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RECENT COST INCREASES: THEIR FUTURE IMPACTS ON AGRICULTURE*

Wayne A. Boutwell and Thomas W. Little

INTRODUCTION

The impact of rapidly escalating input prices of farm income, agricultural production, production adjustments, the general price level, the cost of living and capital requirements in the agricultural sector is a source of increasing concern to farmers, suppliers of capital to agriculture, and consumers of agricultural products. Record prices for agricultural commodities, such as feed grains and soybeans, partially masked the effects of a 52 percent increase in the index of prices paid for production items on net farm income during the period 1971-74. As agricultural machinery and farm buildings are replaced, world stocks of agricultural commodities are replenished, and domestic prices begin to decline, the magnitude of these cost increases will become more apparent [1].

To illustrate how recent cost changes may affect production of competing crops, a review of cost increases is presented; the impacts of recent cost increases on relative profitability of three crops—corn, soybeans and cotton—are examined; and both short-run and long-run implications of increased costs on the agricultural sector are explored.

Production Cost Increases

In April 1974, the index of prices paid for production items was 163 (1967-69 = 100), compared to an index of 107 for 1970. For farmers not changing their input mix during the 1971-74 period, this change represents a 52 percent increase in costs (Table 1). Its magnitude and impact are more easily discerned when one realizes

that farmers had almost 25 years, from 1945 to 1970, to adjust to a comparable percentage increase in input costs.

Examination of annual increases in the index of prices paid for production items reveals a sharp upward trend in annual cost increases of production items since 1970. Using 1967-69 as the base period (1967-69 = 100), the average annual rate of change in the index of prices paid for production items for the 1950-70 period was 1.09 points per year (Table 1). This value compares to an average annual increase of 14 points per year since 1970. The largest annual change in the index occurred in 1973 when it increased 20 points.

Contributing to increases in prices paid for production items during the 1971-74 period have been increases in prices paid for feed, livestock, motor vehicles, farm machinery, fertilizer and seed. Indices of these items increased 73, 39, 26, 32, 84 and 107 percent, respectively, during the 1971-74 interval (Table 1). Major underlying factors have been resource scarcity, spiraling inflation and the energy crisis.

Offsetting Cost Increases

Increases in productivity and product prices offset negative effects of increases in input prices on net farm income. Prior to 1971, prices received by farmers were relatively constant, while input prices were increasing. Without increased productivity, farming would have gradually become an economically depressed industry. However, through the adoption of yield-increasing technology, farmers were able to offset cost increases. One explanation of this phenomenon was forwarded by Cochrane

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Table 1. INDICES: INDICES OF PRICES RECEIVED AND PRICES PAID, 1939-74 (1967-69 = 100)

- 1007

Year	: Index of :	Indices of prices paid for--						
	: prices :	All :	:	:	:	:	:	
	: received :	production:	Feed :	Livestock:	Farm :	Fertilizer:	Seed :	
	: for crops ¹ :	items :	:	:	machinery:	:	:	
1939	:	36	41	45	35	33	68	37
1940	:	40	42	48	36	32	66	41
1941	:	48	44	52	40	32	66	39
1942	:	64	50	64	47	34	74	53
1943	:	83	56	75	54	35	79	66
1944	:	88	59	84	51	36	80	76
1945	:	90	60	83	55	36	81	77
1946	:	101	65	97	63	38	82	80
1947	:	117	76	114	78	42	91	92
1948	:	113	85	121	97	49	99	107
1949	:	100	81	100	86	56	102	96
1950	:	103	84	102	101	57	98	92
1951	:	118	93	114	123	61	103	94
1952	:	119	93	121	103	64	106	107
1953	:	107	87	110	74	64	106	97
1954	:	108	87	109	76	64	107	91
1955	:	103	86	102	74	64	105	95
1956	:	104	85	100	69	67	103	84
1957	:	100	88	97	78	71	104	87
1958	:	99	90	96	95	74	104	86
1959	:	99	91	96	95	77	103	82
1960	:	99	90	94	90	79	103	85
1961	:	101	91	95	90	81	104	85
1962	:	103	92	96	93	82	104	88
1963	:	107	93	100	88	84	103	94
1964	:	106	92	99	78	85	102	93
1965	:	104	94	100	86	88	103	96
1966	:	105	97	105	96	91	103	94
1967	:	100	98	103	93	96	103	96
1968	:	102	100	98	97	100	100	101
1969	:	98	104	99	109	105	96	103
1970	:	100	107	105	113	111	100	107
1971	:	108	113	108	116	118	105	114
1972	:	116	119	111	137	127	107	122
1973	:	164	143	168	175	137	119	157
1974 ²	:	207	163	182	157	147	184	222

