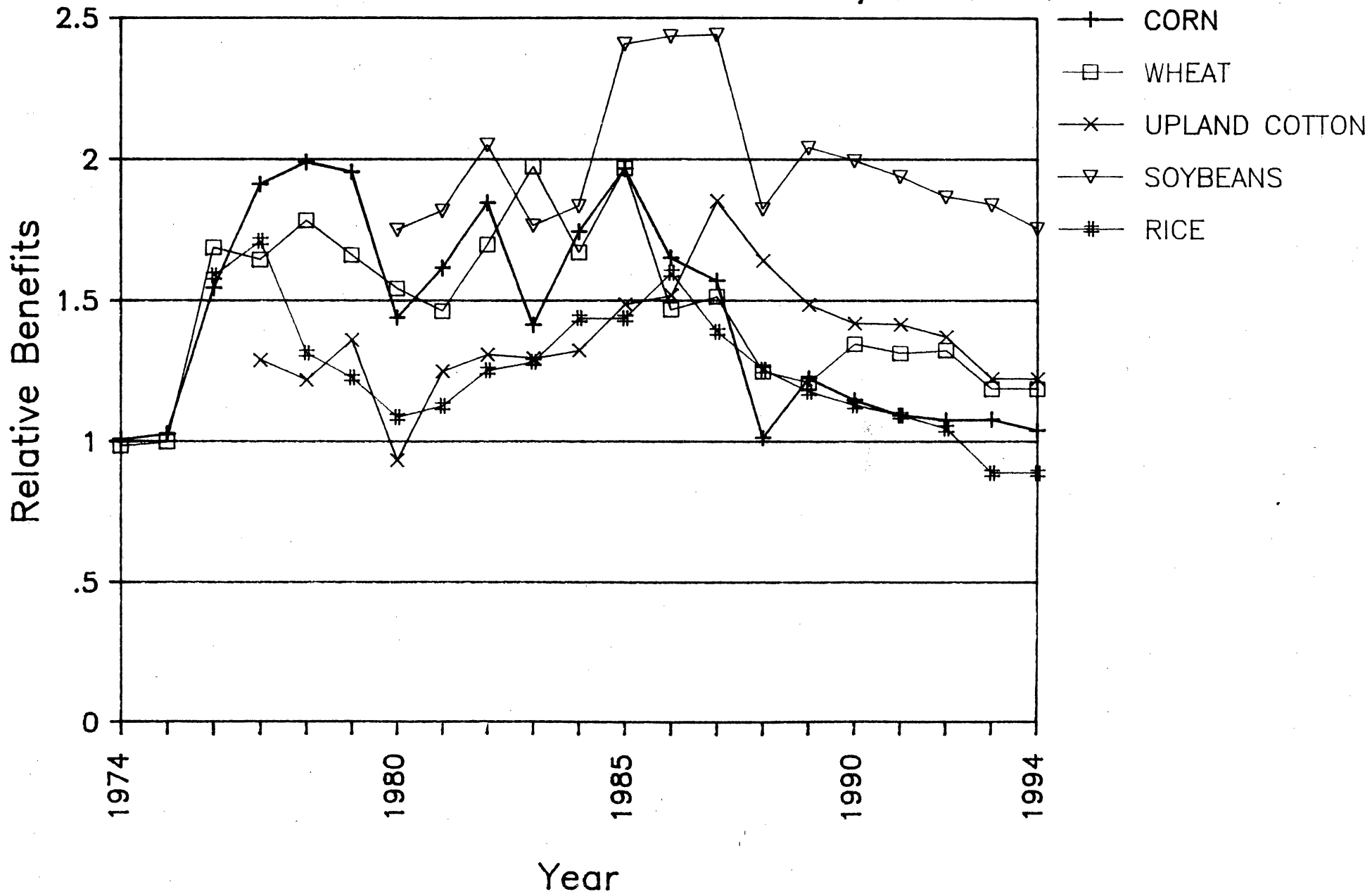


Figure 3. Relative Benefits:
Target Price to Total Economic Costs, 1980-87.