¹ All farm products.

² Preliminary values reported in March and April 1974 *Agricultural Prices* [2].

[3]. In his treadmill theory, he discussed the cost-price squeeze forcing adoption of new technology. He stated that, as production expands, downward pressure exerted on prices narrows profit margins, thereby promoting adoption of new technology. The cycle continues, he contended, as long as new technology is available on the public account and farmers' financial positions permit the acquisition of new technology.

Thus the question exists—what impacts will these cost changes have on the level of agricultural prices, on economic relationships among alternative enterprises, and on public and private institutions serving agriculture?

IMPLICATIONS

Impact of Cost Change on the Level of Agricultural Prices

Because farmers cannot remain in business in the long run if their gross returns are below their production costs, recent cost increases must be offset by higher product prices and/or increased productivity for farming to remain an economically healthy sector of the economy [4].

To assess impact of cost changes on the level of prices, a projected estimate of productivity change had to be established. This was made by calculating the increase in productivity required to maintain comparable returns during the 10-year period from 1955-59 to 1965-69.¹ It was assumed that during this 10-year period, output prices adjusted to productivity and cost such that income in 1965-69 was comparable to 1955-59. Given indexes of input and output prices, the yield index required to equate returns was estimated utilizing the total revenue function. Equations were expressed in terms of indices, and solved for the productivity index which would have been required in 1965-69 to equate returns in that period to those earned during the 1955-59 period.

$$1) \frac{P_1 Y_1}{100} - C_1 = \delta \left(\frac{P_2 Y_2}{100} - C_2 \right)$$

Solving for Y_2 gives

$$2) Y_2 = \left(\frac{\frac{P_1 Y_1}{100} - C_1 + \delta C_2}{\delta P_2} \right)$$

where:

P_1, P_2 = indices of prices received by farmers (1955-59 = 100) for all crops in periods 1 and 2, 1955-59 and 1965-69, respectively,

C_1, C_2 = indices of prices paid by farmers in periods 1 and 2,

Y_1, Y_2 = indices of productivity in periods 1 and 2, and

δ = change in consumer price index between 1955/59-1965/69 used to convert returns to constant dollars.

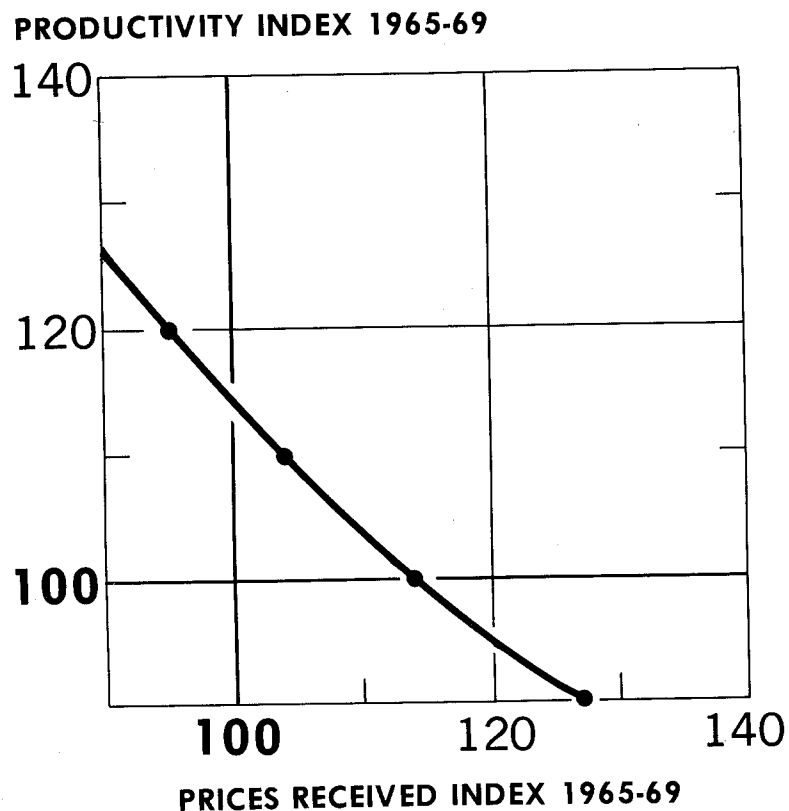
With the index of prices received in 1965-69 equal to 101.8, a productivity index of 112 was required to provide returns comparable to those earned in 1955-59—where the productivity index equals 100 (Figure 1). Trending productivity from 1965-69 to 1974 at the same rate estimated for the 1955-59 to 1965-69 period produced an index of 120—or an increase of 8 points during the 1967-74 period.

The impact of recent cost increases on long term agricultural prices was evaluated by comparing the index of prices received required to offset changes in input prices, which moved the index of prices paid upward from 98.6 in 1965-69 to 163 in 1974. Combinations of output prices and yield indexes for 1974, which provide returns comparable to 1965-69 returns, are contained in Figure 2. This figure may be used to identify either yields at various output prices or output prices at various yields which provide comparable returns between the 1965-69 period and 1974. For example, for prices received to return to the 1965-69 index level of 101, productivity would have had to increase by 71 points between 1967-74. Comparing this change to the 8-point increase estimated for that 7-year period, one concludes that prices received will be the factor which will have to offset recent cost increases, assuming prices are rigid downward.

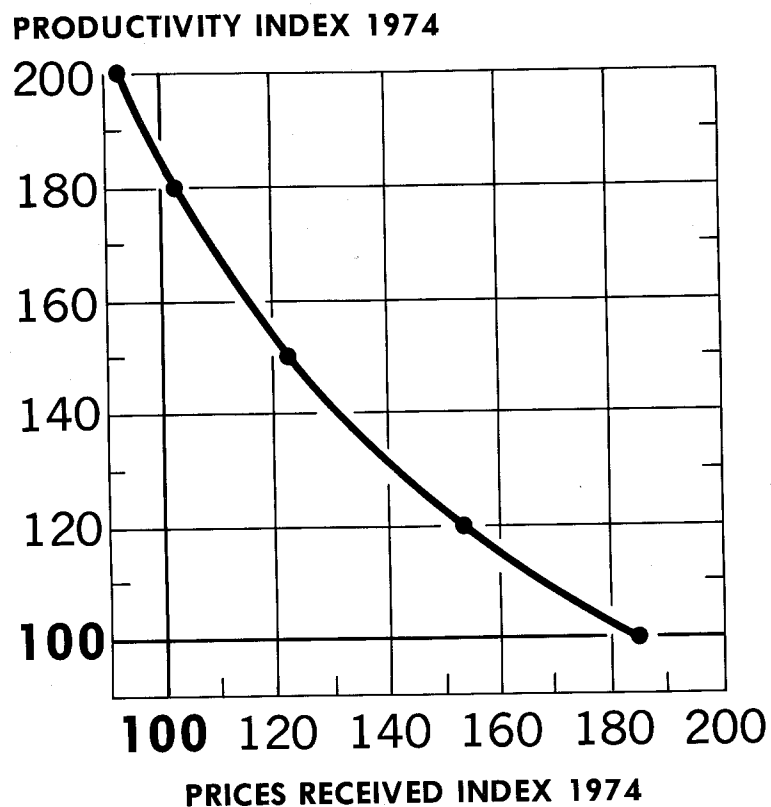
From Figure 2, the estimated productivity index of 120 for 1974 suggests an index of prices received of 155 as a new floor. Although this is well below the 1974 index of 207, it is considerably above the 1965-69 average of 101 and represents a significant deviation from trend.