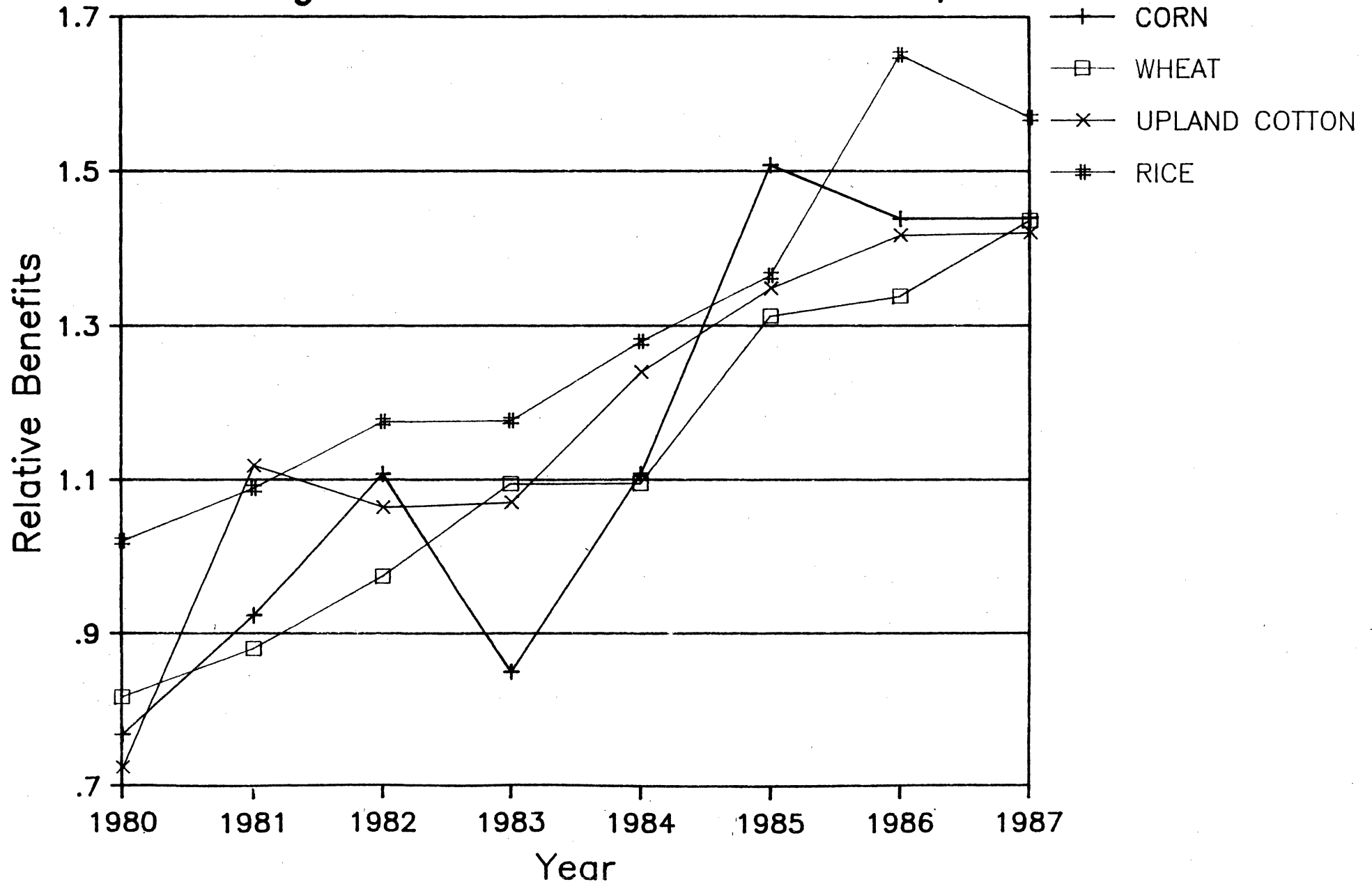


Figure 4. Relative Benefits Considering ARP
 Effective Target Price to Variable Costs, 1980-94.