¹ It was assumed that real income remained constant during the period 1955/59-1965/69 and as a result, may provide a conservative estimate of change in productivity. In using the analysis to project the impact of a cost change on prices received, one assumes that there was not a relative change in the growth of real income between the base and forecast periods.

**FIGURE 1:
INDICES OF
PRODUCTIVITY
AND PRICES
RECEIVED IN
1965-69
PROVIDING
COMPARABLE
RETURNS BETWEEN
1955-59
AND 1965-69**



**FIGURE 2:
INDICES OF
PRODUCTIVITY
AND PRICES
RECEIVED IN 1974
PROVIDING
COMPARABLE
RETURNS BETWEEN
1965-69
AND 1974**



Indexes used in this analysis are relative measures of changes that have occurred and should not be used as absolute values to evaluate specific commodities. However, cost increases do affect prices of individual commodities and relationships among competing enterprises. The following section illustrates the impact of recent cost changes on competitive price relationships of alternative enterprises.

Production Adjustment Prompted by Increased Costs

When cost increases occur, one of the first

reactions of an alert manager is to determine how they may be reduced, and how his resources may be better organized to maintain or increase profits.

Recent cost and price adjustments have caused farmers to reassess some of their "rules of thumb" of management. To illustrate this point, consider the 3:1 corn/soybean ratio which has been employed by some farmers to guide their planting program for the two crops. For these farmers, when the price of soybeans was at least 3 times that of corn, soybean was considered the preferred crop to plant. When the ratio was narrower, corn was considered more profitable.

Table 2. SOYBEANS: ESTIMATED VARIABLE PRODUCTION COSTS, SOYBEANS AND COMPETING CROPS, SPECIFIED REGIONS, 1970 and 1973-74 WITH 1975 ESTIMATE*

Area and crops	Average yield 1967-73 ¹		Estimated variable costs ²			
	Unit	Amount	1970	1973	1974	1975
			--Dollars--			
Illinois--Area Q:						
Corn	:Bu.	98.4	47.66	57.19	78.14	90.95
Soybeans	:Bu.	32.3	22.93	30.79	33.70	36.81
Southeast Coastal Plain--Area B--large farms:						
Cotton	:Lb.	461.8 ³	112.00	130.71	167.40	190.19
Corn	:Bu.	48.4	37.81	45.75	63.55	73.96
Soybeans	:Bu.	20.6	27.60	36.43	44.96	47.85
Delta--Area B--clay soils:						
Cotton, solid plant	:Lb.	542.0	129.23	149.47	182.97	206.91
Soybeans	:Bu.	22.7	23.45	32.09	37.38	41.13

¹ Per planted acre.

² Includes a charge for operator and family labor at hired labor wage rates.

³ 1971-74 average yield per acre harvested.

*Source: W. Herbert Brown, ERS, CED, developed these cost estimates by adjusting variable costs contained in *Selected U.S. Crop Budgets, Yields, Inputs, and Variable Costs*, USDA, ERS, by current input costs. Budgets used were: Corn Belt, Area Q; South Atlantic; Area B; and Delta, Area B.