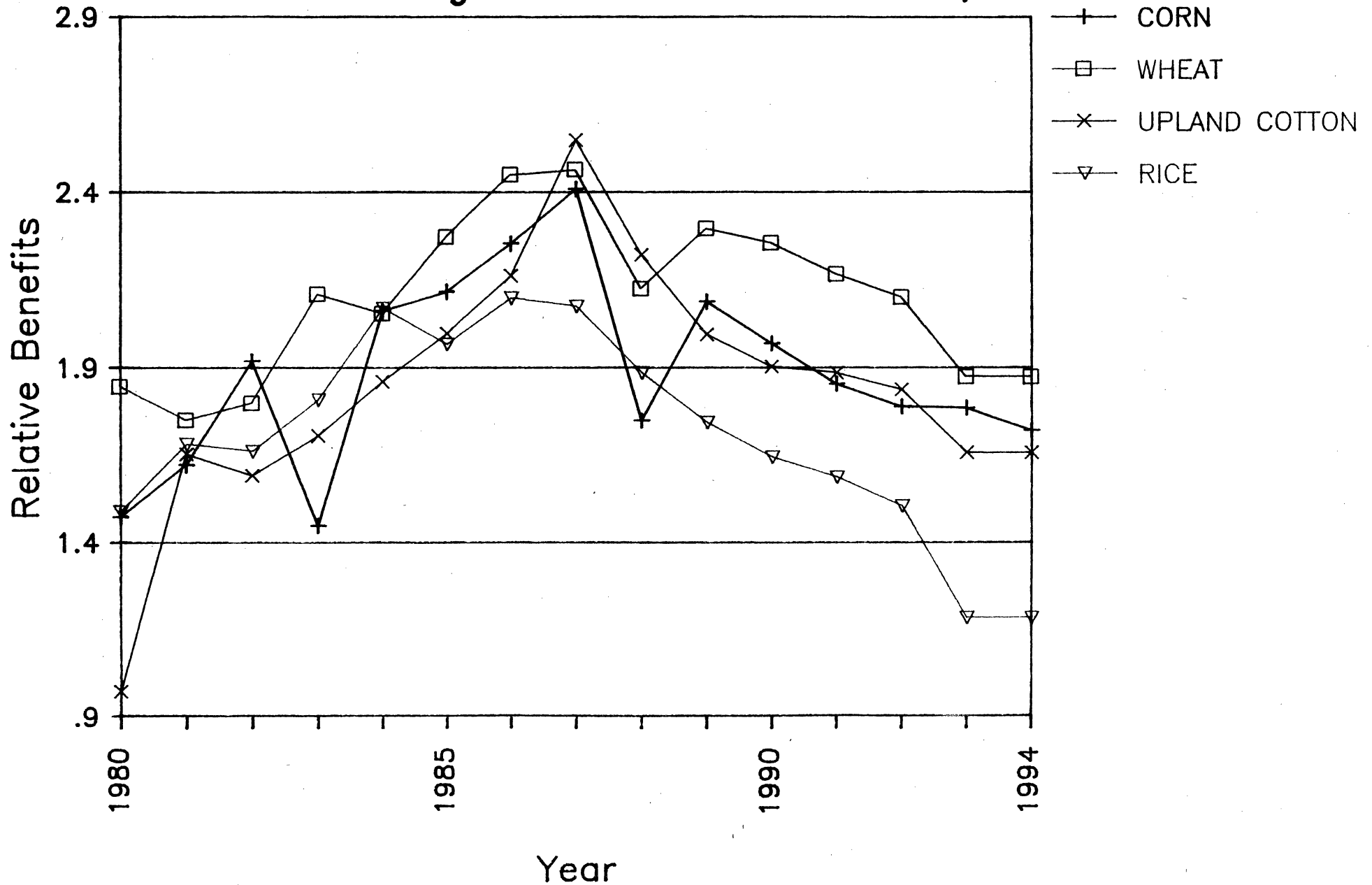
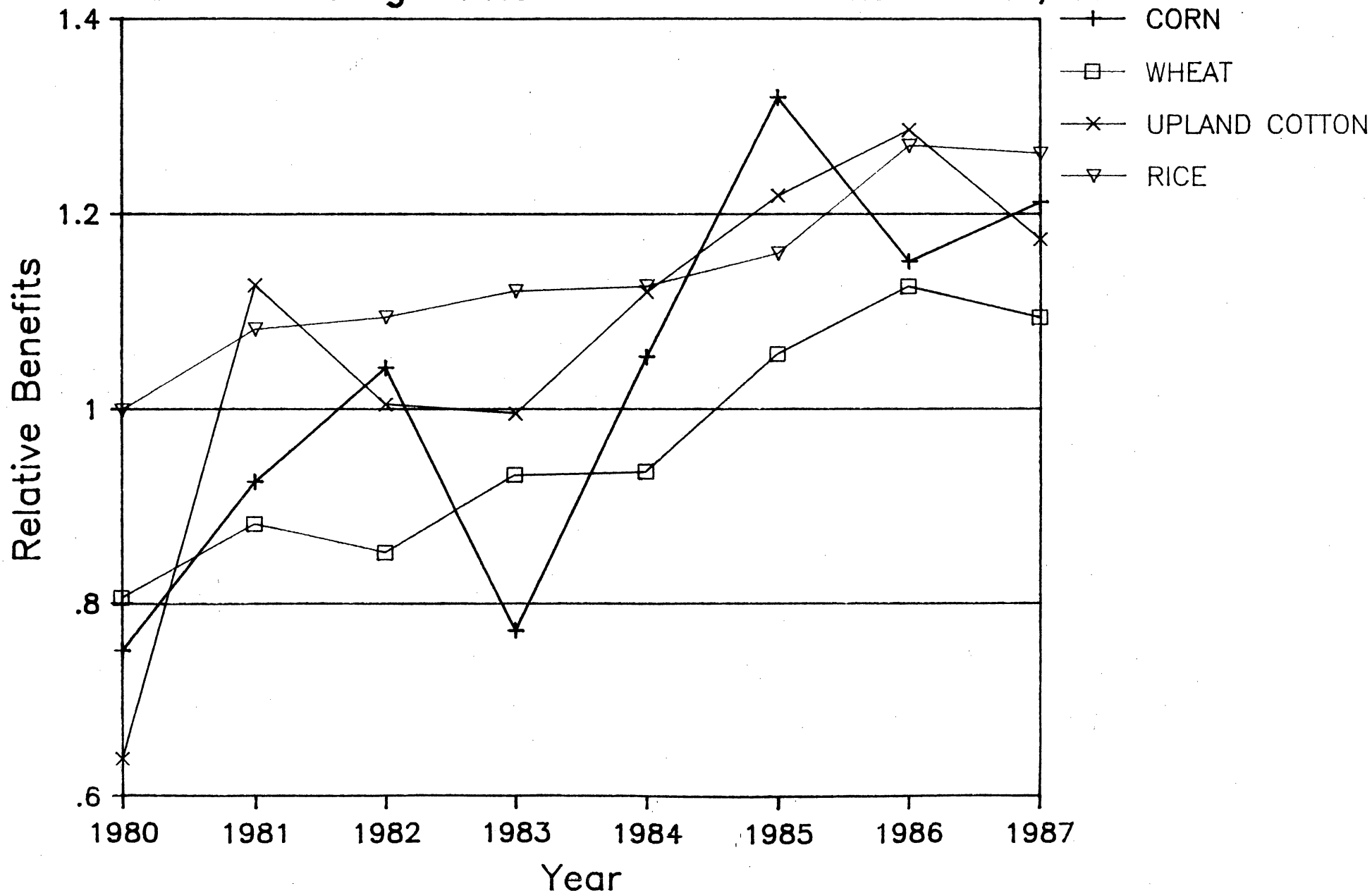