Table 3. FERTILIZER: PRICES PAID BY FARMERS, WITH PERCENTAGE CHANGES IN PRICE, SELECTED TYPES, U.S., 1970-1974

Year	: : : :			
	: Anhydrous ammonium	: Ammonium nitrate (33.5 percent)	: 20 percent phosphorous	: Murate of potash (60 percent K ₂ O)
	: : : :			
	: --Prices paid by farmers (dollars per ton)--			
1970	: 75.00	: 60.00	: 45.40	: 50.90
1971	: 79.30	: 63.30	: 47.80	: 58.20
1972	: 80.00	: 64.70	: 49.90	: 58.80
1973	: 87.60	: 71.04	: 53.70	: 61.50
1974	: 183.00	: 139.00	: 91.40	: 81.30
	: : : :			
	: --Annual percent change in price--			
1970-73 average ¹	: +5.6	: +6.1	: +6.1	: +6.9
1973-74	: +108.9	: +95.7	: +70.2	: +32.2
	: : : :			

¹ Average annual change.

Source: *Agricultural Prices*.

Table 4. INDEX OF PRICES PAID: SELECTED INPUTS, U.S., 1973-1974

Item	: Index of prices paid (June 15) ¹	
	: 1973	: 1974
	: : : --1910-14 = 100--	
Fertilizer	: 172	: 272
Seed	: 369	: 548
Farm supplies	: 332	: 432
Interest ²	: 854	: 974
	: : : --1967 = 100--	
Fertilizer	: 112	: 178
Seed	: 156	: 232
Farm supplies	: 121	: 154
Interest ²	: 179	: 204
	: : :	

¹ Source: *Agricultural Prices*.

² Interest on real estate debt.

Examination of changes in the costs of producing corn and soybeans since 1970 provide a vivid illustration of cost increases which have occurred, an indication of production adjustments which recent increases may foster, and an explanation of why price ratios are being reassessed.

The estimated variable costs of producing corn during 1970, in Illinois, was \$47.66 per acre (Table 2). In 1974 the estimate was \$78.14 per acre, and has been projected to be \$90.95 per acre in 1975 [5]. These changes show a 64 percent increase in variable costs over the 1971-74 period, and a projected increase of 91 percent for the 1971-75 period. Somewhat smaller, but still dramatic, increases have been reported in variable cost estimates for corn production in the Southeast. Similarly, variable costs of producing soybeans and cotton have been increasing. Estimates of variable costs for producing soybeans in Illinois, the Southeast and Mississippi Delta regions show increases of 47, 63 and 59 percent, respectively, for the 1971-74 period.

The principal factor contributing to increases of this magnitude during the 4-year period has been significant increases in input prices. For example, the average price paid for anhydrous ammonia, phosphur and potash increased 144, 101 and 60 percent, respectively, during the 1971-74 period (Table 3). As indicated by the indices of prices paid for individual production items shown in Table 4, other input prices have also increased significantly.

Cost increases of recent magnitudes have had several immediate impacts [6]. The most obvious has been an increase in per-unit variable costs of production. For example, during the 1971-74 period the estimated variable cost of producing corn in Illinois increased \$0.41 per bushel, and the area's variable cost of producing soybeans increased \$0.42 per bushel.

A less obvious impact has been the change occurring in soybean price required to provide per acre returns equal to corn. In 1973, with corn selling for \$2.50, a soybean price of \$6.50 provided equal returns per acre at assumed yield levels. Thus, the critical corn/soybean price ratio at these prices was 2.71:1 (Table 5). By 1974, the ratio providing equal returns for \$2.50 corn had dropped to 2.54:1, and is projected to drop to 2.47:1 by 1975. As shown in Table 5, the ratio equating returns for corn and soybeans within a particular year depends on price level of corn in addition to

yields and costs. In 1973, for example, if the price of corn changed from \$1.00 to \$4.00 the corn/soybean price ratio required to equate returns would range from 2.23 to 2.84. Similar relationships also exist for corn and soybeans produced in the Southeast, and for soybeans and cotton produced in the Southeast and Delta regions.

These results show the need for review of competitive relationships among alternative enterprises. Adjustment incentives will include changes in relative profitability of alternative enterprises; changes fostered by higher costs and their relationship to capital restrictions of individual farm operators; and changes in risks associated with higher cost enterprises.

Other Implications

The impact of recent cost increases will influence other sectors of the economy, policy formulation and consumer prices.

Should the cost-price squeeze become more acute and capital requirements increase, a reduction in farm numbers could be expected as small farms and inefficient producers are squeezed out. Cost increases do raise total capital requirements of the agricultural sector. If capital is limited, its disbursement would likely become more concentrated among larger, established and more efficient producers. Such an occurrence could place a greater burden on federally supported programs providing capital to small farms, and place a greater handicap on new and young farmers trying to get established in farming.

If the price-level of certain agricultural commodities rises, introduction of substitute products would become more attractive. Acceptance of new products could diminish the demand for existing commodities. If demand declines, price reductions and/or supply adjustments will follow.

Should market prices show weakness and recent cost increases continue, more frequent demands for review of agricultural policies designed to raise and stabilize farm income may be anticipated. Requests for added public support of agricultural research, which would increase production and lower costs, may also be anticipated if cost increases are not offset by price increases. Therefore, recent cost increases pose serious economic problems which will influence agricultural production, agricultural policy and consumer prices in the future.

**Table 5. SOYBEAN PRICES: SOYBEAN PRICES EQUATING RETURNS TO FIXED FACTORS
FROM SOYBEANS TO RETURNS FROM COMPETING CROPS, 7 LEVELS OF PRICES
OF COMPETING CROPS AND 2 YIELD LEVELS BY AREAS, 1973-74**

Price level of competing crops	Soybean prices (using average yields ¹)									Soybean prices (above average yields)		
	Illinois (Area Q)			Southeast (Coastal Plain)			Delta			1975		
	1973	1974	1975 ²	1973	1974	1975 ²	1973	1974	1975 ²	Ill. ³	S.E. ³	Delta ³
--Dollars per bushel--												
Corn:												
1.00	2.23	1.72	1.47	1.90	1.48	1.17	---	---	---	1.77	1.02	---
1.50	3.75	3.26	3.04	3.07	2.67	2.36	---	---	---	3.33	2.03	---
2.00	5.28	4.81	4.61	4.24	3.85	3.56	---	---	---	4.90	3.04	---
2.50	6.80	6.36	6.18	5.42	5.04	4.76	---	---	---	6.46	4.05	---
3.00	8.32	7.91	7.75	6.74	6.23	5.96	---	---	---	8.02	5.06	---
3.50	9.84	9.46	9.32	7.77	7.42	7.15	---	---	---	9.58	6.07	---
4.00	11.37	11.00	10.89	8.95	8.61	8.35	---	---	---	11.15	7.08	---
--Cents per pound--												
Cotton:												
30	---	---	---	2.57	1.34	.32	3.31	2.08	1.17	---	.54	.97
40	---	---	---	4.81	3.55	2.50	5.70	4.44	3.54	---	2.41	2.81
50	---	---	---	7.05	5.75	4.68	8.09	6.83	5.90	---	4.27	4.64
60	---	---	---	9.29	7.96	6.86	10.48	9.21	8.27	---	6.14	6.47
70	---	---	---	11.53	10.17	9.04	12.86	11.57	10.64	---	8.01	8.31
80	---	---	---	13.77	12.38	11.21	15.25	14.00	13.00	---	9.87	10.14
90	---	---	---	16.01	14.59	13.39	17.64	16.34	15.37	---	11.74	11.97
100	---	---	---	18.26	16.80	15.57	20.03	18.70	17.74	---	13.61	13.81

¹ Average yield, 1967-73, with average annual rate of increase in yields incorporated in the 1974 and 1975 returns equations.

² Projected prices equating returns to fixed factors in 1975 given average yield expectations.

³ Projected prices equating returns to fixed factors in 1975 given above average yield expectations.

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