Figure 5. Relative Benefits Considering ARP
Effective Target Price to Total Economic Costs, 1980-87.



APPENDIX A

EQ. 1 Formula used to compute relative benefits using effective target price and ARP percentages for corn, wheat, and rice.

$$\text{RELATIVE BENEFITS :} \\ \text{EFFECTIVE TARGET} \\ \text{PRICE to TEC.} = \frac{[\text{TP}-(\text{MP,LR})] [\text{FPY}/\text{AY}] + (\text{MP,NLR})}{[\text{VC}+\text{MA}(\frac{\text{ARP}}{1-\text{ARP}}) + \frac{\text{TEC-VC}}{1-\text{ARP}}] / \text{AY}}$$

TP	Target Price
MP	Market Price
LR	Loan Rate
FPY	Farm Program Yield
AY	Actual Yield
NLR	Net Loan Rate (LR-storage costs)
MA	Maintenance Cost per acre of Set Aside
ARP	Acreage Reduction Program (percent)
VC	Variable Cost
TEC	Total Economic Cost

* Relative Benefits: Effective Target Price to VC is calculated without $\frac{\text{TEC-VC}}{1-\text{ARP}}$ in the denominator.

EQ. 2 Formula used to compute relative benefits using effective target price and ARP percentages for cotton.

$$\text{RELATIVE BENEFITS :} \\ \text{EFFECTIVE TARGET} \\ \text{PRICE to TEC.} = \frac{[\text{TP}-(\text{MP,LR})] [\text{FPY}/\text{AY}] + [(\text{MP,LR})] + [(1.67(\text{AY})/2000) (\text{\$/ton})] / \text{AY}}{[\text{VC}+\text{MA}(\frac{\text{ARP}}{1-\text{ARP}}) + \frac{\text{TEC-VC}}{1-\text{ARP}}] / \text{AY}}$$

* Relative Benefits: Effective Target Price to VC is calculated without $\frac{\text{TEC-VC}}{1-\text{ARP}}$ in the denominator.

EQ. 3 Regression equation used to predict cotton seed price for years 1989 to 1994.

$$\text{COTTON SEED PRICE} = 41.7837 + .1683394 (X_1) + 3.7978 (X_2) + -.01 (X_3)$$

X_1 = SOYBEAN MEAL PRICES (\$/ton)

X_2 = SOYBEAN OIL PRICES (cents/lb)

X_3 = COTTON PRODUCTION (lbs/acre)

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